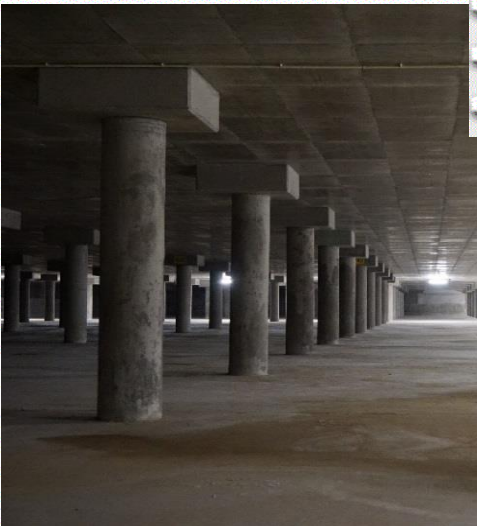
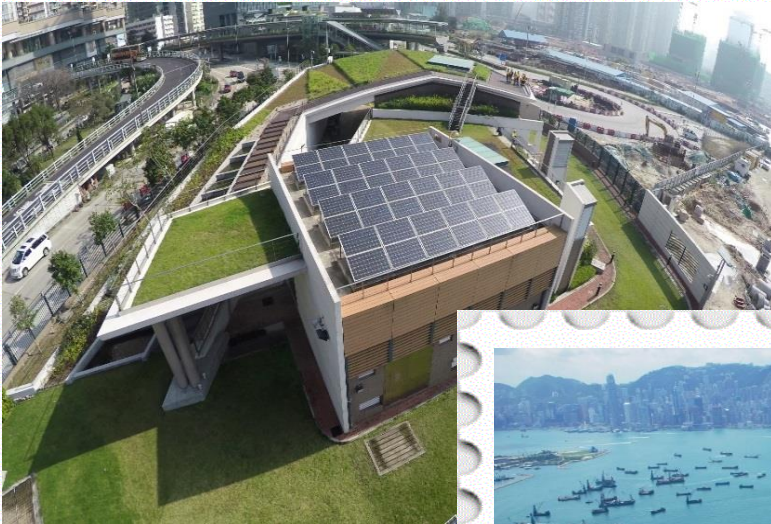


# Safety Manual

(2018)

Safety Policy (2020)  
is incorporated.





## Foreword

The Drainage Services Department is responsible for the planning, design, construction, operation and maintenance of the public sewerage system, sewage treatment facilities and stormwater drainage infrastructure in Hong Kong. Our undertakings adopt numerous types of construction techniques and equipment applied in widely different conditions, and therefore the risks encountered are equally diverse. It is important that all personnel involved should play their respective roles to ensure that our undertakings are carried out safely and our workplaces are maintained in a safe and healthy condition.

The departmental Safety Manual was first published in 1994 and it has been updated twice in 2002 and 2010 respectively. This Manual updates the previous edition and incorporates essential information regarding safety legislations, instructions, procedures and work practices that are relevant to our undertakings. All DSD's staff and staff of DSD's Consultants and Contractors involved in our undertakings should acquaint themselves with the provisions in this Manual.

With our dedicated commitment to safety, it is intended that this Manual will serve as a comprehensive and handy guide to upkeep the safety and health at work of our undertakings, as well as promotion of the safety culture amongst our staff and the staff of our Consultants and Contractors.



**Edwin K. H. TONG**

Director of Drainage Services

October 2018

## Acknowledgement

This Manual was prepared and updated by the Safety Advisory Unit of our department. Thanks are extended to the Safety Manual Working Group, Translation Section and other colleagues concerned, who have provided valuable advice and input during the preparation of this Manual.

### **Safety Advisory Unit**

Drainage Services Department

2018

Remark: The Safety Policy (2018) originally contained in the Manual was replaced by the new Safety Policy (2020).

Safety Advisory Unit  
Drainage Services Department  
2020



## Safety Policy

1. It is the policy of our Department to ensure that all our undertakings are accomplished safely, efficiently and with due regard to the environment. We place the highest priority on safety and health at work. This Policy demonstrates our commitment and continual efforts on improving safety and health at work.
2. Our Department is committed to providing and maintaining a safe and healthy working environment to all persons involved in our work for the prevention of work-related injury and ill health, and appropriate protection to other people who may be affected by our work.
3. For construction, operation and maintenance works undertaken by our contractors, we aim to eliminate fatal accidents and dangerous occurrences, and contain the accident frequency rate to within the limit set by the relevant Bureau for public works contracts. For any work carried out by DSD's in-house staff, we aim to eliminate serious accidents and contain the accident frequency rate within 5 nos. of reportable accidents per 1,000 staff per year.
4. We shall continue to improve our safety management systems, comply with safety and health ordinances and regulations and other requirements concerned, establish safety instructions, work procedures and safety training programmes, and secure resources for implementing this Policy.
5. Our management and supervisory staff shall monitor the implementation of this Policy and safety and health measures in order to ensure that the occupational safety and health risks are eliminated or effectively controlled. Our staff at operational level shall cooperate with our management and comply with the safety instructions and procedures concerned.
6. Safety is a duty for all. Every person is responsible for his/her own safety and the safety of others who may be affected by his/her acts or omissions. All staff shall comply with the safety and health requirements of the Occupational Safety and Health Ordinance, the Factories and Industrial Undertakings Ordinance, codes of practice, departmental Safety Manual and other safety instructions that are related to their work. We shall consult our staff on occupational safety and health matters and encourage their participation.
7. Contractors who are engaged in our construction, operation and maintenance works shall be responsible for the safety and health at work of their employees and those of their subcontractors. Our site supervisory staff or the resident site staff employed by our consultants shall supervise our contractors and monitor their site safety and health performance, and shall take necessary actions to prevent accidents.
8. This Policy shall be made known to all our staff and the employees of our consultants and contractors who are engaged in our construction, operation and maintenance works.

**Kelvin KW LO**

Director of Drainage Services

March 2020



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# 1

## Policy, Objectives and Strategy



渠務署

Drainage Services Department



# CHAPTER 1

## Policy, Objectives and Strategy

### 1.1 Policy

---

- 1.1.1 It is the policy of the Drainage Services Department to ensure that all the Department's undertakings are accomplished safely, efficiently and with due regard to the environment. The Department places the highest priority on safety and health at work.
- 1.1.2 The Department is committed to continuously enhancing its safety management systems, safety instructions and procedures and safety training programme and securing the resources as necessary for implementing the Safety Policy.
- 1.1.3 The Department requires all management and supervisory staff to monitor the implementation of the Safety Policy and safety and health measures in the Department's undertakings in order to ensure that the risks at work are eliminated or effectively controlled. The Department also requires all staff at operational level to cooperate with the management and comply with the safety instructions and procedures.
- 1.1.4 Safety is a duty for all. The Department requires everyone working in the Department's undertakings to take due regard to his/her safety and others who may be affected by his/her acts or omissions, and to observe and comply with the safety and health requirements of the Occupational Safety and Health Ordinance, the Factories and Industrial Undertakings Ordinance, codes of practice, DSD's Safety Manual and other safety instructions that are related to their work.
- 1.1.5 The Department requires all contractors who are engaged in the Department's construction and maintenance works contracts to take due regard to the safety and health of their employees and those of their subcontractors.
- 1.1.6 The Department requires all departmental site supervisory staff or resident site staff employed by the Department's consultants to monitor the safety and health performance of the contractors and take necessary actions to prevent accidents.

## 1.2 Objectives

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- 1.2.1 The Department aims to ensure the safety and health at work of all personnel involved in the Department's undertakings and maintain all DSD's workplaces and works sites free from risk with a view to preventing accidents.
- 1.2.2 For any work carried out by DSD's in-house staff, the Department aims to eliminate serious accident at all and control the accident frequency rate to below 5 Nos. of reportable accidents per 1,000 staff per year (please see notes below).
- 1.2.3 For construction and maintenance works undertaken by contractors, the Department aims to eliminate fatal accidents and dangerous occurrences, and control the accident frequency rate to below the accident rate limit of public works contracts set by Development Bureau (DEVB). The current accident rate limit is 0.6 Nos. of reportable accidents per 100,000 man-hours worked, which is effective on 1 February 2011.
- (Notes: For the purpose of safety performance measurement: -*
- (a) a "fatal accident" is defined as an accident which results in fatality;*
  - (b) a "serious accident" is defined as an accident which results in serious bodily injury;*
  - (c) a "dangerous occurrence" is an incident as defined in the First Schedule of the Factories and Industrial Undertakings Regulations; irrespective of whether there are casualties or not; (please see Section 15.5.3 regarding the eight types of dangerous occurrence in the Schedule) and*
  - (d) a "reportable accident" is defined as a non-fatal accident which results in incapacity for more than three days.)*
- 1.2.4 The Department shall upkeep, monitor, review and continuously improve the safety and health at work and promote safety culture amongst DSD's staff and the staff employed by DSD's consultants and contractors.

## 1.3 Strategy

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The Department adopts a proactive approach to managing and promoting safety and health at work. The strategies to achieve the safety and health objectives set out in Section 1.2 are listed below: -

- 1.3.1 Secure the commitment and participation of all parties involved, including all departmental staff, consultants, contractors, sub-contractors, their site staff and workers.
- 1.3.2 Provide guidance to project engineers during the planning and design stage to properly address the safety and health issues during its construction, operation, maintenance and decommissioning.
- 1.3.3 Incorporate contractual provisions to require contractors who are engaged in the Department's construction and maintenance works contracts to establish and implement safety plans and safe working procedures to discharge their site safety obligations in the contracts.
- 1.3.4 Select contractors who give proper consideration to construction safety to carry out the works. The safety performance of a contractor is to be given a high weighting factor in prequalification exercises.
- 1.3.5 Require DSD's site supervisory staff or resident site staff employed by DSD's consultants to closely supervise site safety activities and monitor the safety performance of the contractors.
- 1.3.6 Require all Engineer's Representatives to take due regard of the contractor's safety performance when rating the Report on Contractor's Performance (RCP) during the contract period.
- 1.3.7 Identify potential high risk activities and establish suitable safety instructions and procedures to provide and maintain a safe and healthy working environment for operation and maintenance activities directly undertaken by the departmental staff.
- 1.3.8 Provide safety training to enhance the safety awareness and competence of all personnel working in the Department's undertakings including: -
  - (a) Arrange mandatory basic safety training, safety training for works involving special risks, safety management and supervision training, firefighting, first aid and other accident prevention training for all in-house staff.
  - (b) Incorporate contractual provisions requiring all resident site staff employed by the Department's consultants to undergo mandatory basic safety training and safety training for works involving special risks.



- (c) Conduct safety seminars on specific safety issues for departmental site staff, consultants and their resident site staff, contractors, subcontractors and workers.
  - (d) Review the safety training needs and arrange refresher training regularly.
- 1.3.9 Carry out safety inspections to DSD's workplaces and works sites to identify unsafe acts and unsafe conditions and advise on the preventive and/or corrective measures.
- 1.3.10 Maintain records of serious accidents, dangerous occurrences and near misses, and statistics of reportable accidents which result in incapacity for more than 3 days. Disseminate lessons to be learnt from accidents and analyze accidents of similar and/or repetitive nature to identify root causes and the corresponding target improvement areas (TIA) to reduce accidents.
- 1.3.11 Monitor continuously the accident statistics of DSD's workplaces and works sites to identify trends and problem areas to enable improvement measures to be taken early.
- 1.3.12 Foster a safety culture amongst DSD's staff and staff employed by DSD's consultants and contractors through arrangement and/or participation of safety promotion activities, competitions and campaigns.
- 1.3.13 Promote experience sharing of good safety and health practices.
- 1.3.14 Review and update the safety management systems and safety procedures for continuous improvement.

# 2



## Safety Responsibilities and Safety Committees



# CHAPTER 2

## Safety Responsibilities and Safety Committees

### 2.1 Responsibilities

---

2.1.1 Safety is a duty for all. All parties have their own responsibilities for ensuring and promoting safety and health in the Department's workplaces and works sites. The safety responsibilities of DSD's staff at different levels, as well as those of the consultants' resident site staff and the contractors, are set out below.

#### **DSD's Staff at Different Levels**

##### 2.1.2 Staff at Management Level

- (a) Formulate policies to ensure the safety and health at work of the staff under their management.
- (b) Secure the commitment and participation of staff to maintain the Department's workplaces and works sites safe and without risk to health.
- (c) Ensure that the safety and health policies, instructions and procedures are understood by all staff concerned and fully implemented.
- (d) Provide information, instruction and training as necessary to ensure the safety and health at work of all staff.
- (e) Assign and train staff to administer and monitor the implementation of the safety and health policies, instructions and procedures.
- (f) Secure adequate resources as necessary for the effective implementation of the safety and health policies.
- (g) Monitor the safety performance of consultants and contractors and take urgent actions to rectify situation should there be major construction safety problems.
- (h) Monitor the implementation of the departmental Safety Policy and review as and when necessary.

##### 2.1.3 Staff at Supervisory Level

- (a) Implement the departmental Safety Policy and enforce the safety and health requirements of this Safety Manual and other safety and health instructions and procedures.

- (b) Draw up specific safety instructions and procedures for work, which involves special risks.
- (c) Supervise the carrying out of the work and monitor the observance of the safety and health standards, rules and practices and take corrective actions to rectify any violations.
- (d) Ensure that all machinery, plants, equipment and tools are maintained in safe working condition and are operated by competent persons.
- (e) Ensure that all defective machinery, plants, equipment and tools are suspended or withdrawn from service and securely locked or isolated to prevent from being accidentally used until they are satisfactorily repaired.
- (f) Report to the management immediately any unsafe conditions and unsafe acts, which are likely to create imminent danger if they are beyond their capabilities to handle them.
- (g) Ensure that personal protective equipment provided to staff are properly maintained and correctly used.
- (h) Inspect the workplaces to ensure that they are free from risks of safety and health.
- (i) Ensure good housekeeping, e.g. cleanliness and tidiness of workplaces, proper storage of materials, plants and tools.
- (j) Maintain safe access to and egress from workplaces.
- (k) Ensure that adequate and sufficient firefighting installations and fire escapes are available in the workplaces.
- (l) Ensure that adequate first aid facilities are always available.
- (m) Conduct accident investigation and recommend corrective actions for preventing similar accidents.
- (n) Report to the management of serious accidents and dangerous occurrences.
- (o) Assess the training needs of the staff and advise the management accordingly.

#### 2.1.4 Staff at Operative Level

- (a) Co-operate with the management and supervisory staff in implementing the safety and health instructions and procedures.
- (b) Make themselves conversant with the safety and health instructions and procedures related to their work and follow these instructions and procedures.



- (c) Work safely and take good care of themselves and others who may be affected by their acts or omissions at all times; avoid to be complacent and take dangerous shortcuts; avoid to improvise dangerous tools; and always ask for assistance and advice if in doubt.
- (d) Use personal protective equipment correctly as required and take reasonable care of them.
- (e) Report any unsafe tools, equipment and plants or any unsafe conditions immediately to their supervisor or the officer-in-charge of the workplace if any rectification works are beyond their capabilities.
- (f) Report all accidents, dangerous occurrences and near misses immediately after their occurrences.
- (g) Attend safety training to meet legislative and operation needs.

#### **DSD's Safety Personnel**

##### 2.1.5 Departmental Safety Advisory Unit (SAU)

- (a) Assist the management in the formulation of safety and health policies, instructions and procedures.
- (b) Liaise with the Development Bureau and Labour Department on matters concerning the safety and health initiatives and procedures, and disseminating the initiatives and procedures to staff.
- (c) Keep track of development of safety legislation and disseminate the information to management, supervisory and operatives.
- (d) Examine and analyse current safety practices and accident statistics reports, investigate serious accidents and advise on appropriate corrective and improvement actions.
- (e) Carry out site safety inspections on works sites and workplaces to identify unsafe acts and unsafe conditions, as well as obvious environmental related irregularities, and advise the corrective and improvement measures.
- (f) Attend Site Safety Management Committee meetings of works sites and joint site inspections before such meetings.
- (g) Vet safety-related tender documents, specifications and/or drawings to provide input on safety requirements during design stage of projects undertaken by the Department.
- (h) Comment on safety plans, method statements and any special safety

issues of construction sites, workshops and plants when required.

- (i) Advise on safety standards and safety precautionary measures to be adopted in inspection, operation and maintenance activities undertaken by the Department's staff and Consultants' resident site staff.
- (j) Review and update safety training needs for DSD's staff and monitor the effectiveness of safety training.
- (k) Promote safety and health on all DSD's workplaces and works sites. Arrange and/or coordinate safety promotion activities.
- (l) Act as the departmental representative on any committees and/or meetings set up for the promotion of safety and health at work.

#### 2.1.6 Divisional Safety Coordinator

Divisional Safety Officer (DSO) is appointed by the Head of Division to act as the contact person on general safety matters on behalf of the Division. Their responsibilities are as follow: -

- (a) Liaise with the departmental Safety Advisory unit (SAU) on all general safety and health matters.
- (b) Coordinate routine returns on safety matters for submission to the SAU including monthly returns on construction site accident statistics, nominations of safety training for the staff of the Division, etc.
- (c) Coordinate returns on safety promotion activities, competitions and campaigns.
- (d) Coordinate the Division's comments on draft safety circulars, new safety initiatives, safety legislations, guidelines and code of practices.
- (e) Receive and disseminate safety promotional materials and publications including safety pamphlets, posters, newsletters, guidelines and etc.
- (f) Receive and disseminate general safety messages including monthly mosquito indices, monthly summary construction site accident statistics, lessons to be learnt from accidents, etc.
- (g) Other safety-related duties assigned by the Head of Division.

## **DSD's Site Supervisory Staff or Resident Site Staff of DSD's Consultants**

### 2.1.7 Engineer's Representative (ER)

The representative or delegate of the Engineer, Project Manager, Service Manager and Supervising Officer, hereinafter collectively expressed as the Engineer's Representative (ER), has the following duties and responsibilities with respect to safety on DSD's works sites: -

- (a) Enforce the legislative and contractual requirements relating to construction safety and health.
- (b) Ensure the safety of his site staff, by providing suitable training, protective clothing, safety equipment, first-aid and welfare facilities, etc.
- (c) Comment on the adequacy of the contractor's Safety Plan and contractor's method statements and submissions.
- (d) Chair the Site Safety Management Committee meeting and prepare the minutes of the meeting.
- (e) Carry out site safety inspections and ensure prompt follow up action is taken by the Contractor on deficiencies identified.
- (f) Scrutinize safety audit reports received and monitor the implementation of the action plan submitted by the Contractor.
- (g) Take follow-up action against deficiencies identified in site inspections, Inspection Reports received from the Labour Department as well as Improvement Notices and Suspension Notices.
- (h) Monitor the site safety performance of the contractor and report to the Division Heads concerned.
- (i) Liaise with the Labour Department, Marine Department and departmental Safety Advisory Unit for the promotion and upkeeping of site safety.
- (j) Report serious accidents, dangerous occurrences and near misses occurred on works sites to DSD's officers concerned, carry out investigation and submit reports on findings and recommendations for improvement.

### 2.1.8 Site Supervisory Staff

- (a) DSD's site supervisory staff, or resident site staff (RSS) employed by consultants as the case may be, are responsible for the site safety supervision and shall assist the ER in carrying out his duties.
- (b) The site supervisory staff shall attend safety training courses and/or refresher courses to enhance and upkeep their competence

in site safety supervision.

- (c) Those site supervisory staff who are not assigned to exclusively deal with construction safety matters should also familiarise themselves with safety requirements and safety legislation (particularly the Factories and Industrial Undertakings Ordinance and Regulations) that are related to their work so that they can detect any unsafe working methods or breach of safety legislation and bring such matter to the attention of the Engineer's Representative and the contractor's Site Agent or Safety Officer.

### **The Contractor and his Safety Personnel**

#### 2.1.9 The Contractor

The Contractor is responsible for all safety and health matters on the works sites under his management and control. He shall assume full responsibilities for the site safety and health management and prevention of accidents that may result in injuries to persons and damage to properties in the course of execution of the contract. The duties and responsibilities of the Contractor include: -

- (a) Be well conversant with the safety legislations, safety requirements of the contract, departmental Safety Policy and instructions and ensure that they are strictly observed by his workers, his sub-contractors and their workers.
- (b) Maintain the site and its immediate vicinities in a safe condition, i.e. safe access and egress, adequate warning signs and safety notices, safe working platforms and temporary works, safe storage and stacking of construction materials, sufficient fire extinguishers and alarms, etc. Ensure no unsafe conditions like free edges, uncovered openings, uneven or slippery surface, jagged edges or protrusions, etc.
- (c) Ensure that all plants, equipment and tools are regularly checked and maintained in safe working order.
- (d) Maintain the site and its surroundings in a clean and tidy condition and free from nuisance to the public, including polluted water, litter, dust, noise, odour, pest and mosquitoes, etc.
- (e) Provide information, instruction, training and supervision as may be necessary to ensure the safety and health at work of his workers and those of his subcontractors.
- (f) Manage and supervise his subcontractors to ensure that their works are carried out safely.



- (g) Investigate all accidents, dangerous occurrences and near misses and report them together with the findings and recommendations for preventing recurrences to the ER of the contract.
- (h) Appoint sufficient number of qualified Safety Officers who are registered under the Factories and Industrial Undertakings (Safety Officers and Safety Supervisors) Regulations and competent Safety Supervisors to assist him to discharge his safety duties and responsibilities as mentioned above.
- (i) Liaise with the Occupational Safety Officers of the Labour Department, Shipping Safety Officers of the Marine Department and departmental Safety Advisory Unit and accompany them in site safety inspections.

#### 2.1.10 Safety Officer

The responsibility of a Safety Officer (SO) is to assist the contractor to promote the safety and health of all workers. In addition to the legal duties as specified in the Factories and Industrial Undertakings (Safety Officers and Safety Supervisors) Regulations, the duties and responsibilities of a Safety Officer shall include: -

- (a) Advise the Contractor of measures to be taken in the interest of safety and health and implement such measures.
- (b) Inspect the workplace to identify potential hazards and advise the Contractor of the corrective and improvement measures.
- (c) Investigate accidents, dangerous occurrences and near misses and report findings with recommendations for prevention to the Contractor. Prepare detailed investigation reports and other standard reporting forms required by legislation and the contract.
- (d) Advise the Contractor of any repair or maintenance that needed to be carried out to the premises, plant and equipment in the interest of safety and health.
- (e) Supervise the Safety Supervisors.
- (f) Receive, discuss and countersign reports submitted to him by Safety Supervisors.
- (g) Update Safety Plan regularly. Supervise and monitor the implementation of Safety Plan and other safety obligations set out in the contract.
- (h) Prepare and submit a monthly report for discussion at the monthly meeting of the Site Safety Management Committee and Site Safety Committee.

- (i) Ensure that sub-contractors and all persons working on the site are made aware of and comply with the Safety Plan and other safety obligations set out in the contract.
- (j) Keep a register of the names, telephone numbers and addresses of the Safety Supervisors, first aiders, competent persons and competent examiners employed in the contract.
- (k) Attend meetings of the Site Safety Management Committee and the Site Safety Committee.
- (l) Maintain a safety diary.
- (m) Carry out weekly site inspections with the ER's site supervisory staff and complete inspection checklist in a format to be agreed by the Engineer's Representative.
- (n) Keep and monitor accident statistics.
- (o) Prepare safety training programme, arrange and/or conduct training and maintain safety training records.
- (p) Coordinate with sub-contractors or other contractors on the preparation of specific method statements including risk assessments.
- (q) Maintain a record of all examination and test certificates of plants and equipment as required by any legislation or the contract.
- (r) Carry out internal safety audits for the site safety management system and site safety procedures with reference to the Safety Plan at intervals of not less than once every six months of which the format, scope and programme are to be proposed and agreed with the ER.

#### 2.1.11 Safety Supervisor

Safety Supervisors (SS) shall have at least three years' experience on construction work and have attended appropriate safety training courses. Their duties and responsibilities are as below: -

- (a) Ensure that the workers observe the safety instructions and safe working procedures.
- (b) Assist the Safety Officer to discharge his safety duties.
- (c) Advise the Safety Officer or the Contractor of any unsafe condition of the site and unsafe act of the workers.
- (d) Supervise the safe execution of work in the construction site.
- (e) Carry out safety inspections at least daily and complete checklist.

- (f) Prepare and submit a weekly report to the Safety Officer or the Contractor in a specified form.
- (g) Attend meetings of the Site Safety Management Committee and the Site Safety Committee.
- (h) Conduct tool box talks.

#### 2.1.12 Safety Representative

In addition to the Safety Officer and Safety Supervisors, the Contractor shall appoint the foreman or ganger of each labour group or team working on the site to act as a Safety Representative (SR). The duties and responsibilities of a Safety Representative are as below : -

- (a) Ensure that the directives on safety and health matters from the Contractor, the Safety Officer and Safety Supervisors are duly carried out.
- (b) Ensure that safety practices are adopted by the workers.
- (c) Ensure the use of personal protective equipment (PPE) and safety equipment by the workers at all times.

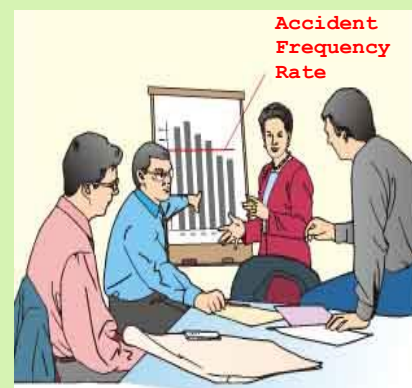
## 2.2 Safety Committees for In-house Operation and Maintenance Activities

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2.2.1 In order to improve the standard of safety and health at work in DSD's workplaces, i.e. sewage treatment facilities, pumping stations and laboratories etc., it is necessary to solicit the view, co-operation and commitment of all staff working in these workplaces. The concerned departmental staff must therefore be able to participate in the making and monitoring of arrangements for promoting safety and health at their place of work. Safety committees comprising staff representatives of different grades in DSD's workplaces shall be established to achieve these objectives.

#### 2.2.2 Electrical and Mechanical Branch Safety Management Committee

- (a) Terms of Reference
  - (i) To promote safety and health at work for electrical and mechanical works.
  - (ii) To review the present installations, daily operation and maintenance



procedures and emergency procedures in Electrical and Mechanical Projects Division, Sewage Treatment Division 1 and Sewage Treatment Division 2.

- (iii) To review accident investigation reports and propose measures to prevent recurrence of accident.
- (iv) To study accident statistics and trends so as to identify unsafe practices and conditions.
- (v) To identify topics of safety training for the staff of Electrical and Mechanical Projects Divisions, Sewage Treatment Division 1 and Sewage Treatment Division 2.
- (vi) To establish safe systems-of-work, monitor their implementation and suggest modification as necessary.

(b) Membership

Chairman: Senior Engineer/Safety Adviser or his representative

Members: Representative(s) of Electrical and Mechanical Projects Division  
Representative(s) of Sewage Treatment Division 1  
Representative(s) of Sewage Treatment Division 2

(c) Frequency of Meeting

Half-yearly.

(d) Minutes of Meeting

Minutes of the Electrical and Mechanical Branch Safety Management Committee shall be sent to all members and those in attendance on ad hoc basis within ten working days of the meeting. Copies of the minutes shall be displayed on notice boards so that all can be informed of the Committee's activities and decisions.

### 2.2.3 Sewage Treatment Works Safety Committee

(a) Terms of Reference

- (i) To promote safety and health at work in the workplace, including major sewage treatment facilities and pumping stations.
- (ii) To provide a forum for the staff to discuss occupational safety and health matters regarding all types of works in the workplace.
- (iii) To review the present installations, daily operation and maintenance procedures, emergency procedures in the workplace.



- (iv) To discuss hazards and necessary precautions associated with the operation and maintenance activities in the workplace.
- (v) To review accidents to identify unsafe practices and conditions and make recommendations for preventing recurrence.
- (vi) To identify and discuss safety training needs of staff.

(b) Membership

Chairman: Inspector or above (for sewage treatment works)

Members: Other staff as appointed by the chairman but preferably at least one representative from each grade of staff in the workplace

In attendance Senior Engineers concerned  
on ad hoc Representative of the departmental Safety Advisory  
basis: Unit

(c) Frequency of Meeting

Quarterly.

(d) Minutes of Meeting

Minutes of the safety committee meeting shall be sent to all members and those in attendance on an ad hoc basis within ten working days of the meeting. Copies of the minutes (with Chinese translation) shall be displayed on notice boards so that all can be informed of the Committee's activities and decisions.

2.2.4 Direct Labour Force Safety Management Committee

(a) Terms of Reference

- (i) To promote safety and health in the Direct Labour Force.
- (ii) To provide a forum for the staff to discuss occupational safety and health matters regarding the work of the Direct Labour Force.
- (iii) To review the daily operation and maintenance procedures, emergency and rescue procedures of the Direct Labour Force.
- (iv) To review accident investigation reports and propose measures to prevent recurrence of accident.
- (v) To study accident statistics and trends so as to identify unsafe practices and conditions.

(vi) To identify and discuss training needs of staff.

(vii) To establish safe systems-of-work, monitor their implementation and to suggest modification as necessary.

(b) Membership

Chairman: Senior Engineer/Safety Adviser or his representative

Members: Representative(s) of the Hong Kong and Islands Division  
Representative(s) of the Mainland South Division (cum Mainland North Division)

(c) Frequency of Meeting

Ad-hoc.

(d) Minutes of Meeting

Minutes of the Direct Labour Force Safety Management Committee shall be sent to all members and those in attendance within ten working days of the meeting. Copies of the minutes shall be displayed on notice boards so that all can be informed of the Committee's activities and decisions.

## 2.3 Safety Committees for Construction and Maintenance Works Sites

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2.3.1 The following committees shall be established for each construction contract of estimated contract sum of \$20 million or above and maintenance works contracts of estimated total expenditure of \$50

million or above to monitor, review and enhance the safety at work on sites: -

(a) Site Safety Management Committee; and

(b) Site Safety Committee

The above committees shall meet monthly. For contracts of lesser estimated contract sum or estimated total expenditure, all site safety matters shall be included as a separate agenda item to be discussed in the monthly progress meeting.

### 2.3.2 Site Safety Management Committee

The Site Safety Management Committee (SSMC) aims to provide a high level communication channel amongst the ER and the Contractor and other members for the monitoring of all safety matters on site and promotion of site safety.

(a) Terms of Reference

- (i) To monitor the adequacy of the Contractor's Safety Plan and ensure its implementation by the Contractor.
- (ii) To review accident statistics and identify trends and probable causes of accidents so as to recommend measures to prevent recurrence.
- (iii) To coordinate the safety measures of sub-contractors and specialist contractors working on the site and to review their safety performance.
- (iv) To review the emergency and rescue procedures.
- (v) To promote safety publicity and training.
- (vi) To study safety audit reports received and review action plan prepared by the Contractor.
- (vii) To conduct safety walks and safety inspections.
- (viii) To review and monitor follow up actions against unsafe practices and unsafe conditions identified during site inspections and in Inspection Reports, Improvement Notices and Suspension Notices issued by Labour Department or Marine Department.
- (ix) To review public enquiries and complaints.

(b) Membership

Chairman: ER or his representative in the professional rank or above

Secretary: ER's safety staff or other staff appointed by him/her

Members: Project Manager or a representative at senior management level from the Contractor's headquarters  
Site Agent  
Contractor's Safety Officer  
Sub-contractors' Safety Supervisors

In attendance Occupational Safety Officer of Labour  
on ad hoc Department  
basis: Shipping Safety Officer/Marine Officer of Marine Department  
Representative of Fire Services Department  
Representative of Hong Kong Police Force  
Representative of utility undertakers  
Representative of the Employer including but not limited to the representatives of the project office, the departmental Safety Adviser and Chief Assistant Secretary (W)5 of Development Bureau (DEVB)

(c) Chairmanship

- (i) The ER or his representative shall act as Chairman of a Site Safety Management Committee to accord with Department's policy of attaching great importance to safety.
- (ii) An ER responsible for several contracts may convene Site Safety Management Committees each covering more than one contract under his/her control.
- (iii) Where the number of contracts exceeds what can be conveniently covered by two Site Safety Management Committees, the chairmanship may be delegated to a professional next in rank to the ER, subject to the following conditions:-
  - the ER has agreed to the delegation, and
  - the person delegated to chair a Site Safety Management Committee is of a rank of Chief Resident Engineer, or
  - the person delegated to chair a Site Safety Management

Committee is of a rank of Senior Resident Engineer or equivalent and the values of the contracts covered by the Site Safety Management Committees to be chaired by him/her does not exceed HK\$500 million in total, or

- the person delegated to chair a Site Safety Management Committee is of a rank of Resident Engineer or equivalent and the Site Safety Management Committee to be chaired by him covers a single contract not exceeding HK\$100 million in value.

(d) Frequency of Meeting

Monthly.

(e) Minutes

Minutes of the Site Safety Management Committee meetings shall be sent to all members and those in attendance on an ad hoc basis within ten working days of the meeting. Copies of the minutes in English, with a Chinese translation listing the main points discussed and decisions reached, shall be displayed on notice boards so that any interested employee can keep himself informed of the Site Safety Management Committee's activities and decisions. The minutes shall be signed by the ER or his representative and the Site Agent.

### 2.3.3 Site Safety Committee

The Site Safety Committee (SSC) aims to provide a forum for employees and the management of the contractor and sub-contractors to discuss, make and monitor the arrangements for safety and health at their place of work.

(a) Terms of Reference

- (i) To ensure the implementation of the Contractor's Safety Plan on site.
- (ii) To review and monitor the effectiveness of the hazard mitigation measures taken on site and recommend improvements.
- (iii) To discuss hazards associated with site operations and necessary safety precautions.
- (iv) To coordinate the interface safety measures of all sub-contractors, utility undertakers or other construction parties working on the site.
- (v) To promote safety publicity and training.
- (vi) To discuss and review emergency and rescue procedures.



- (vii) To review accidents that have occurred so as to recommend measures to prevent recurrences.
- (viii) To review accident statistics and safety performance of sub-contractors.
- (ix) To study safety audit reports received and review action plan.

(b) Membership

Chairman: Site Agent

Members: Project Manager or a representative at senior management level from the Contractor's headquarters  
 Contractor's Safety Officer and Safety Supervisors  
 Safety Representatives  
 Sub-contractors' Safety Supervisors  
 Management of sub-contractors of all tiers  
 DSD's site supervisory staff or Consultant's resident site staff or any other staff appointed by the ER

In attendance Occupational Safety Officer of Labour Department  
 on ad hoc Shipping Safety Officer/Marine Officer of Marine  
 basis: Department

(c) Frequency of Meeting

Monthly.

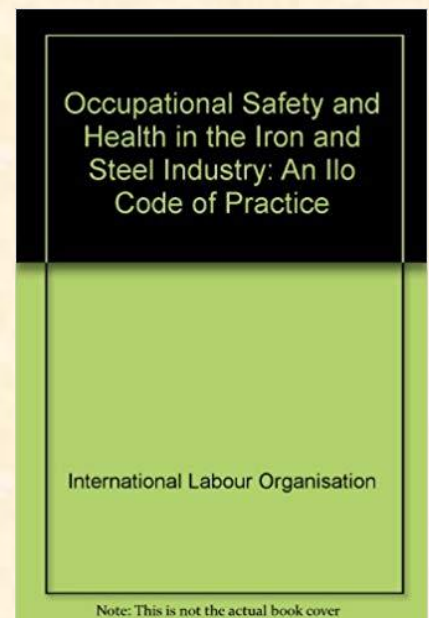
(d) Minutes of Meeting

Minutes of the Site Safety Committee meetings shall be sent to all members and those in attendance on an ad hoc basis within ten working days of the meeting. A copy shall also be sent to the ER. One copy of the minutes in Chinese, and English if necessary, shall be posted on notice boards so that all can be informed of the Site Safety Committee's activities and decisions.

# 3



## *General Safety Requirement*



# CHAPTER 3

## General Safety Requirement

### 3.1 First Aider

3.1.1 The following table shows the recommended ratio of the number of qualified first aiders to the number of employees normally present in various DSD's workplaces (NB: the legal requirements are also tabulated for comparison). The officer-in-charge of a workplace shall ensure that sufficient numbers of first aiders are made available in accordance with the recommendation.

Workplaces in DSD	Legal Requirement on Nos. of First Aiders	Recommended Ratio of First Aiders for DSD's Workplaces
(a) Site offices of capital works contract sites  (b) Site offices of maintenance contract sites  (c) DLF sewer gangs works sites	<u>Construction Sites (Safety) Regulations - Reg. 63:</u>  Min. 1 for 30 to 99 workers  Min. 2 for 100 workers and above	<b>1:25</b>  subject to a min. of 1 no. each for site establishments having 20 staff or more
(a) Sewage treatment works and pumping stations, etc.  (b) Laboratories  (c) DLF depots	<u>Factories and Industrial Undertakings (First Aid in Notifiable Workplaces) Regulations - Reg. 5:</u>  Min. 1 for each 100 persons or part thereof employed	<b>1:50</b> (for each shift)  subject to a min. of 1 no. each for workplaces having 20 staff or more
(a) Offices and the like  (b) Drawing offices, etc.	<u>Occupational Safety and Health Regulation - Section 20(1)(d):</u>  Min. 1 for each 150 employees	<b>1:50</b>  subject to a min. of 1 no. each for workplaces having 20 staff or more

For construction and maintenance contract sites, the Contractor responsible for the site shall provide sufficient first aiders for their workers separately in accordance with the relevant regulations.

- 3.1.2 In case a first aider is not available, the name, mobile phone number, the nearest work location of the appointed first aider shall be posted at a prominent position adjacent to the first aid box.
- 3.1.3 The appointed first aider shall attend the refresher first aid training when his certificate is about to expire.

## 3.2 First Aid Facilities

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### 3.2.1 First Aid Box

- (a) A first aid box with adequate stock of first aid items shall be provided at every workplace.
- (b) Additional first aid box shall be provided and maintained on the basis of one for each 100 employees.
- (c) Every first aid box shall be marked clearly "FIRST AID" in English and Chinese. Staff working at that workplace shall be made known of the location of the first aid box. Access to the first aid box shall be free from obstructions.



- (d) The telephone numbers of the nearby fire station and hospitals shall be posted at a prominent position adjacent to the first aid box.
- (e) The officer-in-charge of the workplace shall ensure that the first aid materials will not be beyond the expiry dates.
- (f) The officer-in-charge of the workplace or works site shall appoint a person to maintain the stock level of the first aid items in the first aid box at regular intervals. The stock level of first aid items shall not be less than the following:

First Aid Items	Recommended level of first aid items		
	Workplaces with less than 10 employees	Workplaces with 10 employees and above but below 50	Workplaces with 50 employees and above
Leaflet of first aid treatment published by the Commissioner for Labour	1	1	1
Small sterilized unmedicated dressing for injured fingers	1	6	12
Medium-sized sterilized unmedicated dressing for injured hands or feet	1	3	6
Adhesive wound dressings of assorted sizes	3	12	24
Triangular bandages of unbleached calico, the longest side of the bandage measures not less than 1.3m and each of the other sides not less than 900 mm	1	2	4
Adhesive plaster (zinc oxide) approximately 25 mm wide and at least 4.5m long	1 roll (but the length is 2 m instead)	1 roll	1 roll
Absorbent cotton wool of 30g.	1 packet	3 packets	6 packets
Pressure bandages	1	2	4
Safety pins	some	some	some

### 3.2.2 Resuscitation Equipment

- (a) When work is carried out at remote locations, especially those involving confined spaces or if the situation warrants, resuscitation equipment shall be made readily available for the rescue of any injured.
- (b) The officer-in-charge of the work shall ensure that at least one member of his workforce has been trained and is fully conversant



with the use of the resuscitation equipment.

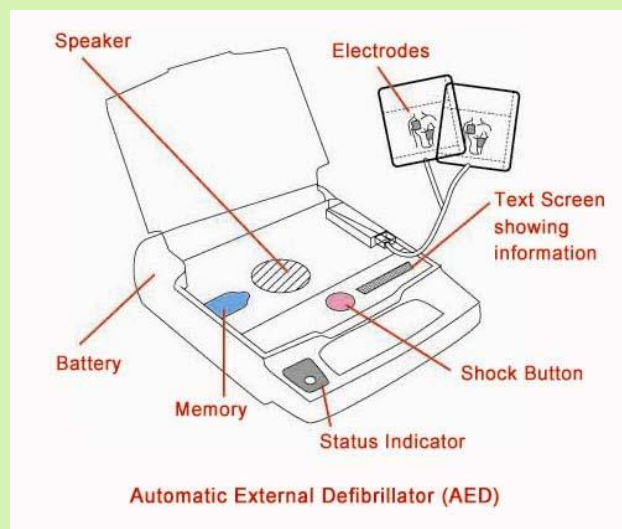
- (c) The officer-in-charge shall ensure that the resuscitation equipment is regularly maintained in good working condition. This includes the cleaning of the face masks, arrangement of tests on oxygen gas cylinder and the refill of oxygen gas after use, etc.

### 3.2.3 Automated External Defibrillator

- (a) Automated External Defibrillator (AED) is useful and effective in reversing an early sudden cardiac arrest (SCA) by "kicking" the heart back into a normal rhythm via an electric shock.



- (b) AED is a computerized, battery operated portable life saving equipment. It is easy to use and it will advise the rescuer if and when a shock is required. The AED uses clear voice and text prompts to guide the rescuer through each step.



- (c) A set of AED should be made available at a prominent position in each major workplace as far as possible.

### 3.2.4 Stretcher and Other Rescue Equipment

- (a) Where work is carried out in confined spaces, tunnels and the like, at least a stretcher should be made available at the entrance of confined spaces.
- (b) The officer-in-charge should ensure that the stretcher is in good working condition and readily available for use.
- (c) When work is carried out near or over water, the following rescue equipment shall be made readily available: -
  - (i) lifebuoys completed with life ropes of adequate length,
  - (ii) life jackets, and
  - (iii) safety pike-poles.

## 3.3 Safety Signs

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3.3.1 Apart from the safety signs for dangerous goods as required by the Fire Services Department under the Dangerous Goods (General) Regulations, other safety signs in English and Chinese that are appropriate to the working environment and the type of work to be performed should be posted at prominent positions of the workplaces. The safety signs include the routes for emergency evacuation, uneven ground etc.



3.3.2 When work which will affect the general public is to be carried out, e.g. work on highways or public places, ensure that adequate number of warning signs and warning lights are installed to alert the general public.

3.3.3 Safety signs and colours should comply with BS ISO 3864-1:2011. Safety signs are classified into four main types: Prohibition, Warning, Mandatory and Safety Condition.

Details are shown in the table below: -

Types of safety signs (Meaning and Purpose)	Colour of the Sign	Examples of Use	Contrasting Colour	Symbol Colour
Prohibition (Stop)	Red	Stop signs; Identification and colour of emergency shut-down devices; Prohibition signs.	White	Black
Warning (Caution, risk of danger)	Yellow	Identification of hazards (fire, explosion, chemical, radiation etc.); Warning signs; Identification of thresholds, dangerous passages, obstacles, and risk of collision.	Black	Black
Mandatory (Mandatory action)	Blue	Obligation to wear PPE; Mandatory signs.	White	White
Safe Condition	Green	Identification of safety showers, first-aid posts and rescue points, emergency exit signs.	White	White
<p><u>Notes:</u></p> <ol style="list-style-type: none"> <li>1. Red is also used to identify fire fighting equipment and its location.</li> <li>2. Supplemental text may be added if required, in the contrasting colour or the safety colour, or as black text on a white background.</li> </ol>				

### 3.4 Ordinances, Regulations, Standards and Codes of Practice

#### 3.4.1 General

The lists of ordinances, regulations, standards, codes of practice, rules and procedures, which are relevant to safety and health at work, are given below. The person responsible for any DSD's workplace and

construction site and the key staff concerned shall acquaint themselves with their own statutory duties and the legislative requirements on the safety and health of their workplace.

3.4.2 All work activities in DSD's workplaces and works sites shall comply with the relevant statutory requirements, which in general shall include but not limited to the following: -

- (a) Occupational Safety and Health Ordinance and its Regulations
- (b) Factories and Industrial Undertakings Ordinance and its Regulations
- (c) Boilers and Pressure Vessels Ordinance and its Regulations
- (d) Electricity Ordinance and its Regulations
- (e) Dangerous Goods Ordinance and its Regulations
- (f) Fire Services Ordinance and its Regulations
- (g) Gas Safety Ordinance and its Regulations
- (h) Builders' Lifts and Tower Working Platforms (Safety) Ordinance and its Regulations
- (i) Waste Disposal Ordinance and its Regulations
- (j) Water Pollution Control Ordinance and its Regulations
- (k) Air Pollution Control Ordinance and its Regulations
- (l) Noise Control Ordinance and its Regulations
- (m) Environmental Impact Assessment Ordinance
- (n) Ozone Layer Protection Ordinance and its Regulations
- (o) Dumping at Sea Ordinance
- (p) Lifts and Escalators (Safety) Ordinance and its Regulations
- (q) Electricity Supply Lines (Protection) Regulation
- (r) Ship and Port Control Ordinance and its Regulations



3.4.3 Amongst the above legislations, the safety and health of construction and maintenance works sites is mostly governed by the Factories and Industrial Undertakings Ordinance and its subsidiary Regulations, whereas the safety and health of workplaces other than works sites, e.g. offices, is mainly governed by the Occupational Safety and Health Ordinance and its Regulations. They are listed in Appendix 3 for easy reference.

3.4.4 Apart from the Ordinances and Regulations given above, the recommendations given in codes of practice, safety guidelines and notices published by the Labour Department and other Government Departments shall be observed and followed.

(a) Publications of the Development Bureau

The following publications of the Development Bureau (DEVB) detail the contractual provisions, roles and responsibilities of the parties involved, administrative arrangements and procedures for site safety related matters, and good safe working practices for the carrying out of the public construction and maintenance works contracts.

(i) Construction Site Safety Manual (CSSM)

(ii) Construction Site Safety Handbook (CSSH)

(iii) DEVB Technical Circulars and memos on construction site safety matters

(b) Publications of the Labour Department

Labour Department (LD) publishes codes of practice and guidance notes on the Occupational Safety and Health Ordinance, the Factories and Industrial Undertakings Ordinance and their subsidiary Regulations, which provide practical guidance and technical information to assist the duty holders to fulfil the requirements of the legislations.

(c) Publications of the Marine Department

Marine Department (MD) publishes Marine Notices, safety newsletters, safety pamphlets and guides to draw the attention of ship repairers, stevedores and owners, masters and operators of vessels to the danger of various malpractices of operations and works on vessels and to advise them of safety practices and precautions on board of ships.

(d) Publications of Other Government Departments

Electrical and Mechanical Services Department (EMSD) publishes codes of practice and guidance notes to provide practical guidance



and technical information with regard to the legal requirements on electrical works, builders' lifts and Legionnaires Disease, working near electricity supply lines, etc.

Environmental Protection Department (EPD) publishes codes of practice and guidance notes providing practical guidance and technical information on the storage, collection, transportation and disposal of asbestos and chemical wastes, etc.

Fire Services Department (FSD) publishes codes of practice and fire protection notices setting out the requirements on prevention of fire hazards and providing practical guidance on good practices on fire protection.

Highways Department (HyD) publishes the "Code of Practice for the Lighting, Signing and Guarding of Road Works" which sets out the standard of good practice for the arrangement of traffic diversion and temporary traffic control for road works.

- (e) Publications of the Occupational Safety and Health Council (OSHC) and Construction Industry Council (CIC)

The Occupational Safety and Health Council (OSHC) and Construction Industry Council (CIC) publish safety guide books to provide practical safety and health guidance for different types of work.

3.4.5 The Ordinances and Regulations can be viewed and downloaded from the website: [www.elegislation.gov.hk](http://www.elegislation.gov.hk), whereas the safety publications mentioned above are available for viewing and/or downloading from the website of the departments and organizations concerned, which are listed in Appendix 1 for easy reference.

3.4.6 The officer-in-charge of DSD's workplace or works site shall as far as practicable ensure that a copy of the relevant safety legislations, standards, codes of practice, safety guides, etc. are kept in the workplace and made known to all staff concerned.

## **3.5 Safety Training**

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3.5.1 All DSD's staff shall attend safety training courses and refresher training appropriate to their duties and responsibility to enhance their safety knowledge and upkeep their safety awareness so that they are able to: -

- (a) recognize the importance of safety at work and assign sufficient resources to handle it,

(b) give proper consideration to safety during planning and design stages to eliminate or reduce possible safety problems during later stages of the projects,

(c) take into account potential safety problems during preparation of method statements,

(d) avoid performing unsafe acts,

(e) avoid creating unsafe conditions, and

(f) identify unsafe acts and unsafe conditions and ask for rectification.



3.5.2 The management of a workplace or works site shall provide information, instruction, training and supervision as are necessary to ensure, as far as reasonably practicable, the safety and health at work of all persons working in the workplace or works site under their control.

3.5.3 Departmental staff of different ranks and posts shall attend and complete "mandatory basic safety training (MBST)" appropriate to their ranks and posts, and "safety training for works involving special risks (SRST)" for those who are involved in certain types of work entailing special risks as per Drainage Services Department Technical Circular (DSDTC) No. 2/2018 - "Safety Training for DSD Staff".

3.5.4 Apart from the safety training as required in Sections 3.5.3 above, there are various safety training courses organized by Labour Department (LD), Fire Services Department (FSD), Auxiliary Medical Service (AMS), Occupational Safety and Health Council (OSHC), Hong Kong Institute of Construction (HKIC) of Construction Industry Council (CIC) and other academic institutes, which may be suitable for the special nature of work and working environment of DSD's undertakings. The training courses provided by these organizations are listed in Appendix 2 for easy reference and shall be arranged for DSD's staff on a need basis.

3.5.5 Resident Site Staff (RSS) employed by the Department's consultants shall attend suitable safety training courses commensurate with their duties, as per DEVB Technical Circular (Works) No. 7/2018 - "Management Handbook for Direct Employment of Resident Site Staff by Consultants for Public Works Projects".

3.5.6 Contractors shall ensure that any persons employed by them or their subcontractors shall have received the necessary safety training as required by the legislation and contract provisions.

3.5.7 The Training Unit shall maintain the safety training record of DSD's staff.

# 4

## Safety in Planning and Design



# CHAPTER 4

## Safety in Planning and Design

### 4.1 General

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- 4.1.1 This Chapter is intended to assist project engineers to properly address the safety and health issues associated with a project during the planning and design stage with a view to avoiding or mitigating any possible safety and health hazards that may arise during the later stages of the project including fabrication and erection, commissioning, operation, maintenance, demolition and disposal.
- 4.1.2 As a general rule, any hazards identified during the project planning and design stage shall be avoided in the first place. Control measures shall be considered only if such hazards cannot be avoided.
- 4.1.3 The safety-related requirements as stipulated in the ordinances, regulations, safety guidelines and standards, codes of practice, technical circulars, etc. shall be observed during the planning and design stage.
- 4.1.4 Sufficient site inspection and investigation shall be carried out to identify site constraints and potential hazards to facilitate safe planning and design.



Safe Working Procedures

- 4.1.5 The end-users and/or the maintenance authority shall be consulted for information on the safety requirements regarding future operation and maintenance of the completed works.
- 4.1.6 Detailed design of the safety features shall be agreed with the end-users and/or the maintenance authority.
- 4.1.7 Sections 4.2 and 4.3 below outline the essential points to be considered during the planning and design stage as to avoid or mitigate the potential hazards inherent in engineering projects.
- 4.1.8 The departmental Safety Advisory Unit shall be consulted, if needed.

## **4.2 Planning**

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- 4.2.1 The construction work shall be properly phased to avoid too many different types of work activities to be carried out at the same time and at the same location as far as practicable.
- 4.2.2 Phased completion of the works, if any, shall be so designed to allow continued safe construction and occupation of the finished work.
- 4.2.3 The construction programme shall be realistic. Adequate time shall be allowed for each construction activity to avoid a rush for completion, which is always the cause of many site accidents.
- 4.2.4 Consideration shall be given as to whether the surrounding development will pose risks of fire, flood or other hazards to the work site, or vice versa.
- 4.2.5 Effect of the project on local environment (e.g. traffic, noise, vibration, lighting) shall be considered.
- 4.2.6 Existing services shall be avoided rather than re-routing them.
- 4.2.7 Consideration shall be given to see whether site constraints or ground conditions will exclude any particular construction methods from the safety point of view.
- 4.2.8 The site access and egress shall be properly planned to ensure safe transportation and handling of any large and heavy plants for the works.
- 4.2.9 Impact of the project on existing road traffic shall be reviewed to determine broad engineering options.



- 4.2.10 Desk study and ground investigation shall be carried out to obtain enough information on the nature and extent of any suspected contaminated or difficult ground.
- 4.2.11 Details of foundations of existing structures and previous work at the site shall be established.
- 4.2.12 The working space required for different methods of excavation or types of foundations shall be established.
- 4.2.13 Sufficient space should be allowed on site for temporary storage and sorting of construction and demolition (C&D) materials, which shall be subsequently reused, recycled or disposed of etc.

### **4.3 Detailed Design**

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#### 4.3.1 General

- (a) All relevant Ordinances, Regulations, Codes of Practice, Standards and Instructions, etc. shall be followed.
- (b) The stability of partly completed structures or works shall be considered during all stages of construction.
- (c) Safety requirements of any work processes, plant and equipment shall be stated in the Particular Specification.
- (d) Operation and maintenance manuals shall be prepared and training shall be provided to staff on special plant and equipment with potential hazards.
- (e) Allowance shall be made for provision of adequate ventilation system at the workplace, and the associated monitoring instruments if necessary, in order to maintain a safe and healthy working environment, particularly for enclosed workplaces.

#### 4.3.2 Surrounding Environment

- (a) Consideration shall be given for off-site fabrication to minimize the extent and duration of work on site and thus the risks entailed.
- (b) Detailed environmental impact assessment (EIA), traffic impact assessment (TIA) and drainage impact assessment (DIA) shall be carried out to minimize the possible adverse impacts on the surrounding environment brought about by the project.
- (c) Works shall be so designed as to avoid existing services rather than re-routing them as far as practicable.

#### 4.3.3 Access

- (a) Access points to the site shall be carefully chosen so as not to impose a hazard to the construction workers and vehicles and all other road-users. Site entrances at concealed location and with acute bend shall be avoided.
- (b) The layout of the site entrance shall be carefully designed to enable safe transportation of materials and movement of plants and workers. Separate access for vehicles and pedestrians shall be provided on site as far as practicable.
- (c) When the works are to be completed in phases, the need to maintain unobstructed and safe construction access routes within the site shall always be considered.
- (d) Requirements on the provision of paved and/or covered walkways, drainage and hard core roads, etc. for various site activities shall be stated in the Particular Specification.
- (e) Any hazardous operation shall be located away from the public as far as possible (e.g. avoid site welding near public).
- (f) Provision for emergency access, e.g. emergency vehicular access (EVA), fire escape routes, etc. shall be taken into consideration during detailed design stage.

#### 4.3.4 Excavation and Foundation

- (a) For works in contaminated ground, safe methods of handling and disposal of spoil shall be considered.
- (b) Adequate surface water drainage system of the site shall be provided to mitigate flooding of excavation and surrounding area of the site.
- (c) The stability of adjacent buildings and structures shall be carefully considered and monitored, and if necessary suitable ground support system shall be designed and erected to protect them during construction.
- (d) Existing services that may be affected by the excavations shall be identified and measures to properly support and protect them shall be designed.
- (e) Access and escape routes in excavations shall be identified and specified in the contract as far as practicable.

#### 4.3.5 Working on or adjacent to Roads

- (a) The works shall be so designed (e.g. method of construction and plants to be used) to minimize the risk of causing damage to overhead

or underground services.

- (b) Temporary traffic arrangement (TTA) measures including signing, guarding and lighting shall be designed to the satisfaction of the Transport Department, Highways Department, Traffic Police and other authorities concerned. Consultation shall be carried out with District Councils, local residents, nearby shop owners and other interested parties, etc. if necessary.
- (c) The works shall be so designed as to reduce the frequency and extent of maintenance (e.g. number of lanes to be closed), particularly for works located on heavily trafficked routes.
- (d) The works shall be programmed to avoid diurnal and seasonal peak traffic flows.

#### 4.3.6 Working over or near Water

- (a) Consideration shall be given to see if any part of the works can be prefabricated off-site so as to minimize work over water.
- (b) Suitable structures such as cofferdam shall be designed to provide a dry working environment during the construction stage as far as practicable.
- (c) The works shall be programmed to be carried out at time of low tide as far as practicable.
- (d) New works shall include provision of safe access and/or other fall-arresting system (e.g. safety nets, secure anchorage) for future maintenance.
- (e) Durable materials with non-slippery surfaces shall be selected for maintenance access over or near water.
- (f) Allowance shall be made for provision of sufficient guard rails, toe boards and warning signs, etc.

#### 4.3.7 Electrical and Mechanical Works

- (a) Selection of major plant items shall be considered on the basis of eliminating or reducing the common hazards including: -
  - (i) falling from height (e.g. low level plant);
  - (ii) hazardous substances (e.g. non-toxic, non-flammable refrigerants); and
  - (iii) avoidance of pressurized system (e.g. low temperature hot water heating systems).
- (b) Main equipment rooms shall be located at outer walls of buildings as far as possible to allow easy in and out of heavy and bulky

equipment.

- (c) The need to work on 'live' services shall be avoided as far as possible.
- (d) Sufficient space and lifting devices shall be made available for the safe installation of large plant items.
- (e) The layout of plant rooms shall be so designed as to allow sufficient space for the installation, operation and maintenance of all plant items.
- (f) Safe access to plant items, which require frequent and regular maintenance, shall be provided.
- (g) Permanent stairs, ladders or catwalks, equipped with guard rails, toe boards and safety hoop as appropriate, shall be provided if work is to be carried out at height. Anchoring points shall be provided for lifelines if necessary.
- (h) Equipment emanating high sound pressure level shall be avoided. Acoustic enclosure shall be provided where necessary.
- (i) The floor and access of all plant rooms shall be so designed as to avoid tripping and slipping hazards by using slip-resistant surfacing materials and keeping routes free of pipes and ducts, etc.
- (j) Wherever possible, the use of prefabricated items connected by bolts and nuts shall be specified to minimize the use of cutting and grinding tools, etc.
- (k) Prefabricated items shall be specified as far as practicable to minimize the time to be spent on working at height.
- (l) Moving parts and other dangerous parts of machinery and plant shall be guarded by suitable screens.
- (m) Wherever possible, heavy machinery and plant shall be mounted and installed on isolated dampers to reduce noise and vibration.
- (n) The lighting of all plant rooms shall be designed to the standards for the type of work to be carried out. Emergency lighting shall be provided at strategic locations (e.g. escape routes and locations of plant and equipment for use in emergency situations).
- (o) All electrical equipment shall be designed to be adequately insulated, protected by circuit breakers and the like, able to be isolated (for maintenance) and earthed.
- (p) Wherever possible, the use of hazardous materials and those, which

may become hazardous when heated, shall be avoided.

- (q) Equipment shall be located with sufficient working space to ensure emergency egress is not obstructed.
- (r) Lifting beam, eye-bolts and the like shall be provided where heavy plants and their parts need to be lifted for maintenance.
- (s) Materials that may require special handling or protection during removal and disposal (e.g. asbestos) shall be avoided as far as possible.
- (t) Potential ignition sources shall be avoided. Where this is not possible, the electrical system shall be designed to be safely contained and shielded and preferably located away from combustible substances.
- (u) Cable ducts and cable routing shall be designed to be accessible at ground level to reduce the necessity for working at height (e.g. inside cable trench or mounted at low level on wall).
- (v) Water sprinkling system shall not be used in the vicinity of electrical equipment. If this is not possible, the electrical system shall be designed to be waterproof, and/or able to automatically shut down prior to the activation of the water sprinklers.

#### 4.3.8 Sewage Treatment Works and Pumping Stations

- (a) When designing pipe intakes, strainers, screens, gates and the like where blockages are likely to occur, provision shall be made for automatic removal of debris and screenings as far as practicable to avoid man-entry into the channels or chambers.
- (b) Non-slip walkways equipped with handrails and toe boards shall be provided for maintenance access.
- (c) Easily accessible injection and dosing points for chemicals shall be provided.
- (d) Dyke, drip pan, drainage channels and the like shall be provided to contain spillages at chemical storage, injection and dosing points.
- (e) Areas in which chemicals are handled or stored shall be spacious and well ventilated.
- (f) Accesses and openings of sufficient size shall be provided to allow personnel wearing breathing apparatus to carry out maintenance duties in confined areas where hazardous gases are likely to be present.

- (g) All storage rooms, containers, vessels, pipework and the like used to store and convey hazardous chemical substances shall be labelled clearly.
- (h) All controls and displays shall be clearly labelled.
- (i) Flexible hoses shall not be used in dosing system. Permanent piping systems shall be used instead.
- (j) Suitable boundary wall or fencing shall be erected to maintain the security of the sewage treatment works and pumping stations, with CCTV and floodlights installed at strategic locations (e.g. entrance).
- (k) Provide adequate fire-fighting facilities, fire escape routes etc.
- (l) Landings with fencing and safety hoops shall be provided to ladders of considerable height.
- (m) Consideration shall be given to the provision of mechanical aids to reduce risks associated with manual handling operations that are frequently required, e.g. raking of screenings, carrying of polymer bags etc.
- (n) Avoid as far as practicable nooks and crannies, which may possibly become a "confined space" in future, where dangerous gases might accumulate owing to the restricted geometry and poor ventilation.
- (o) Avoid crevices, voids and depressions where nesting of pests or breeding of mosquitoes due to ponding of water is likely to occur.
- (p) Provide fencing, whether fixed or removable type, to all free edges from where fall of persons is liable (e.g. roof, elevated walkway).

#### **4.4 Contractual Provisions on Construction Safety**

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##### **Pay for Safety Scheme (PFSS) and Pay for Safety Performance Merit Scheme (PFSPMS)**

- 4.4.1 All public works contracts, including design and build contracts and term contracts shall incorporate the relevant provisions set out in Chapter 3 - "Contractual Provisions on Construction Safety" and Chapter 12 - "Pay for Safety Scheme" of the Construction Site Safety Manual (CSSM). Project engineers shall check for the latest version of the CSSM available in DEVB's website and incorporate the appropriate provisions into the tender documents.



4.4.2 Further, as an extension of the PFSS, the Pay for Safety Performance Merit Scheme (PFSPMS) was introduced to further uplift the site performance of public works contracts. Under the PFSPMS, payment will be made under a set of pre-priced performance-tied payment items which are measured according to the contractors' achievements in respect of the safety performance specified in the contract. The PFSPMS is applicable to all public civil and E&M capital works contracts and design and build (D&B) contracts which adopt PFSS. The payment for PFSPMS is in addition to that for PFSS.

#### **Design for Safety (DfS)**

4.4.3 The Design for Safety (DfS) process was modelled on the basis of the Construction (Design and Management) concept originated from the U.K. The DfS process provides a structured framework to facilitate project officers to systematically identify and manage different safety and health risks arising from each stage of a project, including its planning, design, fabrication, erection, commissioning, operation, maintenance, demolition and disposal.

4.4.4 In 2006, the former Environmental, Transport and Works Bureau produced two documents namely, the "Construction Design and Management – Guidance Notes" and "Construction Design and Management – Worked Examples", which provided guidelines and worked examples for incorporating the CDM process in public works projects. Following a review completed in 2015, the now Development Bureau introduced a new paradigm of CDM, being referred to as "Design for Safety" (DfS), with the publication of a new set of documents namely, the "Guidance Notes of Design for Safety" and "Worked Examples of Design for Safety".

4.3.5 The main objectives of DfS are to: -

- (a) promote early involvement, cooperation and communication of all stakeholders in the timely provision of safety-related project data;
- (b) demarcate the roles and responsibilities of the stakeholders in coordinating and providing safety-related project data at all stages; and
- (c) identify the outputs of the DfS application process and the specific risk reduction measures.

4.4.6 The DfS process shall be implemented in public works projects with estimated construction cost of \$500M or more, excluding Design and Build projects, with effect from 8 June 2016. The "Guidance Notes of Design for Safety" and "Worked Examples of Design for Safety", can be viewed and downloaded from DEVB's website:

[http://www.devb.gov.hk/en/publications\\_and\\_press\\_releases/publications/index.html](http://www.devb.gov.hk/en/publications_and_press_releases/publications/index.html).

### **Independent Safety Audit Scheme (ISAS)**

- 4.4.7 The Independent Safety Audit Scheme (ISAS), which operates on the basis of the safety auditing system developed by the Occupational Safety and Health Council (OSHC), was first introduced for selected large scale public works contracts in 1996. Further implementation of ISAS were not pursued upon enforcement of the Factories and Industrial Undertakings (Safety Management) Regulation (Cap 59AF) in 2002, which requires proprietors and contractors to develop, implement and maintain a safety management system (SMS) for their undertakings and perform safety audits or safety reviews regularly as appropriate.
- 4.4.8 However, the Panel of Enquiry formed under DEVB TC(W) No. 3/2009 – “Regulation Action against Contractors for Occurrence of a Serious Incident or Conviction for Site Safety or Environmental Offences” may from time to time requires a contractor who has incurred serious site safety incidents to conduct a safety audit using the latest version of the safety auditing system developed by OSHC to thoroughly examine the adequacy of the SMS of the works contract concerned.
- 4.4.9 Due to the surge in number of mega projects and deployment of unconventional construction methods in recent years, ISAS has been re-introduced for mega public capital works contracts of estimated contract sum exceeding \$1,000M or capital works contracts involving unconventional construction method since 2015 to uphold the safety performance of these contracts. Project engineers should take note of WBTC No. 32/99 – “Independent Safety Audit Scheme for Mega Capital Works Contracts or Capital works Contracts Involving Unconventional Construction Method” when preparing the tender documents.

# 5

## Safety on Construction Sites



# CHAPTER 5

## Safety on Construction Sites

### General

#### 5.1 Site Security

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- 5.1.1 The perimeter of the works site shall be fenced to prevent unauthorized entry and illuminated as far as practicable. For large construction sites, all ingress and egress points shall be guarded to control all vehicles and persons going in and out of the site.
- 5.1.2 "No Trespassing", "Danger", "Caution" and other warning signs, in English and Chinese, carrying appropriate messages to warn against unauthorized entry to the works site shall be posted at appropriate locations around the works sites.
- 5.1.3 24-hour emergency telephone numbers and hotlines for complaints and enquiries shall be posted at conspicuous locations of the works site.
- 5.1.4 All valuable tools, equipment and materials shall be stored in a safe place and locked if necessary, at the end of a workday.
- 5.1.5 Watchmen shall be provided in the Engineer's site office, Contractor's site offices and storage areas as far as practicable.
- 5.1.6 All trenches and excavations should be securely barricaded and/or covered at the end of a workday.
- 5.1.7 All items of mobile plants shall be parked on firm and level ground with the booms and their attachments, e.g. buckets, blades and the like, lowered at the end of a workday. They shall be locked up and the ignition keys shall be removed.
- 5.1.8 Dogs kept on site shall be licensed. The provisions set out in the "Code of Practice for the Keeping of Dogs on Construction Sites in Hong Kong" published by the Agricultural, Fisheries and Conservation Department (AFCD) and relevant contractual requirements shall be strictly observed. More details are given in Section 13.5.

## 5.2 Site Offices and Temporary Works Area

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- 5.2.1 Unlike erection of permanent buildings, the safety of site offices construction may sometimes be overlooked because of the following characteristics:-
- (a) Site offices are of temporary nature and the structure is relatively simple.
  - (b) Short construction period and small work force involved.
  - (c) Relatively crude tools, equipment and erection method.
  - (d) Sites are usually remote, without direct access or at certain walking distance from main road.
  - (e) Lesser supervision available in the early stage of a contract.
- 5.2.2 Particular attention shall be paid to the risks that may arise during site offices construction including:-
- (a) Work at height,
  - (b) Use of hand tools and portable power tools,
  - (c) Manual handling and lifting,
  - (d) Use of lifting appliances and lifting gear,
  - (e) Use of chemicals, and
  - (f) Work in adverse weather and outdoors.
- 5.2.3 The risks associated the above activities and the corresponding safety precautionary measures are described in other sections of this Chapter.
- 5.2.4 Temporary works areas (TWA) and other non-works areas used as storage yard for plants and materials, subcontractors' temporary offices, sheds or containers for storage of tools and the like shall be clearly demarcated and fenced. Good housekeeping shall be maintained in TWAs and other non-works areas, which are often easily overlooked and expediently used as the dumping ground for rubbish or construction waste.
- 5.2.5 TWAs and other non-works areas should be regularly inspected and cleaned to ensure they are kept safe, tidy and free from rubbish and stagnant water to avoid breeding of mosquitoes and pests and environmental nuisance.



## 5.3 Access and Traffic Control on Site

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- 5.3.1 The layout of access on construction sites shall be carefully planned before commencement of the works. Consideration shall be given to the location of access and egress points, loading and unloading points, routing and directions. Separate accesses for vehicles and people shall be provided as far as the site condition permits. The accesses shall be clearly delineated by guards and signs.
- 5.3.2 All site accesses shall be:-
- (a) of reasonably good construction;
  - (b) suitably levelled and illuminated to maintain safe travel;
  - (c) free from obstruction; and
  - (d) free from hazards of falling materials and slippery substances, etc.
- 5.3.3 Adequate lighting shall be provided along all accesses.
- 5.3.4 All drivers, plant operators and site personnel shall be instructed to observe and comply with the traffic rules on site and safety instructions.
- 5.3.5 All plants and vehicles must not be overloaded. Dump trucks carrying dusty or loose materials must be properly covered.
- 5.3.6 Speed limit signs, traffic direction signs, headroom limit signs (e.g. for overhead power cable, flyover etc.) and other suitable warning signs (e.g. at crossing, sharp bend, etc.) shall be erected at suitable locations.
- 5.3.7 A signalling system to regulate the movement of vehicles and people at the access and egress points of the site shall be provided if the situation warrants.
- 5.3.8 The movement of heavy construction vehicles and plants shall be guided by properly trained banksmen. Automatic audio-visual warning signals shall be installed for such plants to warn passers-by while reversing.



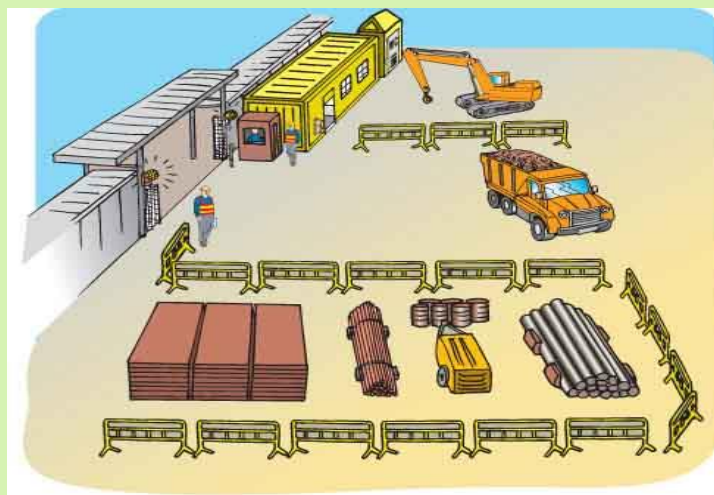


- 5.3.9 A watchman's kiosk, flash warning light and warning signs shall be provided at the entrance of the site to control and safeguard the ingress and egress of vehicles, site personnel and the public.
- 5.3.10 Washing facilities shall be provided at the site exit to remove the soil and dust that may be carried onto public roads by construction vehicles and site personnel.
- 5.3.11 The operation zone of any lifting plants and other construction plants like excavators shall be securely fenced off and demarcated by prominent signage as DANGER ZONE to prevent site personnel or passers-by from being struck by the loads being lifted or the moving parts of the plants. Strict site rules shall be established and enforced to ensure that nobody is allowed to enter or stay in the danger zone when the plants are in operation and vice versa no operation shall be allowed to proceed unless the danger zone is confirmed cleared.

## 5.4 Housekeeping

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- 5.4.1 Good housekeeping means the maintenance of a works site in a good standard of cleanliness and tidiness so as to make it a safe and healthy place of work.
- 5.4.2 All workplaces, passageways, staircases, accesses, haul roads and means of emergency escape shall be kept clear and unobstructed at all times.



- 5.4.3 All working areas and accesses shall be kept tidy and free from slipping and tripping hazards.
- 5.4.4 Construction waste and rubbish shall be frequently cleared and regularly removed from the site. Adequate receptacles shall be provided for the day to day disposal of the construction waste and rubbish.

- 5.4.5 Separate metal bins with close-fitting metal lids shall be provided for oily rags and other combustible waste.
- 5.4.6 Dangerous goods and chemicals shall be stored in dangerous goods stores of the appropriate category and clearly labelled.
- 5.4.7 All protruding nails in timber shall be removed or bent down so that they do not constitute a hazard to others.
- 5.4.8 Ground surface of working areas shall be kept dry and non-slippery. No ponding water shall be allowed to avoid mosquito breeding.
- 5.4.9 Provide suitable storage areas and/or rooms for equipment, tools and materials. Store items that are not required for immediate use orderly and safely so as to avoid them obstructing the accesses and workplaces.
- 5.4.10 Pipes or cylindrical shape items shall be properly stacked, fastened and chocked.
- 5.4.11 Adequate drainage system shall be constructed to properly collect, convey and dispose of the surface runoff.

## **5.5 Environmental Protection**

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- 5.5.1 No rubbish shall be burnt on site.
- 5.5.2 No polluting substances (e.g. muddy or contaminated water, chemical waste, etc.) shall be allowed to ingress into public drains, watercourses or to the outside of the site.
- 5.5.3 Containers holding petrol, diesel oil, greases, paints and chemicals shall be stored on a hard standing and correctly labelled. Drip pans shall be used to capture possible leakage and spillage due to filling, decanting or on-site consumption etc.
- 5.5.4 Wastes of different nature shall be properly separated, contained and disposed of, in particular:-
  - (a) all chemical wastes (e.g. used oil, solvents, etc.) shall be kept in separate and properly labelled metal bins with close-fitting metal lids which shall be disposed of under a controlled manner in landfills or other suitable facilities;
  - (b) the inert portion of construction waste (i.e. earth, building debris, bricks, broken rock and concrete) shall be separated for disposal at public filling areas; and

(c) other construction waste (e.g. timber crates and pallets, packaging, paper, metal and plastics, etc.) shall be properly sorted and stored, prior to removal from site for reuse, recycling or disposal at landfills as appropriate.

5.5.5 No percussive piling works shall be allowed between 7 p.m. and 7 a.m. on working days and 24 hours on general holidays.

5.5.6 The following activities shall not be carried out unless a construction noise permit is issued by the Director of Environmental Protection (DEP): -

(a) the use of any powered mechanical equipment other than percussive piling between the hours of 7 p.m. to 7 a.m. or at any time on a general holiday;

(b) the prescribed construction work as stated in the Noise Control (Construction Work) Regulation; and

(c) the use of percussive piling machine between 7 a.m. to 7 p.m. on any day.

5.5.7 A wheel washing basin shall be provided at the entrance of the site and all vehicles leaving the site must be hosed down to prevent mud and dirt from being carried onto public roads.

5.5.8 Suitable treatment facilities shall be provided to treat wastewater before discharge into the public sewers.




5.5.9 Dust-generating operations, e.g. rock breaking, grinding and blasting, etc., shall be controlled by wetting, enclosure, local exhaust ventilation (LEV) or other effective means for capturing the dust as

appropriate.

- 5.5.10 Soil heaps, bared slopes and cut faces etc. shall be securely covered by canvas or hydroseeded to prevent release of dust. Haul roads shall be paved with hardcore to suppress dust.
- 5.5.11 Percussive breakers and air compressors should have obtained the relevant noise emission labels issued by the Director of Environmental Protection before use.
- 5.5.12 All dump trucks carrying dusty materials shall be fitted with a properly designed and constructed mechanical cover to prevent escape of the dusty materials from the dump bed into the atmosphere.
- 5.5.13 B5 diesel, which is 5% biodiesel blended with 95% Euro V diesel, shall be used for all non-road based construction plants powered by internal combustion engines.

## 5.6 Fire Prevention

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- 5.6.1 A fire emergency plan shall be drawn up and everyone must understand and follow the procedures in case of a fire.
- 5.6.2 A properly trained firefighting team led by a fire marshal shall be established to take charge of any emergency situation.
- 5.6.3 A plan showing the fire escape routes and locations of firefighting equipment and notices giving instructions on the actions to be taken in case of a fire shall be displayed at prominent positions on construction sites and adjacent to fire alarm call points.
- 5.6.4 Regular training on firefighting and fire drills shall be provided to the staff.
- 5.6.5 Assembly points shall be designated in the event of fire and emergency.
- 5.6.6 The emergency escape routes shall be free from obstruction and escape doors shall be able to be opened from inside.
- 5.6.7 Suitable and sufficient emergency exit signs and emergency lighting shall be provided along emergency escape routes.
- 5.6.8 Adequate firefighting equipment, smoke detectors and alarms, and fire

doors shall be provided and maintained.

- 5.6.9 All flammable wastes shall be stored in metal containers before disposal. Warning signs shall be attached on the containers.
- 5.6.10 All flammable materials shall be stored away from heaters, stoves, welding areas, or other heat sources and the storage quantities shall not exceed those permitted under the regulations applicable.
- 5.6.11 No rubbish shall be burnt on site.
- 5.6.12 No smoking, welding or hot work shall be allowed in the vicinity of flammable materials and combustibles. Suitable warning signs shall be displayed at fire-risked locations and good ventilation shall be maintained.
- 5.6.13 All fuel driven plants shall be switched off before refuelling and a funnel shall be used to avoid splashes.
- 5.6.14 Proper screens shall be used as protection against sparks from igniting other materials during welding.
- 5.6.15 Wet clothes shall not be dried over fires, heaters or running engines.
- 5.6.16 Smoking should be prohibited as far as possible during work, especially work activities involving combustibles, e.g. sawdust, paints and solvents, etc. Smoking should only be allowed in designated areas where proper disposal facilities of cigarette ends and ashes are provided.
- 5.6.17 Naked fire shall not be allowed on site unless it is necessary for the work. Burning of timber to expel mosquitoes and pests shall be avoided.

## **5.7 Work in Adverse Weather**

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- 5.7.1 Conduct risk assessment on work to be performed under inclement weather conditions, identify and analyze the hazards. Check weather information by visiting Hong Kong Observatory's website <http://www.hko.gov.hk>.
- 5.7.2 Formulate safe plan and emergency procedures, including staffing and duties, communication of weather information, traffic arrangement, protection of temporary structures, construction plants and materials, evacuation route, safe shelters, first aid facilities and back up services, etc.
- 5.7.3 Formulate training programme and provide training on identification of hazards, and thus precautions, in inclement weather conditions.
- 5.7.4 Appoint an overseer to monitor changes in weather conditions likely to

- affect the safety at work. Suspend works of which the safety is susceptible to inclement weather, e.g. no welding in wet weather and no lifting in strong wind, etc. and/or close the site during typhoon.
- 5.7.5 Install appropriate warning systems like anemometer, lightning warning system, etc. where necessary, to give real time warning to enable appropriate safety measures to be taken immediately.
- 5.7.6 Provide safe shelters or structures that can protect workers from the adverse effect of strong wind, lightning and rainstorm. Provide safe means of transport and route for evacuation to safe shelters in the event of adverse weather conditions.
- 5.7.7 Provide communication system, radio, and appropriate personal protective equipment for use by those who have specific duties in times of inclement weather.
- 5.7.8 After the warning signals are lowered or cancelled, assess the effects of adverse weather on the workplace and prohibit entry into areas where it is still dangerous. Listen to weather broadcast and monitor the weather conditions for possible revival of thunderstorms, rainstorms and typhoons.
- 5.7.9 Resume work only after a thorough examination of the workplace to ensure the condition is safe to work therein.
- 5.7.10 More detailed precautions for safety at work in adverse weather are described in Chapter 10 of this Manual.

## **5.8 Prevention of Drowning on Construction Sites**

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- 5.8.1 Risks of drowning on construction sites are likely to arise as the work proceeds. In particular, ponding may occur in trenches and excavations, which are formed during the construction of channels, pipes, culverts, underground substructures and the like, or as-constructed structures like tanks, chambers, flood storage ponds etc. during the course of water tests or commissioning. Such ponding not only creates risk of drowning to the persons working on site, but worst still trespassers, especially children who are not aware of the potential danger.
- 5.8.2 The risk of drowning is created when temporary excavations, as-constructed structures, depressions in ground surface, abandoned fish ponds and wells, etc., are filled up by water, which may come from underground seepage, rain water, surface runoff, pipe leakage or water used for testing purposes.
- 5.8.3 The safety measures to protect the persons working on site are detailed in Section 5.12 - "Work over or near Water". This Section sets out the precautionary measures to prevent unauthorized entry and safeguard



trespassers from the risk of drowning. It should be noted that different sites might require different safety measures. The following safety measures, which are set out in the hierarchy of prevention, elimination, reduction, protection and lastly emergency preparedness, should be adopted as far as practicable.

#### 5.8.4 Prevention of Unauthorized Entry

- (a) Erect and maintain fencing and/or hoardings along the site boundary in good condition. Ensure that all mill barriers erected for the works in areas accessible by the public are securely and continuously linked together. Maintain sufficient lighting and warning signs on the site and its boundary.
- (b) Demarcate suitable entrance points for the passage of workers, plants and materials and impose access control.
- (c) Post suitable warning signs with telephone hotline at all site entrances and prominent positions along the site boundary.
- (d) Deploy sufficient watchmen to man the site entrances and strictly prohibit any persons not related to the works from entering the site, especially during non-working hours and holidays.
- (e) Install CCTV and/or infrared anti-burglary detection device at strategic locations for monitoring if situation warrants.
- (f) Maintain effective communication with nearby communities or villages through newsletters, briefings and meetings with their representatives to warn the residents of the possible danger of drowning and convey the necessary safety message. Solicit their views and assistance to formulate and implement practical safety measures to prevent site trespassing.

#### 5.8.5 Elimination and Reduction of Risk of Drowning

- (a) Eliminate possible ponding sites such as depressions in ground surface, abandoned fishponds and wells etc. by backfilling. Establish effective site drainage system including construction of dykes, channels and pumping points, having regard to the topography of the site and its surroundings.
- (b) Clear regularly all drainage system within and in the immediate vicinity of the site and maintain them unblocked, especially during rainy seasons. Provide and maintain pumping facilities if there is foreseeable risk of ponding.
- (c) During the course of construction, keep temporary excavations and as-constructed structures free from ponding by effective drainage and/or pumping at all times.

- (d) If it is impracticable to keep temporary excavations and as-constructed structures dry, suitable and robust safety measures like fencing, netting or decking securely fixed at position and warning notices should be used to safeguard such excavations and structures, especially during non-working hours and holidays.
- (e) Netting and decking provide full protection and are suitable for pits of small size or trenches of limited width. When netting is used, attention should be paid to the strength of netting, size of apertures, coverage, anchorage and possible sagging to ensure that it is suitable for the purpose. When decking is used, the anchorage should be checked to ensure that no panels could be displaced accidentally.
- (f) Grab-lines are suitable for arresting persons from being washed away by flowing water as in the case of running streamcourses, live sewers, etc. If suitably tautened and supported on water with buoys, grab-lines can be used as lifelines for holding on by a person in water.
- (g) When determining the suitable type of guarding to be used, i.e. netting, decking, grab-lines or else, it is necessary to assess the risk of drowning of a trespasser, having regard to the size and depth of the ponding site, the expected duration of ponding, specific site condition like location and accessibility, etc. An example is an as-constructed flood storage pond flooded with rainwater, where special attention shall be paid if it cannot be pumped dry in a short time. If necessary, the Engineer's Representative (ER) should ask the contractor to submit a method statement for guarding against the ponding sites.
- (h) Inspect periodically the site security condition and on-site safety arrangement for prevention of drowning, e.g. at the end of each day and days immediately before and after long holidays.
- (i) Include the inspection of drowning risks as one of the items of the joint inspection prior to the monthly Site Safety Management Committee (SSMC) Meeting.

#### 5.8.6 Emergency Preparedness

- (a) Ensure that the telephone hotline for public enquiry or emergency assistance as displayed on warning signboards is manned by a duty person 24 hours a day
- (b) Provide and maintain sufficient life-saving equipment at strategic locations, e.g. lifebuoys attached with lifelines, life jackets of self-inflatable type, etc.
- (c) Notify before commencement of work the nearby police and fire brigade of the works and the exact location of the sites to avoid

unnecessary delay of arrival of emergency assistance, especially for rural sites, which may not be easily located and reached.

## 5.9 Arrangement Before, During and After Long Holidays

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5.9.1 When construction sites are closed for long holidays (e.g. Chinese New Year), accidents are likely to occur if proper precautionary measures have not been taken beforehand. This might possibly due to factors like lapse of attention before and after long holidays, prolonged idling of plants and equipment, effect of adverse weather, temporary structures (e.g. scaffoldings) or incomplete works (e.g. excavations) being unattended for a long period, etc.

5.9.2 To ensure site safety before, during and after long holidays, it is essential to plan and develop proper arrangement to address the various factors likely to cause accidents. The following safety precautionary measures are suggested. It should be noted that additional arrangements shall be made for individual sites having special needs.

### 5.9.3 Site Security

Deploy sufficient manpower and resource to maintain effective site security before, during and after long holiday and implement the following measures:

- (a) Post sufficient warning signs at all site entrances and prominent positions around the site boundary.
- (b) Maintain hoardings and covered walkways including their lighting provisions in good condition. Ensure that all mill barriers erected along the works or site boundary are securely linked together.
- (c) Ensure that the telephone hotline for public enquiry and complaint, or emergency situation, is manned by a duty person 24 hours a day.
- (d) Establish and strictly enforce a site rule to prohibit any persons not related to the works from entering the site. Arrange suitable number of watchmen on site, who should know the emergency telephone number of the duty staff of the Contractor for assistance.
- (e) Arrange a small patrol team to check the site condition and safety arrangement on a daily basis during the holidays.
- (f) If roadwork is involved, attention shall be paid to works sites located at particularly crowded areas, e.g. the waterfront of the Victoria Harbour and urban open spaces at times of fireworks display or festivals. Special arrangement should be made to safeguard the general public, including robust fencing, clear warning signs,

well-constructed temporary pedestrian access, safety net over excavation, removal of unnecessary plants and materials, etc.

#### 5.9.4 Housekeeping

The site shall be kept clean and tidy before long holidays. Construction plants shall be properly parked and materials shall be properly stored, in particular:-

- (a) Remove all construction wastes and rubbish within and in the immediate vicinity of the site.
- (b) Store all construction materials, tools and equipment properly at secure places.
- (c) Hazardous substances (e.g. flammable materials or dangerous chemicals, etc.), if not removed from site before holiday, shall be stored in metal bins or dangerous goods stores of the appropriate category away from the reach of public.
- (d) Clear all drainage system within and in the immediate vicinity of the site and maintain them unblocked during holiday. Provide and maintain pumping facilities if there is foreseeable risk of flooding.
- (e) Empty, remove and/or cover all containers and other receptacles that may hold water, e.g. water tanks, drip trays etc., to prevent breeding of mosquitoes.

#### 5.9.5 Construction Plants and Equipment

- (a) Park all construction plants on firm and level ground, with the parking brake firmly applied and wheels wedged, where appropriate. Avoid parking near edges of slopes and excavations.
- (b) Lower all attachments or working tools of construction plants to the ground.
- (c) Remove the ignition keys and have them kept by designated site personnel for safe custody. Keep the telephone number of the operators in case of emergency.
- (d) Marine construction plant shall be removed off-site to typhoon shelter or securely anchored with their booms and jibs lowered at rest supports. Marine plant shall not be left unattended. Brief the watchman or security guard the emergency procedures.

#### 5.9.6 Gas Cutting and Welding Equipment

- (a) Remove all gas cutting and welding equipment from confined areas such as trench bottoms, chambers or box culverts, etc.

- (b) Release the gases trapped in gas hoses and blowpipes completely. Close all valves to the cylinders.
- (c) Store all gas cutting and welding equipment and gas cylinders in secure and well-ventilated places.

#### 5.9.7 Temporary Electricity System (TES)

- (a) Disconnect all electrical equipment from the power source except those essential ones such as lighting provisions for covered walkways, temporary traffic light signals, submersible pumps, etc.
- (b) Disable generators and other power supply sources that are not required.
- (c) Ensure that all switchboards are securely locked and can only be accessible by the designated registered electrical workers (REW).
- (d) Properly protect all electrical equipment and tools, cables and connections, etc. against the weather and possible flooding. Store unused items and cables in proper shelter.
- (e) Protect power cables against possible mechanical damage.

#### 5.9.8 Scaffolding and Working Platforms

- (a) Remove any plants and materials or rubbish from the scaffolding and working platforms before the holidays.
- (b) Provide and maintain adequate, or even additional, ties and struts for the scaffolding.
- (c) Fence off and display warning notice at the entrance/access to the scaffolding and working platforms.
- (d) Arrange a competent person to inspect and maintain the scaffolding during holiday.

#### 5.9.9 Trenches and Excavations

- (a) Fence off all trenches or excavation areas securely, particularly at areas adjacent to the public. Provide adequate lighting and signing, wherever necessary. Prevent any ingress of surface water, which could impair the stability of the excavation.



- (b) Erect proper shoring system to support trenches and excavations or have them backfilled. It should be noted that unsupported excavations, irrespective of the depth and the soil condition, may easily collapse under prolonged vibrating load induced by the running traffic.
- (c) Check and ensure the netting and/or decking over ground openings on public roads and pavements are securely fixed in position.
- (d) Arrange a competent person to inspect the trenches and excavations during holiday.

#### 5.9.10 Temporary Traffic Arrangement (TTA)

- (a) Check all TTA to ensure that they are set-up and maintained in strict accordance with the "Code of Practice for the Lighting, Signing and Guarding of Roadworks". Repair and replace damaged, defaced or discoloured traffic cones, traffic signs or directional signs etc. Check the conditions of all lighting and warning lanterns to ensure that they are functioning properly and are lit at night.
- (b) Check the conditions of the temporary footpath. Ensure that the footway is cleared of obstruction and mill barriers are securely linked together to prevent pedestrians from trespassing or taking a shortcut through the works areas.
- (c) Arrange a patrol team to inspect and maintain the TTA set-up at least twice a day, or at more frequent intervals as appropriate.

#### 5.9.11 Emergency and Maintenance Team

- (a) Review the emergency preparedness and conduct drills to ensure its effectiveness.
- (b) Develop emergency checklists for different scenarios. The checklists shall provide the details of the resources required and the responsible parties.
- (c) Ensure that the emergency team members could be readily reached and mobilized.
- (d) Provide adequate resources including labour, plant and equipment and ensure that they are readily available when summoned.

#### 5.9.12 Thorough Safety Check before Resumption of Work

- (a) After long holidays, it is necessary to conduct a thorough check on the condition of the site, including temporary structures, incomplete works, construction plants and equipment, temporary electrical system, fire service system, etc. to ensure the safety



of the workplaces and the integrity of the plants and equipment.

- (b) The checking shall be performed by the relevant competent persons and/or registered electrical workers (REW). Watch out for possible leakage of welding gases, electricity, hazardous chemicals, fuel etc. (which might be caused by cable sheathing, flexible hoses, etc. being damaged by rodents), unsafe structures and excavations (which might be caused by strong wind, rainstorm, vandalism), etc.
- (c) Report immediately any dangerous and abnormal conditions and carry out investigation and remedial actions. Resumption of work shall not be allowed until the site condition is confirmed safe.

## Safety of Various Types of Work

### 5.10 Work in the Vicinity of Public Utilities

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- 5.10.1 Before the work commences, the relevant utility companies shall be consulted for updated information on the locations of public utilities and the proper safety precautionary measures required to be taken. It shall be noted that the information shown on the utilities drawings is not absolutely accurate.
- 5.10.2 The relevant utility companies shall be informed of the works to be carried out.
- 5.10.3 Clearly marked barriers or goal-posts shall be erected to protect overhead power lines.



**Traffic passing beneath overhead power lines**

- 5.10.4 Underground cable locating work must be carried out by a "competent person", who has completed a recognized training course and approved

by the Director of Electrical and Mechanical Services (DEMS), in accordance with the "Code of Practice on Working Near Electricity Supply Lines". The "competent person" shall prepare proper written records of the identified underground cables and brief the site personnel on the findings and the required safety precautions.

- 5.10.5 Utilities locators shall be used to identify the location of underground utilities before excavation.
- 5.10.6 Trial holes shall be dug to confirm the alignment and depth of the underground utilities before full excavation. Breaking of road slab by mechanical means shall never take place right above or in the close proximity of the detected utilities alignments as the depth of the utilities is unknown.
- 5.10.7 The alignment and depth profile of all underground utilities shall be clearly marked on the ground before full excavation.
- 5.10.8 Excavation near underground utilities shall be carried out by hand digging as far as practicable. Ample clearance shall be maintained between underground utilities if the use of mechanical excavators or hand-held power tools is inevitable.
- 5.10.9 All works shall be carried out under the direct supervision of a supervisor with sufficient experience in working with underground utilities.
- 5.10.10 All buried cables shall be regarded as live. Pot-ended cables shall not be assumed dead or disused. The relevant utility companies shall be consulted for any unidentified cables.
- 5.10.11 All exposed utilities shall be marked to indicate their kind.
- 5.10.12 All exposed utilities shall be properly supported and protected in accordance with the instructions from utility companies.
- 5.10.13 Diversion of utilities shall be carried out by the utility companies concerned.
- 5.10.14 Damaged electricity cables must not be touched.
- 5.10.15 The area shall be evacuated if signs of gas leakage or pipe break are observed. Notify the utility companies concerned immediately.

## **5.11 Work on Highways**

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- 5.11.1 The safety and interest of the public shall always be the most important concern.



to the running traffic.

- 5.11.9 Workers should wear suitable respiratory protection where necessary.
- 5.11.10 Maintenance vehicles, if available, shall be parked between the oncoming traffic and the manholes where maintenance work is to be carried out. A warning notice shall be displayed at the rear of the vehicle, e.g. "DSD - Manhole Operation", to warn the approaching traffic.
- 5.11.11 All site vehicles shall be equipped with amber flashing beacons.
- 5.11.12 Always keep the disturbance to the general public and nearby residents to a minimum, i.e. hammering, talking loudly or vehicle engine noise shall be prohibited especially during works at night.
- 5.11.13 Plants, tools, materials, etc. shall not be left unattended on roads and highways. Plants and materials that are not required for immediate use shall not be stored on site, especially drainage pipes that may roll and possibly endanger the road users. Always maintain adequate lighting, signing and guarding to protect all road users.

## **5.12 Work over or near Water**

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- 5.12.1 Choose known swimmers for the work whenever possible.
- 5.12.2 Workers shall tell their supervisor if they are afraid of water.
- 5.12.3 A team of at least two workers shall be assigned to work at the same time.
- 5.12.4 Scaffolds and platforms complete with handrails and toe boards shall be provided whenever practicable.
- 5.12.5 Fall arrest systems such as safety nets and harnesses shall be used where scaffolds and standard working platforms cannot practically be provided.
- 5.12.6 Life jackets shall always be worn. The self-inflatable type life jacket is preferable as the worker may lose his consciousness after falling into water. They shall comply with BS EN ISO 12402-3:2006 and shall be capable of supporting an unconscious person face-upwards.
- 5.12.7 Safety harnesses attached with lifeline securely anchored at a fixed point shall be used when there is a risk of being washed away.



- 5.12.8 It shall be noted that the wearing of some types of bulky personal protective equipment may increase the risk of drowning, e.g. non-slip shoes are preferable to heavy Wellington boots, depending on the nature of the work.
- 5.12.9 Sufficient rescue equipment including rescue boats and lifebuoys attached with rescue lines shall be provided at proper locations. Training and instruction in its use shall be provided to the workers concerned.
- 5.12.10 There shall be adequate warning signs to warn of deep water and risk of drowning.
- 5.12.11 Sufficient lighting shall be provided at the work site.
- 5.12.12 Suitable audio and visual alarms shall be provided at strategic positions on the site.
- 5.12.13 The weather and the flow condition shall be closely monitored. Watch out for any sudden rise in water level at the workplace, e.g. due to flash flood, etc.
- 5.12.14 Never overload a boat, act silly or rock the boat.
- 5.12.15 No one shall work in channels, nullahs, streamcourses, manholes and chambers, etc. where water is flowing. If this is unavoidable, all suitable safety measures as mentioned above shall be taken.

## 5.13 Work in Confined Space

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- 5.13.1 A confined space means any place in which, by virtue of its enclosed nature, there arises a reasonably foreseeable specified risk, such as chamber, tank, vat, pit, well, sewer, tunnel, pipe, flue, boiler, pressure receiver, hatch, shaft or silo, etc. The specified risk means a risk of: -
- (a) serious bodily injury arising from a fire or explosion;
  - (b) loss of consciousness arising from an increase in body temperature;
  - (c) loss of consciousness or asphyxiation arising from gas, fume, vapour or the lack of oxygen;
  - (d) drowning arising from an increase in the level of liquid; or
  - (e) asphyxiation arising from a free flowing solid or the inability to reach a respirable environment due to entrapment by a free flowing solid.
- 5.13.2 Entry into a confined space shall always be avoided by using other alternative methods of working as far as practicable.
- 5.13.3 "Competent Person" (CP) shall mean a person who is either a registered safety officer or has successfully completed a safety training course approved by the Labour Department; and has at least one year's relevant post-qualification experience as per Factories and Industrial Undertakings (Confined Spaces) Regulation. For the carrying out DSD's confined space work, the CP shall also complete a "Confined Space Safety Training Course for Competent Persons Engaged in DSD's Works" and hold a valid certificate (hereinafter called "Designated Competent Person" (DCP)).
- 5.13.4 "Certified Worker" (CW) shall mean a person who has successfully completed a safety training course approved by the Labour Department as per Factories and Industrial Undertakings (Confined Spaces) Regulation. For the carrying out DSD's confined space work, the CW shall also complete a "Confined Space Safety Training Course for Certified Workers engaged in DSD's Works" and hold a valid certificate (hereinafter called "Designated Certified Worker" (DCW)).
- 5.13.5 No one shall enter a confined space unless: -
- (a) a risk assessment report in respect of the confined space has been prepared by a DCP;
  - (b) all necessary safety precautions in relation to the hazards identified in the risk assessment report have been taken and a



permit-to-work has been issued;

- (c) he/she is a DCW;
- (d) every piece of mechanical equipment in the confined space, which is liable to cause danger, has been disconnected from its power source and with its power source locked out;
- (e) every pipe or supply line whose contents are liable to create a hazard has been properly blanked off;
- (f) the confined space has been tested to ensure the absence of any hazardous gas and no deficiency nor enrichment of oxygen;
- (g) the confined space has been adequately purged and sufficiently cooled and ventilated, having regard to the circumstances of the particular confined space, to ensure that it is a safe workplace;
- (h) adequate supply of fresh air and effective forced ventilation have been provided inside the confined space;
- (i) a person is stationed outside the confined space for maintaining communication with the workers inside;
- (j) effective steps have been taken to prevent an ingress to the confined space of hazardous gas, vapour, dust or fume, and an in-rush into the confined space of free flowing solid or liquid; and
- (k) there is no possibility of a cave-in of materials.

5.13.6 The length of time that a worker can safely stay in the confined space must be determined before works commence and specified in the permit-to-work. No one shall stay in the confined space longer than the pre-determined time.

5.13.7 All entrances to the confined spaces shall be securely fenced off and warning signs erected conspicuously indicating that no unauthorized entry is permitted. In the case of ground openings, suitable measures shall be taken to avoid falling of objects into the confined spaces, e.g. grating.

5.13.8 Appropriate procedures to deal with any serious and imminent danger to workers inside a confined space shall be formulated and implemented. Arrangements for emergency rescue will depend on the nature of the confined space, the risks identified and the likely nature of the emergency rescue. All members of the rescue team shall be properly and adequately trained.

5.13.9 The following safety equipment shall be kept readily available and if recommended by the risk assessment provided at the scene: -

- (a) Sufficient number of multi-gas detectors (NB: at least 1 No. of multi-gas detector shall be carried into the confined space to continuously monitor the atmosphere therein.)
- (b) 1 No. of dead-man type audio-visual alarm for each person entering the confined space to alert those staying outside.
- (c) 1 No. of safety harness and fall arrest device attached to rescue lifeline for each person entering the confined space.
- (d) 1 No. of man-lifting tripod, or other lifting equipment approved by the ER.
- (e) 1 No. of first aid kit.
- (f) 1 No. of crowbar.
- (g) Sufficient sets of lighting (e.g. spark-proof / explosion-proof lamp or torch).
- (h) 3 Nos. of safety chains, each 3 m long.
- (i) Sufficient sets of breathing apparatus (BA) of approved type for the use of persons entering the confined space if so required, plus at least one additional standby set to be placed in the immediately vicinity of the entrance to the confined space.
- (j) Two-way communication device, e.g. spark-proof / explosion-proof walkie-talkie or BA equipped with microphone and speaker.
- (k) Mechanical ventilation (e.g. blowers).
- (l) Zoom camera / CCTV camera for real-time monitoring of the condition in the confined space.
- (m) 1 set of resuscitation equipment.
- (n) 1 No. of stretcher.
- (o) 1 set of firefighting equipment.
- (p) Safety helmets or bump caps.
- (q) Protective clothing.
- (r) Safety gloves.
- (s) Skid-resistance safety footwear.
- (t) Safety goggles.



**Worker wearing breathing apparatus and full-body safety harness with lanyard connected to a man-lifting tripod**

(u) Hearing protection device (e.g. ear muffs, ear plugs, etc.)

5.13.10 Effective means of communication other than shouting between the persons working inside confined space and the standby person staying outside shall be established and maintained at all times.

5.13.11 The air within the confined space shall be checked using a multi-gas detector suitable for checking oxygen content and the presence of gases which are hazardous to health, and flammable gases such as methane and propane. The atmosphere shall be continuously monitored throughout the period of stay in the confined space.

5.13.12 Matches or lighters shall not be allowed in a confined space.

5.13.13 No smoking and naked light shall be allowed in a confined space or near openings leading to it.

5.13.14 Cylinders of oxygen or other dangerous gases shall not be taken into confined spaces.

5.13.15 Suitable and sufficient firefighting equipment shall be provided.

5.13.16 All electrical equipment brought into the confined space shall be of explosion-proof type or intrinsically safe type.

5.13.17 The alarm shall be raised at once in a gassing incident. Summon the rescue team and/or public emergency service immediately and inform the person-in-charge. No one shall enter such a confined space without wearing breathing apparatus.

## 5.14 Work in Gas Risk Areas

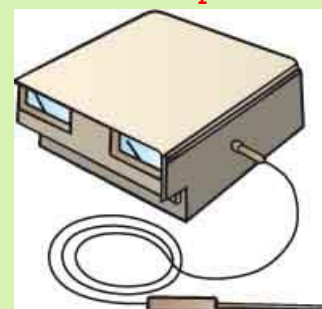
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5.14.1 The safety precautions to be taken for work in gas risk areas, e.g. in the close vicinity of landfill or dumping site or suspected damaged gas mains, etc. are basically the same as those for tackling risks of flammable gases present in confined spaces as listed in Section 5.13.



**Fire and Explosion**

5.14.2 The area shall be tested with gas detectors on a continuous basis.



**Gas leakage detector**

5.14.3 No one shall be allowed to work inside an enclosed gas risk area alone.

5.14.4 A permit-to-work shall be obtained before working in a gas risk area.

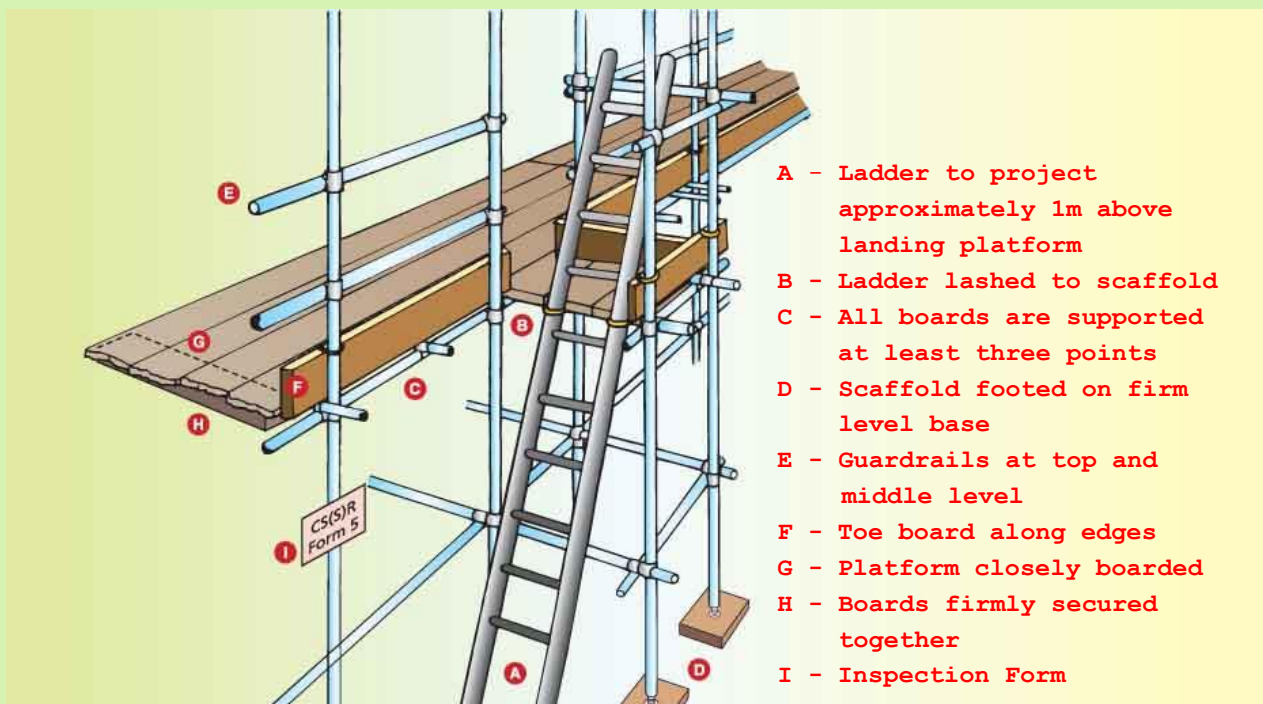
- 5.14.5 An enclosed gas risk area shall be ventilated and that a gas leakage detector must be carried before entry.
- 5.14.6 All hand tools and equipment to be used in gas risk areas shall be of non-explosive or intrinsically safe type.
- 5.14.7 Suitable and sufficient firefighting equipment shall be provided at the gas risk area.
- 5.14.8 No smoking or naked light shall be allowed within the gas risk areas.

## 5.15 Work at Height

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- 5.15.1 Avoid work at height where possible, e.g. by designing and using specific tools to enable the work to be done on ground. If work at height cannot be avoided, provide a safe working platform (fixed or mobile). Ladders are to be used for access only and shall not be used as working platforms. Only under safe circumstances, should simple and light work be performed on a ladder, platform ladder or step ladder, e.g. replacing a defective light bulb.
- 5.15.2 All open sides of a workplace from which a person is liable to fall by more than 2m shall be protected by guardrails and toe boards. The height of the top guardrails shall be between 900mm and 1150mm, the height of the intermediate guardrails shall be between 450mm and 600mm and the height of the toe boards shall be at least 200mm.
- 5.15.3 Working platforms with guardrails and toe boards shall be erected for workplaces at height. If provision of working platform is impractical, all workers employed at the elevated workplaces shall be protected from falling by means of appropriate safety nets, and safety belts and harnesses complete with shock absorber and lifelines or lanyards properly attached to secure points.
- 5.15.4 All workers shall be suitably trained in the use of safety belts and harnesses, and briefed about the hazards and safety precautions before commencing work. Increase the level of site supervision if necessary.
- 5.15.5 All fall-arrest equipment shall be regularly inspected for damage and that there is a system of reporting defects to the supervisors.
- 5.15.6 All elevated workplaces and working platforms shall be provided with safe and suitable means of access and egress such as stairs, ramps and ladders.
- 5.15.7 All ladders used shall meet the following requirements: -
  - (a) Securely fixed at the top, or if impracticable, at the bottom.

- (b) Rest on a firm level footing.
- (c) Extend at least 1 m above landing place, unless other suitable handhold is provided.
- (d) Vertical run not to exceed 9m, unless an intermediate landing is provided.
- (e) Set ladders at a slope of 4 to 1.
- (f) The rungs shall be free from moisture, dirt and grease.
- (g) Always face a ladder when going up or down and use both hands to grasp the rungs for support. Use a tool holster to carry hand tools to spare hands for holding the ladder.
- (h) All ladders shall be inspected and maintained at regular intervals with records.
- (i) Never paint wooden ladder as it may conceal defects.



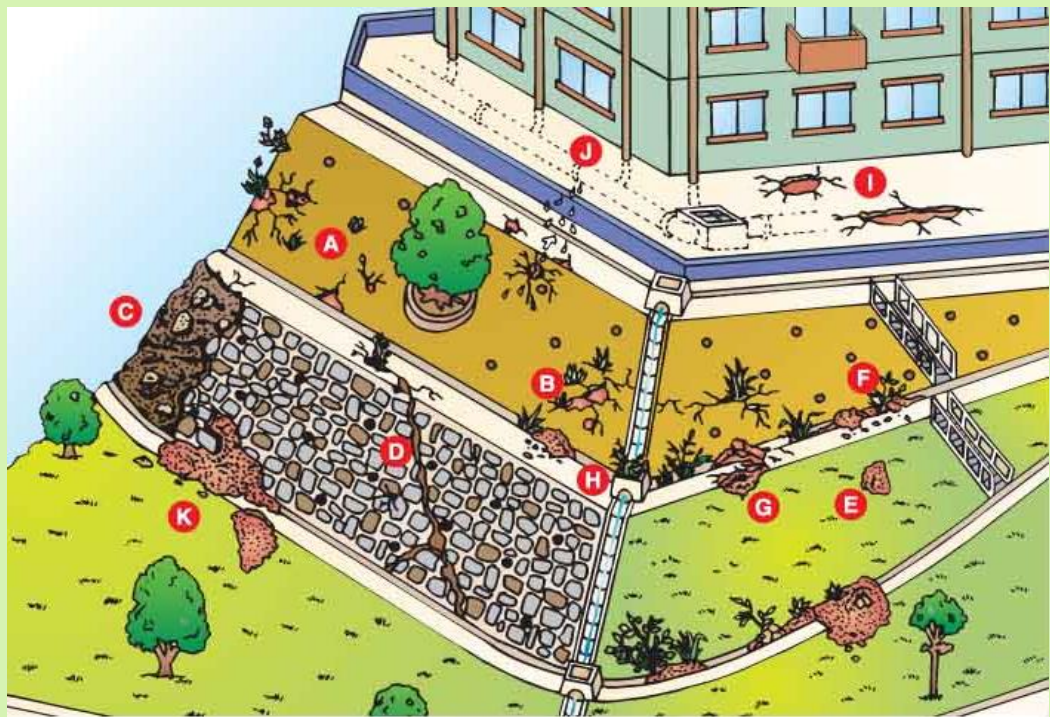
- 5.15.8 Never throw materials from height. Use enclosed chutes.
- 5.15.9 Works at height in adverse weather conditions shall be avoided as far as practicable, e.g. high winds or when surfaces may be slippery due to rain.
- 5.15.10 Safety nets and properly constructed safety catch fans shall be erected to catch falling objects and prevent any workers and members of the public from being injured by falling objects.



- 5.15.11 Never improvise expedient access to an elevated workplace.
- 5.15.12 Report defects of the working platform and ladders, e.g. loose or broken parts or connections and affix a warning label to prohibit further use until they are repaired.

## 5.16 Work on Slope

- 5.16.1 The common causes of accidents on slopes are sudden landslide and earth movement, fall of persons from height and improper use of mechanical equipment.



### Signs of Potential Danger

- |   |  |
|---|--|
| A - Blocked weepholes                     | G - Cracked / Damaged berm                             |
| B - Cracks in chunam or shotcrete surface | H - Blocked sand trap                                  |
| C - Bare rock slope surface with outcrops | I - Cracked / Damaged concrete paving at top of slope  |
| D - Cracks in facing stone wall           | J - Leakage from buried pipes                          |
| E - Bare slope surface                    | K - Fallen earth and stone fragments or trickling sand |
| F - Blocked / Damaged U-channel           |  |

- 5.16.2 A risk assessment shall be carried out by a professionally qualified geotechnical engineer for the purpose of formulating effective safety measures for the works to be carried out.

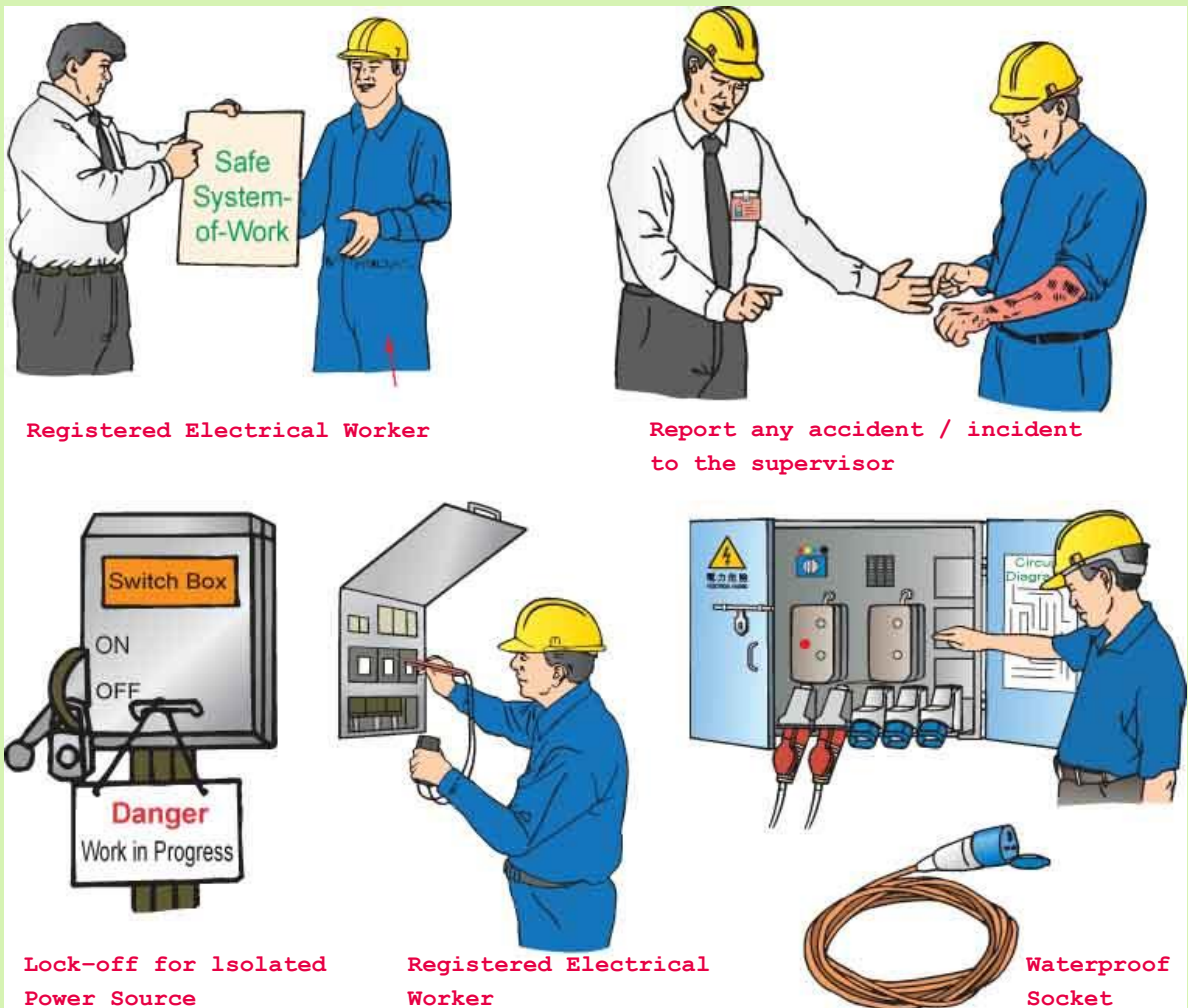


- 5.16.3 A competent person with sound geotechnical engineering background and experience shall be appointed on site to supervise the implementation of the safety measures.
- 5.16.4 All slopes shall be continuously monitored for earth movement by suitable measuring devices.
- 5.16.5 A suitable alarm system such as a high-power siren or hand-held gongs shall be provided to alert all personnel to stay clear of the area when signs of earth movement are detected. A supervisor shall be assigned to watch out for such danger.
- 5.16.6 All stormwater runoff and ground seepage shall be diverted by constructing suitable surface channels and sub-soil drains. The slope shall be covered with tarpaulins at times of heavy rainfall.
- 5.16.7 A suitable structure, e.g. steel-wire mesh screen, shall be erected to prevent workers or the public from being endangered by falling or displacement of earth, rock, or other material.
- 5.16.8 The slope work, including the structure mentioned in Section 5.16.7 above, shall be examined by a competent person as and when the site conditions warrant and in any case at least once every 7 days. Further examination shall be carried out where there are signs showing that the slope may have been affected by weather conditions. No further work shall be allowed unless the competent person has certified that the slope is safe. No remedial work shall commence unless other adequate precautions for ensuring the safety of the persons engaged in such work have been taken.
- 5.16.9 A suitable barrier shall be provided at the edge of a slope or berm from where a person is liable to fall for more than 2m.
- 5.16.10 No material shall be placed or stacked close to the edge of a slope.
- 5.16.11 No heavy construction plant shall operate or sit close to the edge of a slope.
- 5.16.12 The ground on which excavators or other heavy construction plants are seated shall be stable, compact and able to withstand the weight of the plants and the dynamic load during operation.
- 5.16.13 Working platforms shall be provided for workers who are at risk of falling. If this is not practicable, suitable safety nets, and safety belts and harnesses with lifelines attached to suitable anchorage points shall be provided.
- 5.16.14 Where lifelines are used, the anchorage points shall be checked regularly to ensure that they are safe to anchor.

- 5.16.15 Workers shall be regularly trained in the proper use of all personal protective equipment provided for their use.
- 5.16.16 Safe access shall be provided, including fenced passageway and suitable stairway with handrails at different levels of the slope where practicable.
- 5.16.17 Plants and equipment shall only be maintained and operated by operators who have been properly trained and are competent to carry out works on slopes.

## 5.17 Electricity

- 5.17.1 Only registered electrical workers (REW) of the appropriate grade under the Electricity Ordinance (EO) shall be allowed to carry out electrical work.



Registered Electrical Worker

Report any accident / incident to the supervisor

Lock-off for Isolated Power Source

Registered Electrical Worker

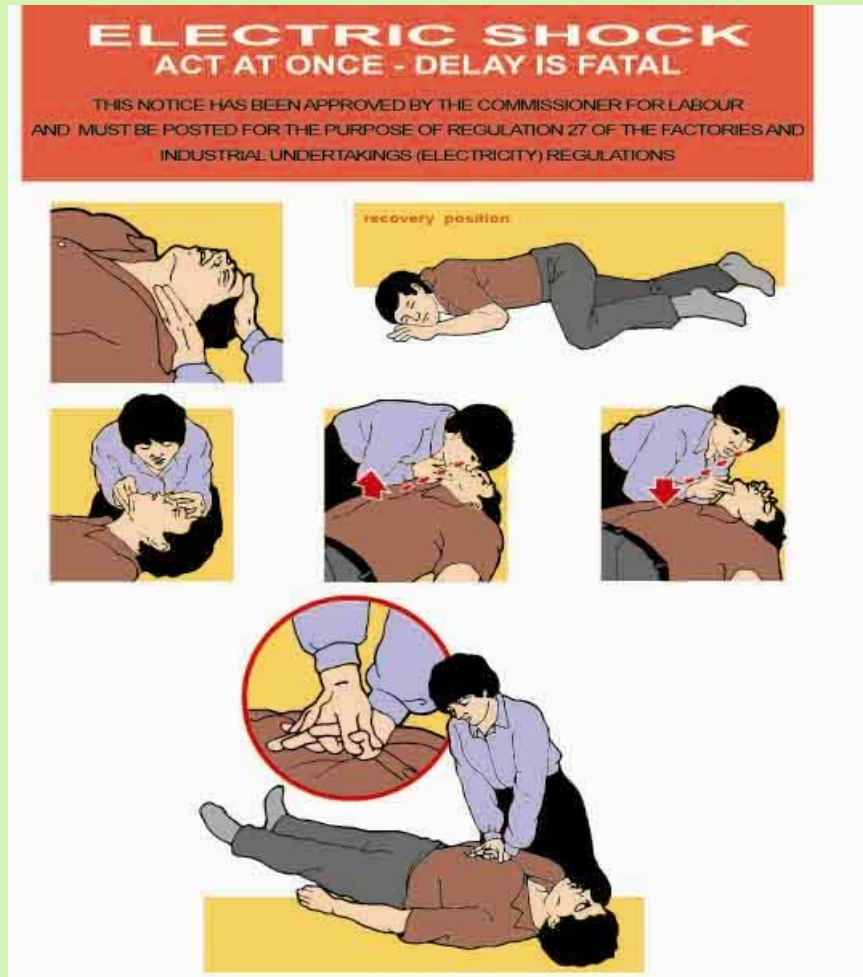
Waterproof Socket

- 5.17.2 The electrical supply system, including the generation, transmission and distribution, and all electrically-powered tools, shall be regularly inspected, checked and maintained by the REW.

- 5.17.3 All electrical equipment shall be earthed. Temporary site lighting shall operate at a voltage of 110V maximum.
- 5.17.4 If portable electrical appliances or tools are not double-insulated, they should be earthed. Plugs and sockets complying with safety standards should be used in conjunction with residual current device (RCD) for earth leakage protection.
- 5.17.5 Portable electric tools of 110V maximum shall be used.
- 5.17.6 Home-made extension cables shall not be used.
- 5.17.7 Multi-way adaptors or domestic sockets and plugs shall not be used.
- 5.17.8 Plugs shall not be forced into the wrong sockets.
- 5.17.9 Cables shall not be left lying on ground unprotected.
- 5.17.10 Cables shall be protected from edges of sharp objects and other possible mechanical damage.
- 5.17.11 Worn or aged electrical cables shall not be used.
- 5.17.12 All outdoor electrical outlets, connections and wiring shall be of splash-proof type to IP 54 or above.
- 5.17.13 All fuse boxes and electricity distribution panels shall be securely closed and locked and shall only be accessible to the designated REWs.
- 5.17.14 All supply, distribution and transformer units shall be marked with warning signs. The name and contact telephone number of the authorized REW shall be displayed on the units.
- 5.17.15 All workers shall keep away from overhead high-voltage power lines as far as possible.
- 5.17.16 Operation of cranes and construction plant with booms or arms must be kept clear from overhead power cables. Clearly marked goalposts and warning signs shall be erected to protect overhead power cables from being accidentally hit by construction plants while they are operating or travelling underneath the overhead power cables.
- 5.17.17 Portable stands, screens, mats and covers and insulating boots, gloves or other protective equipment shall be provided and maintained in good condition.
- 5.17.18 Adequate lighting shall be provided for electrical apparatus if it requires operation and attention from time to time.

5.17.19 Trained personnel who are familiar with first aid and cardio-pulmonary resuscitation (CPR) shall be available at the workplace to treat electric shock.

5.17.20 Safety posters for treatment of electrocution shall be posted in the vicinity of power outlets, switchboards and other prominent positions on the site as appropriate.



5.17.21 The procedure given below shall be followed when removing a person from a live wire without yourself being electrocuted: -

- (a) switch off the current if the switch is near to hand;
- (b) if the current cannot be switched off, DO NOT attempt to move the victim with your bare hands;
- (c) if he is wearing a coat, pull him clear by grasping his coat tail, provided that the cloth is dry;
- (d) alternatively you can use your own coat to grasp his body, or you can slip your belt around his leg or arm and pull him clear;
- (e) use a dry piece of wood to knock or push aside the live conductor;  
and

(f) you can protect yourself further by standing on a piece of insulating material such as dry wood, dry folded paper, dry coat, or rubber matting.

5.17.22 Check all protective devices of the electrical installations (such as fuses and circuit breakers) to ensure that they are functioning properly.

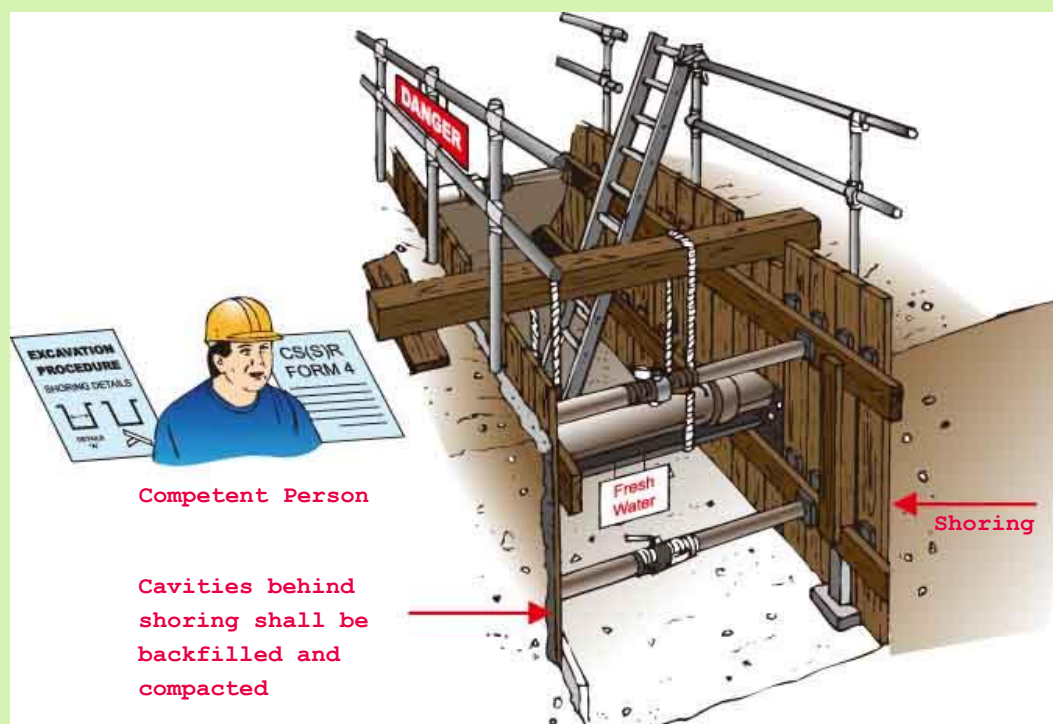
5.17.23 If protective device of the electrical equipment (such as fuses or circuit breakers) had operated and interrupted the electric current, the cause of fault should be identified and rectified before putting it back into service.

5.17.24 Installation of electrical appliances, connection of electric wires, repair and maintenance of electrical appliances must be conducted by qualified and recognized electricians, i.e. REWs. Remember to isolate the electricity supply before work.

## 5.18 Excavation

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5.18.1 All excavations shall be examined and certified safe by a competent person once every seven days. Visual inspection shall be carried out daily by an experienced person before work in excavation commences.



5.18.2 In general, excavation over 1.2m in depth shall be supported by proper shoring or battered to a safe angle, unless having regard to the nature

and slope of the sides of the excavation, no fall or dislodgment of earth, rock or other materials is liable to occur.

- 5.18.3 The edges of excavations shall be protected by guardrails. Toe boards shall be provided to guard against objects from falling into the excavation.
- 5.18.4 Adequate supply of suitable timber or other shoring material shall be available and that they shall be installed in accordance with the approved design and erection method.
- 5.18.5 No one shall alter the position of any component of the trench supporting system unless he is authorized to do so under proper supervision.
- 5.18.6 No one shall stand or work on struts, walings, bracings and the like and no plant and material or load shall be placed on the same, unless they are designed for such purpose.
- 5.18.7 Loads, plants or materials shall not be placed near the edge of the excavation unless it has been checked safe to do so.
- 5.18.8 Measures to protect workers working in trench against falling objects like earth, tools and materials, etc. shall be implemented, e.g. toe boards, safety nets, etc.
- 5.18.9 Suitable barriers, cones, lights, and warning signs shall be erected to guard excavations in roads in accordance with the approved temporary traffic arrangement (TTA) layout.
- 5.18.10 Suitable ladders, bridges and gangways for access to and egress from excavations, where necessary, shall be available on site.
- 5.18.11 Emergency means of escape shall be provided in excavations, especially where flooding is liable to occur.
- 5.18.12 The location of all underground utilities shall be identified and marked and that they shall be firmly supported and adequately protected once exposed.
- 5.18.13 Workers shall not swing picks or hammers, etc. in the close proximity to one another and shall not work within the radius of an excavator jib.
- 5.18.14 When vehicles are working near edges of excavations, suitable stoplogs or other substantial barriers shall be provided to prevent the vehicles from accidentally running or falling into the excavation, especially during reversing.
- 5.18.15 Maintain a reasonably dry working condition inside an excavation.



- 5.18.16 Suitable measures shall be taken to avoid excessive settlement due to dewatering that may cause damage to adjacent properties and utilities.

## 5.19 Industrial Diving

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- 5.19.1 It shall be noted that industrial diving operation, especially those undertaken inside sewage pipes, manholes, chambers, culverts and submarine outfalls, etc., are extremely high risk activities because of the cramped working environment, the poor or even zero visibility underwater, the dangerous atmosphere inside, the presence of filthy water and foul materials, the restricted access, etc., all of which will considerably increase the risk of work and the difficulty for escape and rescue in the event of emergency.



- 5.19.2 As a first consideration, industrial diving operation shall be avoided as far as there are other alternative engineering solutions.
- 5.19.3 Due consideration shall be taken in the planning and design stage to effectively minimize or eliminate the need for industrial diving in future stages of work, e.g. the use of removal stoplogs or inflatable packers instead of in-situ built blockwork may negate the need of working underwater during flow diversion or reinstatement work.
- 5.19.4 All diving work shall be carried out in strict accordance with the "Code of Practice - Safety and Health at Work for Industrial Diving" published by the Labour Department.
- 5.19.5 A method statement which incorporates the relevant safety provisions of the "Code of Practice - Safety and Health at Work for Industrial Diving" shall be prepared. No diving work shall be carried out if the method statement cannot demonstrate satisfactorily that the method

of working and safety precautionary measures can effectively control the risk at work and the emergency procedures are adequate for withdrawing a diver in danger immediately.

- 5.19.6 A competent diving contractor shall be employed to carry out industrial diving operation.
- 5.19.7 The diving contractor shall be responsible for: -
- (a) planning of the diving operation including assessing the risks, selection of appropriate diving modes and establishment of diving rules;
  - (b) employing suitable diving supervisors to be in immediate control of the diving operation; and
  - (c) employing sufficient divers and supporting personnel to undertake the diving operation. The training and experience of individual team members shall be commensurate with the assigned tasks.
- 5.19.8 Copies of diving rules and decompression tables, if appropriate, should be available for reference at the diving location.
- 5.19.9 The diving contractor shall provide and maintain a Diving Operation Log Book. The diving supervisor shall complete it on a daily basis and sign all entries during the course of the diving operation under his control. Each diver shall maintain a personal Diver's Log Book. The Log Books shall be retained for at least two years after the date of the last entry in it
- 5.19.10 When the dive does not exceed 30m in depth, a team of at least three persons comprising one diving supervisor, one work diver engaging in the underwater work, and one standby diver at the diving location, shall be present for each diving operation. An extra diver at the diving location shall be present in case of air diving with decompression stops, air diving exceeding 30m in depth, and air diving where there is a special hazard.
- 5.19.11 For bell diving operation, the diving team shall have at least five members. At least two divers must travel to the underwater work site in the diving bell, one of whom acts as the standby diver in the bell. Further, there shall be a diving supervisor, a gas supply panel operator and at least one other standby diver at the diving location.
- 5.19.12 A person on the surface shall be responsible for monitoring boat traffic and other potential hazards such as sudden change of weather and shark attack.
- 5.19.13 All necessary plants and equipment shall be properly maintained and available for immediate use. A register of all plants and equipment

shall be kept up-to-date containing maintenance records and test and examination certificates. They shall be checked by a competent person within 6 hours immediately before the diving operation commences.

- 5.19.14 All cylinders containing breathing mixtures for diving purposes shall be correctly labelled and coloured.
- 5.19.15 In case breathing air is supplied to the diver from an air compressor, the diving contractor shall ensure that suitable equipment is used to supply adequate breathing air which is suitable for the diving operation.
- 5.19.16 Compressed air shall not be used as a breathing mixture for diving at depths exceeding 50m. For diving at depths exceeding 50m, it is necessary to replace compressed air with a suitable breathing mixture in which the proportion of nitrogen is reduced or eliminated.
- 5.19.17 All diving team members shall have the appropriate first aid training and experience.
- 5.19.18 All divers must be medically examined and shall possess a Certificate of Medical Fitness to Dive issued by a medical practitioner, not more than 12 months before the date of the diving operation.
- 5.19.19 First aid equipment, including first aid kits and an oxygen unit capable of delivering 100% medical oxygen for a minimum period of time to be fixed by a medical adviser shall be provided.
- 5.19.20 An emergency arrangement shall be available and all diving team members shall be informed and trained to familiarize themselves of the emergency arrangement.
- 5.19.21 An effective communication system shall be established between the diving team at the diving location, the persons having control of that place, and the emergency services including police, fire services, recompression facilities, etc.
- 5.19.22 A proper lifeline shall be provided. It shall be: -
  - (a) of sufficient length and of not less than 8mm in diameter;
  - (b) properly anchored to the safety harness worn by the diver at one end and to a secure anchorage point at the other end, except where restrictions on mobility due to the lifeline would itself create a hazard; and
  - (c) adequate in strength and suitable for recovering the diver under normal operation and emergency conditions without dislodging life-supporting equipment.

- 5.19.23 All divers shall be fitted with an emergency or reserve gas supply system for use when the primary gas supply system fails.
- 5.19.24 Under the following emergency situations, diving operation shall be terminated immediately: -
- (a) There is a sudden change in environmental conditions such as adverse weather rendering diving operation hazardous.
  - (b) The diver requests termination.
  - (c) The diver fails to respond correctly to signals from a diving team member.
  - (d) Communication is lost and cannot be re-established between the diver and the diving team at the diving location.
  - (e) Diver begins to use the reserve breathing gas supply.
- 5.19.25 In case where diving operations are carried out in culverts, tunnels, outfalls or the like, the following additional precautionary measures shall be taken wherever applicable: -
- (a) Check and confirm the positions in culvert, lock, tunnel, weir, outfalls, etc., where sudden flow of water may occur. Check whether a diver can be recovered from downstream or upstream if he is sucked into a pipe or tunnel grating in the event of a sudden flow of water.
  - (b) Ensure that all safety precautionary measures are effectively implemented, especially how a diver at work can immediately escape or be withdrawn in the event of emergency.
  - (c) Before any valve, gate or other plant resumes operation, all divers shall leave the water. To prevent accidental opening of valves etc., a lockout or tagout system under the control of the diving supervisor shall be implemented.
  - (d) The diving gear shall be capable of offering protection against foul matters.
  - (e) Sufficient amount of clean water and soap shall be available to wash up the diver immediately after the diving operation is complete.

## 5.20 Manual Handling and Lifting

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- 5.20.1 Mechanical equipment shall be used to reduce or replace manual handling as far as possible.
- 5.20.2 If a particular manual handling operation is first undertaken at a workplace, make a preliminary assessment of the risks of the manual handling operation according to the Occupational Safety and Health Regulation and make a further assessment of the manual handling risks if the hazardous operation cannot be avoided.
- 5.20.3 The factors to be considered shall include:
- (a) characteristics of the task;
  - (b) loads;
  - (c) working environment;
  - (d) individual capability; and
  - (e) other factors, e.g. movement restriction arising from personal protective equipment.
- 5.20.4 The load for manual handling shall be lightened and suitably shaped as far as possible.
- 5.20.5 All persons shall be trained in the proper methods of lifting and carrying.
- 5.20.6 The manpower required to handle or lift the load safely shall be assessed and arranged appropriately.
- 5.20.7 Where teamwork is required, persons shall be selected on the basis on their ages and physical builds so that they are compatible for teaming up. The actions of the team members shall be coordinated by giving necessary training, instructions and signals.
- 5.20.8 All paths shall be clear of obstructions and tripping hazards.
- 5.20.9 Proper personal protective equipment such as gloves, safety shoes, etc., shall always be used.
- 5.20.10 Particular attention shall be paid to any splinters, sharp edges, loose banding and nails.

5.20.11 The following procedures shall be followed whenever a load is lifted: -



- (a) Stand close to the object. Have a firm footing with feet spread on either side of the load.
- (b) Bend the knees and keep your back as straight as you can.
- (c) Grasp object firmly. Be sure grip will not slip.
- (d) Breathe-in and throw the shoulders backwards.
- (e) Straighten the legs and continue to keep the back as straight as you can.
- (f) Hold object firmly close to the body.
- (g) Always lift smoothly. Avoid jerky motions. Turn with feet instead of twisting back.

## 5.21 Welding

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### General

5.21.1 The following personal protective equipment shall be worn in welding operation:

- (a) Face-mounted or handheld shields fitted with filters conforming to BS EN 169:2002 or equivalent.
- (b) Goggles conforming to BS EN 166:2002 or equivalent when chipping slags.
- (c) Gloves conforming to BS EN 407:2004, which shall be long enough to protect wrists and forearms against heat, sparks, molten metal and radiation.



- (d) High-top boots conforming to BS EN ISO 20344:2011 and BS EN ISO 20345:2011 to prevent sparks from entering footwear.
  - (e) Respirators conforming to BS EN 14387:2004 if local exhaust ventilation (LEV) cannot be arranged.
- 5.21.2 The workplace shall be ventilated using air blowers and exhaust fans to remove poisonous fumes and gases given off during welding.
- 5.21.3 The workplace shall be screened off with sturdy opaque or translucent materials because glare can cause eye injury up to 60m away and severe pain after exposure for 24 to 48 hours.
- 5.21.4 Flammable materials and combustibles shall be moved to a safe place away from the hot work, or covered with a fire retardant sheet.
- 5.21.5 The workpiece shall be checked to ensure that they are free from residues of petrol, oils, spirits, paint, or any inflammable or explosive materials before welding.
- 5.21.6 Precautions shall be taken against flying sparks and hot slags when welding is being done near flammable materials. After welding work is finished, the area shall be checked before leaving.
- 5.21.7 Workpieces degreased with solvent shall not be welded until completely dry.
- 5.21.8 Suitable and sufficient number of fire extinguishers shall be provided at the workplace.

### **Electric Arc Welding**

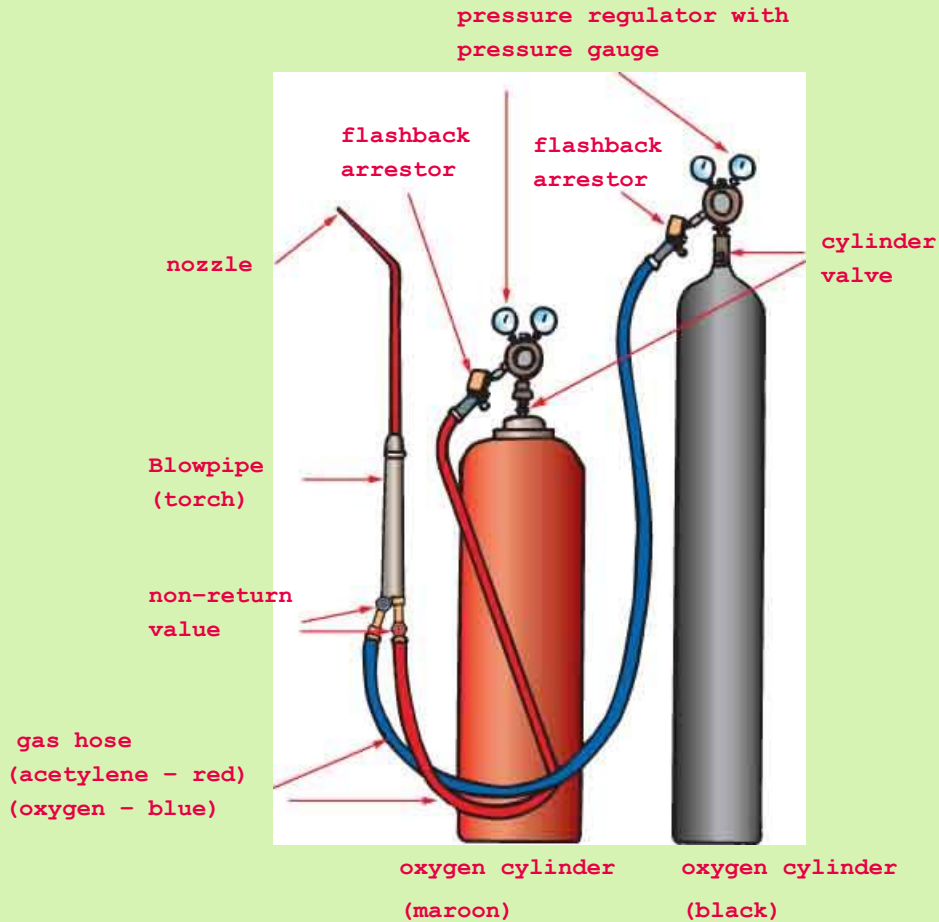
- 5.21.9 All arc welding machines and electrode holders shall comply with BS EN IEC 60974-9:2018, BS EN IEC 60974-1:2018 and BS EN 60974-11:2010.
- 5.21.10 The welding process shall not be carried out on wet floor, in humid condition or in rainy weather.
- 5.21.11 The welding equipment and workpiece shall be properly and effectively earthed.
- 5.21.12 The welding current shall be as low as practicable. The welding machine shall be turned off when left unattended.
- 5.21.13 The current to the electrode grip shall be switched off when putting it down.
- 5.21.14 The integrity of the cable shall be checked regularly. Trailing welding cables shall be kept clear of ground to avoid possible mechanical damage and creating tripping hazards, whenever possible.

- 5.21.15 The work shall be carried out as per Code of Practice - "Safety and Health at Work for Manual Electric Arc Welding" published by Labour Department.



#### **Gas Welding and Flame Cutting**

- 5.21.16 The gas cylinders shall be fitted with suitable and effective flashback arrestor and non-return valve.
- 5.21.17 The acetylene and oxygen cylinders shall be stored separately.
- 5.21.18 All cylinders shall be stored in a properly constructed store and secured against accidental displacement.
- 5.21.19 Gas cylinders shall be kept in a vertical position both in storage and when in use.
- 5.21.20 Gas cylinders shall be lifted and shall not be slid along the ground or dropped from trucks.
- 5.21.21 Gas cylinders shall not be used as supports or rollers.
- 5.21.22 Check leakage in hose and connection regularly by using a solution of soapy water.
- 5.21.23 The gas welding set shall be kept away from sources of heat, flammable materials, corrosive chemicals and fumes.
- 5.21.24 Oil and grease shall never be used on oxygen cylinder fittings.
- 5.21.25 Cylinders with damaged valves shall not be used.
- 5.21.26 Valve caps shall be replaced after use.



- 5.21.27 Undue force shall not be used if valves are stuck. Cylinder valves shall always be opened slowly.
- 5.21.28 The regulator screw on a welding torch shall be opened before opening the cylinder valve.
- 5.21.29 Hoses and connections shall be in sound condition and securely protected to avoid damage. Worn or aged hoses must be replaced immediately.
- 5.21.30 Ensure that gas welding and flame cutting work is only performed by a person who holds a valid certificate pursuant to the Factories and Industrial Undertakings (Gas Welding and Flame Cutting) Regulation or is undergoing training in performing gas welding and flame cutting work under the supervision of such a valid certificate holder.
- 5.21.31 The work shall be carried out as per Code of Practice - "Safety and Health at Work for Gas Welding and Flame Cutting" published by Labour Department, including the establishment of a hotwork permit making firefighting equipment readily available.

# Tools, Plants and Machinery

## 5.22 Hand Tools

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- 5.22.1 Experience revealed that most accidents involving the use of hand tools are attributable to improper use of hand tools or use of defective and/or wrong hand tools. It follows that supervision of the work and checking of hand tools are essential in preventing such accidents. The following sections may not cover all types of tools. If anyone is unfamiliar with any tool he is using, he should ask his supervisor for instruction on its use.



**Defective hand tools**

- 5.22.2 Right tools shall be selected for the right job. A tool must be used only to perform the job for which it is designed.
- 5.22.3 Wooden handles of hand tools shall be made of hard materials free from cracks and knots. The handles shall be securely fixed to the tools.
- 5.22.4 Precautions should be taken to prevent hand tools slipping out from hands while working at height.
- 5.22.5 Hand tools shall be regularly inspected and properly maintained.
- 5.22.6 Only non-sparking hand tools shall be used in explosion risk area.
- 5.22.7 Hand tools shall be kept in good working condition and with cutting edges sharp.
- 5.22.8 All sharp hand tools shall be handled with care. All sharp edges shall be protected if not in use.
- 5.22.9 Files without a handle shall not be used.
- 5.22.10 Pliers shall not be used as a substitute for hammers, wrenches or spanners.
- 5.22.11 Screwdrivers shall not be used as a makeshift punch, wedge or pry-bar.
- 5.22.12 Correct size spanners shall be used. Packing pieces shall never be used.

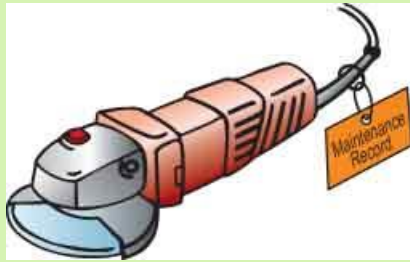
- 5.22.13 Hammer or extension handles shall not be used on a spanner for tightening up nuts.
- 5.22.14 Hammers shall be chosen to fit the type of work to be done. Various types and weights of hammers are designed for specific jobs and shall not be used for other purposes.
- 5.22.15 Only the proper type and size of chisels shall be selected. Cold chisels for cutting metal shall not be used for cutting timber.
- 5.22.16 Wear safety glasses or goggles when using chisels.
- 5.22.17 All mushroomed heads on chisels shall be properly rounded off.
- 5.22.18 When hand tools with sharp corners or edges are used, their direction of movement should be away from the body. Suitable personal protective equipment such as helmets, aprons or gloves should be used when necessary.
- 5.22.19 When flying fragments, particles or noise are generated during the operation of hand tools, suitable personal protective equipment, e.g. goggles, masks or ear-muffs, that conform to safety standards should be worn.
- 5.22.20 Hand tools shall be properly stored and shall not be left lying in places where persons have to work or pass, or on scaffolds or other elevations from which they may fall on persons below.
- 5.22.21 Repetitive use of hand tools for a prolonged period or using unsuitable tools for work could also cause musculoskeletal disease, e.g. tenosynovitis. Suitable rest or break should be taken to avoid fatigue.
- 5.22.22 One should concentrate on the job when using a hand tool. Playing with hand tools should be strictly prohibited.

## **5.23 Portable Power Tools**

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- 5.23.1 Only correct equipment or tools shall be used for the job.
- 5.23.2 Portable power tools shall be operated at a voltage of 110V or less supplied from a step-down transformer with its output winding centre-tapped to earth and comply with BS EN 61558-1:2005 and BS EN 61558-2-23:2010 or equivalent. All cables shall be terminated within the transformer enclosure of Class I and IP55 and the outgoing circuit shall be provided with short circuit protection. In confined and damp situations, e.g. inside metal vessels, the voltage of hand-held tools shall not exceed 25V.

- 5.23.3 The equipment or tools and any circuit shall not be overloaded. Fuses of the correct capacity shall be used at all times.
- 5.23.4 All electrical equipment and tools shall be effectively earthed.
- 5.23.5 Repairs to any electrical equipment and tools shall only be carried out by registered electrical workers (REW).
- 5.23.6 The electrical supply shall be switched off and where possible the fuses shall be removed before making repairs and adjustments.



- 5.23.7 The flexible cables attached to the power tools shall have protective braid and abrasion resistant sheaths.
- 5.23.8 Regular checks and maintenance shall be carried out to identify and rectify defective or damaged cables, plugs, sockets and damaged or worn tools.
- 5.23.9 Defects shall be reported at once and defective tools shall not be used until repair has been made.
- 5.23.10 Loose cables shall be kept off the floor and out of the way of other people as far as possible.
- 5.23.11 A plug shall not be withdrawn from a socket by pulling the cable.
- 5.23.12 All electrical equipment or tools shall be kept dry and clean unless they are designed for working under such condition.
- 5.23.13 Flame-proof electrical equipment or tools shall be used in place where flammable vapour may be present.

## 5.24 Abrasive Wheels

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- 5.24.1 All mounting shall be done by competent persons appointed in writing by the employer. They shall be well trained and have the practical experience for the mounting job.





- 5.24.2 Only wheels, discs, etc. complying with the Factories and Industrial Undertakings (Abrasive Wheels) Regulations shall be used.
- 5.24.3 Only trained persons shall be allowed to use abrasive wheels and cutting discs.
- 5.24.4 The speed of the spindle of a machine shall be checked to ensure that it does not exceed the maximum permissible speed of the wheel as specified by the manufacturer.
- 5.24.5 A new or replacement abrasive wheel shall be run at least 1 minute before use. Only the correct grade of wheel shall be used for the work.
- 5.24.6 The guard shall be in position and properly adjusted.
- 5.24.7 The work rest shall be adjusted as close to the face of the wheel as possible, in any case not exceeding 3.2mm to the wheel.
- 5.24.8 The sides of an abrasive wheel shall never be used for grinding.
- 5.24.9 The spindle shall be checked that it does not become overheated through lack of lubrication.
- 5.24.10 A wheel shall not be stopped by the application of pressure to the wheel.
- 5.24.11 Never use undue pressure on the wheel when grinding.
- 5.24.12 High impact resistant goggles shall be worn even when a protective screen is fitted to the machine.
- 5.24.13 A dropped abrasive wheel shall be examined very carefully before using it. If in doubt of its condition, the wheel shall be destroyed.
- 5.24.14 The floor in the vicinity of a grinding machine shall be in good condition, free from flammable materials, obstruction and not slippery.
- 5.24.15 Faults or unusual signs of the machine shall be reported to the officer-in-charge immediately.

## 5.25 Cartridge Operated Tools

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- 5.25.1 Only tools approved by the Labour Department in accordance with the Factories and Industrial Undertakings (Cartridge-Operated Fixing Tools) Regulations shall be used.
- 5.25.2 Users of cartridge operated tools shall be: -
- (a) at least 18 years of age; and
  - (b) holding a certificate of competence on the particular tool to be used.
- 5.25.3 Cartridge operated tools must be used in accordance with the manufacturer's instructions.
- 5.25.4 Operators and others directly engaged in firing activities shall wear suitable high impact resistant goggles, safety helmets and ear protectors.
- 5.25.5 Cartridge operated tools shall not be used in an atmosphere containing flammable vapours, flammable gases or explosive dusts.
- 5.25.6 Never point tools, whether loaded or otherwise, towards any person. The tools shall be pointed downwards (except when firing) and, as far as possible, away from the bodies.
- 5.25.7 Never walk around with loaded tools.
- 5.25.8 Never put the hand over the end of the barrel of the tool.
- 5.25.9 Never lay down loaded tools.
- 5.25.10 Tools shall not be loaded until immediately before it is required. If a tool is loaded in error, the tool shall be unloaded immediately.
- 5.25.11 Force shall not be used when loading a cartridge in the breech. Any difficulty in loading shall be reported to the immediate supervisor.
- 5.25.12 The immediate vicinity of the firing place shall be kept clear. Particular attention shall be made when firing against soft or thin material because it may allow the fixings to penetrate it and injure someone on the opposite side.

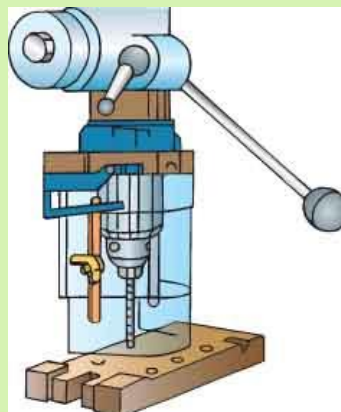


- 5.25.13 A tool without a protective shield or splinter guard shall not be used. Cut-away or adjustable guards shall only be used where the structure being fired into provides a shield against possible flying fixings or splinters at least equivalent to a standard 100mm diameter guard mounted concentrically to the tool muzzle. The standard guard shall be immediately refitted on completion of such special work.
- 5.25.14 The tool shall be kept as nearly as possible at a right angle to the working surface and the whole of the splinter guard shall be flush with that surface.
- 5.25.15 Fixings shall not be fired into concrete or masonry at a distance of less than 65mm from the edge, unless special precautions are taken. Where present, the distance shall be increased by the thickness of a plaster coat.
- 5.25.16 Fixings shall not be fired into existing holes, or at a point where another pin or stud has previously been fired in and subsequently broken off or failed to hold, or where the surrounding material has crumbled away. The new fixing shall be located at least 50mm from that point.
- 5.25.17 Cartridges for immediate use shall be kept in a suitable damp proof box that contains no other objects.

## 5.26 Guarding of Machinery

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- 5.26.1 All dangerous parts of machinery including prime movers, transmission machinery and points of operation shall be properly guarded as per Factories and Industrial Undertakings (Guarding and Operation of Machinery) Regulations.
- 5.26.2 Suitable machine guards appropriate to the types of work to be done shall be selected:
- (a) Fixed guards are suitable where feeding of material and withdrawing of components are achieved mechanically or by means of specially designed aids.



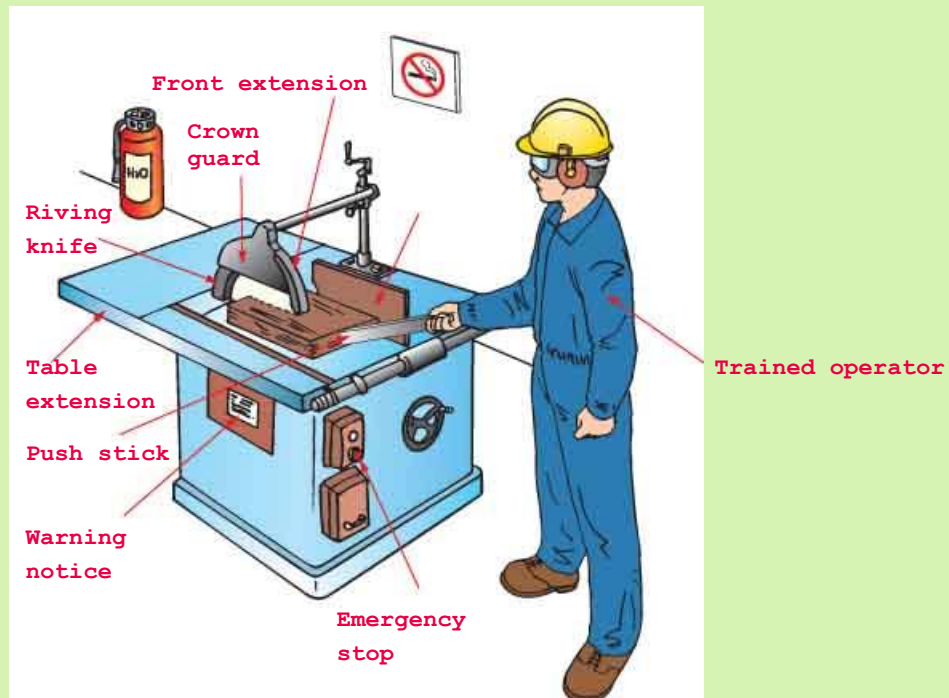
- (b) Interlocking guards are suitable for guarding points of operation where feeding of material and withdrawing of components are required in every cycle of operation and for guarding heavy rotating parts of a machine to which access is required on regular occasions.
  - (c) Automatic guards are suitable for use on a machine of which the cycles of operation are interspaced by manual feeding of materials. It relies on a mechanical linkage which derives its motion from the movement of the point of operation.
  - (d) Trip guards are suitable for use on machines which are normally in continuous motion where the hands (or other parts of a person) have to temporarily enter a space swept by the dangerous part, or where entangling may occur in an article or material which is being fed to a machine.
- 5.26.3 Guards shall be rigid and of substantial construction and made of incombustible materials.
- 5.26.4 Wherever practicable, guards shall be made from solid material in preference to perforated or open mesh construction. Where open mesh guarding is chosen, the apertures shall be such that finger access to the dangerous parts is not possible.
- 5.26.5 All guards shall be securely anchored to the machine.
- 5.26.6 The inside of a solid guard shall be located as close as possible to the moving part. Too much space between a guard and the machinery will increase the possibility of access to the dangerous part.
- 5.26.7 Access shall be provided for the operational controls and for normal lubrication and cleaning without the need for removing the guard.
- 5.26.8 Guards shall be free of sharp edges.
- 5.26.9 Guards shall be regularly and frequently checked by a competent person to ensure that they are in good repair and kept in position. A record shall be kept of the results and any action taken.

## **5.27 Woodworking Machines**

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- 5.27.1 Every woodworking machine shall be provided with a riving knife, an adjustable top guard, an under bench plate, and a readily accessible stopping and starting device.
- 5.27.2 Circular saw blades shall be kept sharp at all times.

- 5.27.3 A push stick shall be used to prevent the hand from coming into contact with the blade of a circular saw, planing machine or vertical spindle moulder.



- 5.27.4 Sawdust or resin shall not be removed until the saw blade has stopped.
- 5.27.5 Removal of small wood chips from nearing moving parts of the machine shall never be attempted.
- 5.27.6 Loose clothing shall not be worn when working near a woodworking machine.
- 5.27.7 No one shall use a woodworking machine until he has been properly trained in its use.
- 5.27.8 The working space around the machine shall be unobstructed and the floor shall be clean and non-slippery.
- 5.27.9 A facemask shall be worn.
- 5.27.10 Noise level shall be reduced as far as possible. If the noise level exceeds 85dB(A), hearing protection shall be provided and used.
- 5.27.11 Suitable and adequate number of fire extinguishers shall be provided beside every woodworking machine.
- 5.27.12 Reference shall be made to other safety requirements stipulated in the Factories and Industrial Undertakings (Woodworking Machinery) Regulations.

## 5.28 Site Vehicles and Loadshifting Machines

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- 5.28.1 Site vehicles in this section generally refer to trucks, lorries, tractors, trailers, tankers, as well as cars and vans, intended for the transport of construction material and personnel, whereas the loadshifting machines specifically refer to those defined in the Factories and Industrial Undertakings (Loadshifting Machinery) Regulation as detailed in Section 5.28.3 below.
- 5.28.2 Drivers of any site vehicle shall hold a valid driving license appropriate to the type of vehicle for which he/she is driving. The contractor should ensure that site vehicles are properly licensed.
- 5.28.3 The Factories and Industrial Undertakings (Loadshifting Machinery) Regulation requires that certain types of loadshifting machines, including fork-lift truck, bulldozer, loader, excavator, compactor, dumper, grader, locomotive and scraper etc. shall only be operated by a person who has attended a relevant training course recognized by the Commissioner for Labour and holds a valid certificate. More details, together with other safety guidelines, can be found in the "Guidance Notes on Safe Use of Loadshifting Machines for Earth Moving Operation on Construction Sites" published by Labour Department.
- 5.28.4 The list of authorized drivers and operators shall preferably be affixed to the site vehicles and loadshifting machines concerned.
- 5.28.5 The manufacturers' operation manuals of the site vehicles and load shifting machines shall be consulted and the limitations on the gradients of slopes and loads on which the vehicles can safely handle must be observed and strictly followed.
- 5.28.6 Drivers and operators should perform check on the condition of the site vehicles and loadshifting machines at the beginning of a working day to ensure that they are in good working condition.
- 5.28.7 Drivers of site vehicles and operators of load shifting machines shall remain in seat and use safety belt, if provided, during driving and operation.
- 5.28.8 Always drive a vehicle and operate a machine at safe speed. Avoid reversing as far as possible, e.g. use drive-through circulation route if provided.
- 5.28.9 Site vehicles shall not be used on roads that are not constructed and maintained for safe travel.
- 5.28.10 No passengers shall be allowed to be carried by vehicles that are intended for transport of construction material only except those with proper seats.



5.28.11 Site vehicles shall be fitted with reversing alarm and warning light and/or reversing video device (RVD) to safeguard reversing wherever possible. Other form of warning signals and/or banksman shall be provided to guide reversing movements if situation warrants, e.g. audible signals will cause nuisance to nearby residents or hospitals particularly at night, or the working environment is too noisy for the signal to be heard.

5.28.12 An inspection and maintenance programme complying with the manufacturers' requirements and instructions shall be established. All inspection and maintenance work shall be carried out by competent mechanics and the inspection and maintenance done on the site vehicles and load shifting machines shall be recorded.

5.28.13 No one shall be allowed to work under any raised bodies of a site vehicle unless they are properly supported by suitable stands.



5.28.14 The rubber tyres of site vehicles shall be regularly checked for tyre pressure and excessive wear and tear and shall be repaired or replaced before they are likely to cause danger.

5.28.15 Cars, vans, trucks and other types of road-going vehicles used on site shall have the roadworthiness certificate issued by the Commissioner for Transport.

5.28.16 Site vehicles shall not be overloaded and shall be properly covered when carrying loose and dusty materials. The loads shall be evenly distributed and secured, and not projecting beyond the sides or back of the vehicle.

5.28.17 Before leaving the site, all road-going vehicles shall be cleaned and the tyres shall be hosed down to avoid contamination of the public roads. Loads of dusty materials shall be covered by impervious sheeting or mechanical cover. Adequate measures shall also be taken to avoid leakage of dust and washout of silt and mud during travel, especially in the rainy days.

5.28.18 At the end of a working day, site vehicles and loadshifting machines shall have the engine switched off, the attachments lowered and securely supported, the ignition key removed, the gear in neutral and the handbrake on. Wheels shall also be chocked if the vehicle is to be parked on sloping ground.

## 5.29 Lifting Appliances and Lifting Gear

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### General

- 5.29.1 Operators of all lifting appliances and signallers shall be: -
- (a) authorized, trained and competent; and
  - (b) at least 18 years of age;
- 5.29.2 All lifting appliances and their supporting structures shall be: -
- (a) of good condition;
  - (b) made of strong and sound materials;
  - (c) properly maintained; and
  - (d) free from patent defect.
- 5.29.3 Erection, dismantling or structural alteration of lifting appliances shall be carried out under the supervision of a competent person.
- 5.29.4 Adequate arrangements shall be made for supporting, fixing, anchoring and stabilizing lifting appliances before they are used in the construction site.
- 5.29.5 An unobstructed passageway of 600mm wide or more shall be maintained between the slewing or other moving parts of lifting appliances and the guardrails, fences or other fixtures. If the passageway cannot be maintained at any particular place, access to such place shall be prevented when the appliance is in use.
- 5.29.6 Every lever, handle, switch or other devices used for controlling the operation of any part of lifting appliances shall be provided with: -
- (a) a suitable spring or other locking arrangement to prevent accidental movement or displacement; and
  - (b) clear markings to indicate their purpose and mode of operation.
- 5.29.7 Lifting appliances shall be clearly and legibly marked with the safe working load (SWL). No lifting appliances shall be used in excess of their specified safe working load.
- 5.29.8 All lifting operations shall be guided by one and only one qualified signaller.
- 5.29.9 Lifting shall not commence until all personnel are clear of the load.

- 5.29.10 A load shall be lifted a few centimeters first to check for balance before completing the full lift.
- 5.29.11 Lifting appliances shall not be left unattended while a load is suspended.
- 5.29.12 Lifting appliance shall be fitted with an efficient brake or other similar safety devices to prevent a suspended load from falling out of control.
- 5.29.13 Loads being lifted or lowered by lifting appliances shall be: -
- (a) of known weights and that weights should be clearly marked wherever possible;
  - (b) securely suspended or supported; and
  - (c) adequately secured to prevent danger from arising to persons or property because of the slipping, displacement or accidental falling of any part of the load.
- 5.29.14 Receptacles used for raising or lowering stones, bricks, tiles, slates or other objects by lifting appliances shall be enclosed, or so designed and constructed as to prevent any accidental falling out of any such objects.
- 5.29.15 A suitable weather-proof cabin shall be provided. The cabin shall be so constructed as to give the operator a clear and an unobstructed view.

## **Cranes**

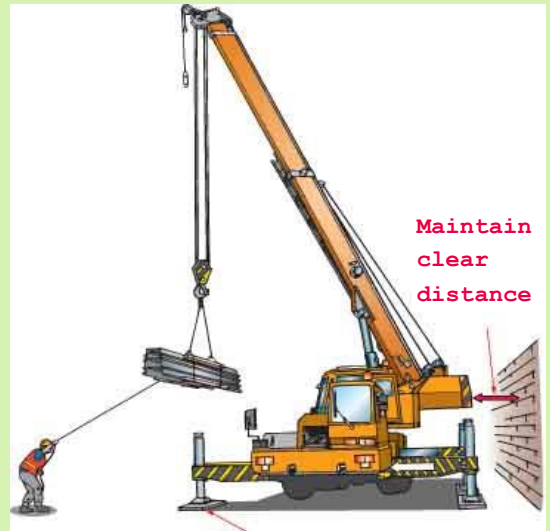
- 5.29.16 The platform provided in a crane for the use of the operator or for the signaller shall be: -
- (a) of sufficient area;
  - (b) either closely planked or plated; and
  - (c) provided with a safe means of access.
- 5.29.17 A guard rail of adequate strength with top rail at a height between 900mm and 1150mm, intermediate rail at a height between 450mm and 600mm and toe board at a height not less than 200mm, shall be affixed to the platform of a crane from which a person may fall a distance of more than 2m and any raised standing place of a crane.
- 5.29.18 Toe boards of not less than 200mm in height shall be provided at above the level of the platform of crane and any raised standing place and in a position that will prevent the fall of persons, materials and tools from the platform.

- 5.29.19 The rails or the sleepers supporting the rails on which a crane is mounted shall not be used as an anchorage for them.
- 5.29.20 A suitable diagram or notice shall be affixed to cranes indicating the position and amount of counterweight to be used to secure their stability.
- 5.29.21 Cranes shall not be used under adverse weather conditions likely to endanger their stability.
- 5.29.22 A crane's hoisting mechanism shall not be used for any purpose other than raising or lowering and the load shall be kept directly and vertically under the jib head at all times before lifting.
- 5.29.23 Cranes shall have no structural member made of timber.
- 5.29.24 Cranes shall have clear and legible marks indicating: -
- (a) the safe working load (SWL) at various radii of jibs, trolleys or crabs; and
  - (b) the maximum radius at which the derricking jib may work.
- 5.29.25 Cranes, except those of safe working load less than 1 tonne, shall be fitted with an automatic safe load indicator (ASLI), which shall be inspected, tested and examined by a competent examiner on a regular basis.
- 5.29.26 Cranes having derricking jibs operated through a clutch mechanism shall be provided with a properly maintained and effective locking arrangement, placed between derricking clutch and the pawl sustaining the derricking rope drum, which will ensure that: -
- (a) the clutch cannot be disengaged unless the pawl is effectively engaged with the derricking rope drum; and
  - (b) the pawl cannot be disengaged unless the clutch is effectively engaged with the derricking rope drum.

#### **Mobile Cranes**

- 5.29.27 The "Code of Practice of Safe Use of Mobile Cranes" published by Labour Department provides practical guidance on the safe and proper use mobile cranes with a view to preventing accidents.
- 5.29.28 All controls shall be in the neutral position before starting the engine. Before commencing lifting operation, mobile cranes shall be: -

- (a) standing on firm ground that will take the weight of the crane and the load to be lifted;
- (b) level, have all operational outriggers in position, fully extended and pinned; and
- (c) clear of the edge of slopes or trenches.



**Outriggers fully extended and footed on firm and level support**

- 5.29.29 All mobile cranes shall be fitted with a radius indicator and automatic safe load indicator (ASLI).
- 5.29.30 All crane movements shall be made slow enough to prevent the load from swinging. Cranes shall not move unless instructed by the crane attendant or slinger.
- 5.29.31 Attention shall be paid to the presence of any overhead obstructions, particularly overhead power lines, and in urban area, signboards and neon lights.
- 5.29.32 A daily maintenance programme shall be carried out and any defects identified shall be reported immediately.
- 5.29.33 Properly fence off all lifting zones (e.g. fencing or barricade) with suitable warning notices displayed; or where is not reasonably practicable to fence off the lifting zones due to space constraint, etc., the taking of effective measures, such as appointment of watch-out persons, to ensure no unauthorized entry into the zones.

**Winding Drums, Pulley Blocks, Gin Wheels and Sheer Legs**

- 5.29.33 Pulley blocks, gin wheels or sheer legs shall not be used for lifting loads more than 1 tonne unless they have been previously tested and thoroughly examined by a competent person.
- 5.29.34 Winding drums or pulley blocks of lifting appliances shall be of sufficient diameter and construction for the rope used.
- 5.29.35 Rope that terminates at the winding drum shall be secured to the drum properly with at least two turns of the rope remaining on the drum at any time.

- 5.29.36 Pulley blocks or gin wheels shall be secured effectively to the pole or beam that supports them.
- 5.29.37 The pole or beam shall be secured adequately to support the pulley blocks or gin wheels and the load safely and to prevent undue movement of the pole or beam.

**Lifting Gear**

- 5.29.38 All slings shall be marked with the safe working load (SWL) in English and Chinese, and properly colour coded as below.

Colour code	Status
Blue	Jan/Feb/Mar
Yellow	Apr/May/Jun
Green	Jul/Aug/Sep
Orange	Oct/Nov/Dec
Red	To be removed from Site
White	Under quarantine in Central Yard

- 5.29.39 Correct and up-to-date copies of the Sling Chart and Safe Working Load Tables shall be available.
- 5.29.40 Upper ends of the sling legs of double or multiple slings used in raising or lowering or for suspension shall be connected by means of a shackle, ring or link of adequate size and strength.
- 5.29.41 A suitable rack shall be available for storing slings when they are not in use. Wire ropes shall be stored in a dry atmosphere.
- 5.29.42 Slings shall not be used if they are unidentified, damaged or there are broken strands.
- 5.29.43 Sharp corners of the load shall be padded to prevent damage to the sling and the load itself.
- 5.29.44 Suitable guide ropes shall be used to prevent spinning or swinging of the load being lifted.
- 5.29.45 Slings shall be so placed that the tension is equalled throughout the sling immediately on lifting.
- 5.29.46 Scrapped slings shall be severed, sprayed red and removed from site as soon as possible.



## Inspection and Testing

5.29.47 The Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations require lifting appliances and lifting gear to undergo inspections, thorough examinations and tests at specified frequency by competent person and competent examiner for ensuring the safety and reliability. Details can be seen in "Guidance Notes on Inspection, Thorough Examination and Testing of Lifting Appliances and Lifting Gear" published by Labour Department.

## 5.30 Excavators

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5.30.1 Excavators are widely employed on DSD's works sites for excavating, moving and handling of earthwork but very often they are expediently used for lifting of drainage pipes and fittings, manhole covers, concrete skip, bedding materials, timber, steel sections and sheet-piles, etc. especially in congested pipe laying sites.

5.30.2 Always secure proper lifting plant for the lifting job. Use an excavator for lifting loads only when the use of a proper lifting plant is impractical and the loads to be lifted are light.



Excavator used for lifting

5.30.3 Select a suitable excavator for lifting operation, e.g. sufficient capacity, maximum working radius, headroom requirement, designated lifting point available from the manufacturer on its bucket, arm or boom for attaching lifting gear, safety features like falling object protective structure (FOPS) or roll-over protective structure (ROPS), etc. as required by the specific site condition.

5.30.4 An excavator should only be operated by a suitable operator who:

- (a) has attained the age of 18 years;
- (b) is trained and competent to operate an excavator and holds a valid certificate as per Factories and Industrial Undertakings (Loadshifting Machinery) Regulation;
- (c) is authorized by the contractor; and

(d) has the ability to understand and follow instructions and information contained in the manufacturer's manuals concerning safe operation of the machine.

5.30.5 An excavator is a lifting appliance under the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations and has to be tested, thoroughly examined and certified safe by a competent examiner (reg.5) and periodically inspected by a competent person (reg.7A) when being used.

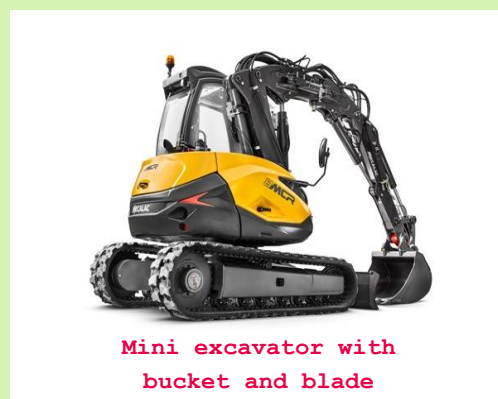
5.30.6 Operate the excavator on firm and level ground as far as possible. Never place an excavator on strutting or bracing of an excavation unless they are designed to carry such load. Measures such as levelling or compaction of ground, provision of load-bearing supports should be taken to prevent instability and overturning when excavators are used on slopes.

5.30.7 Fence off and keep clear from the area within the operating radius of the excavator. Employ a banksman to watch out for any danger especially when the sight of the excavator operator is blocked, e.g. when the bucket is lowered to below ground level.

5.30.8 When operating on a slope, place the crawlers in the direction of the slope instead of across to avoid tipping. Maintain a safe distance from the edge of slope.

5.30.9 When travelling on a slope, drive at a safe speed straight up and down along a slope instead of across as far as possible and place the load being lifted, if any, on the uphill side to avoid toppling.

5.30.10 Never use an excavator for sheet-pile extraction. Overloading may occur when extracting sheet-piles driven to considerable depth and snapping of the lifting wire or the shackle can be disastrous if happens in congested urban area.



**Mini excavator with bucket and blade**

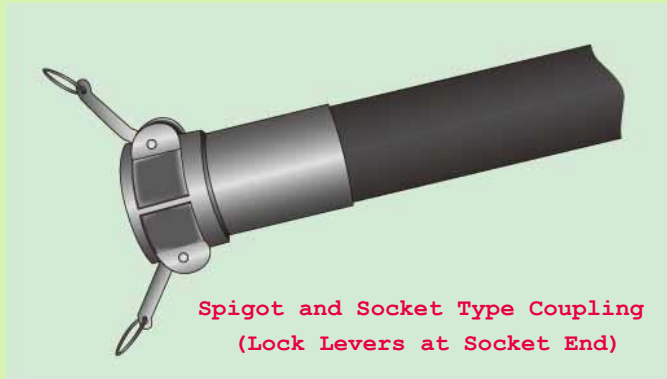
5.30.11 Never use the bucket as a working platform or passenger carrier, or a prop for moving the excavator across trenches and obstacles, or jack up the excavator with its boom as a way to rescue the machine from instability.

5.30.12 Reference shall also be made to the Code of Practice on Safe Use of Excavators published by Labour Department.

## 5.31 Hoses and Connections

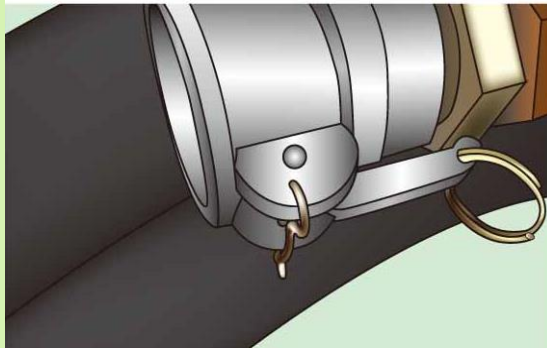
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- 5.31.1 There are various types of hose connectors for different applications on construction sites, e.g. compressed air, high pressure water jet, chemicals and grouts for ground treatment or other uses, heated water, etc.

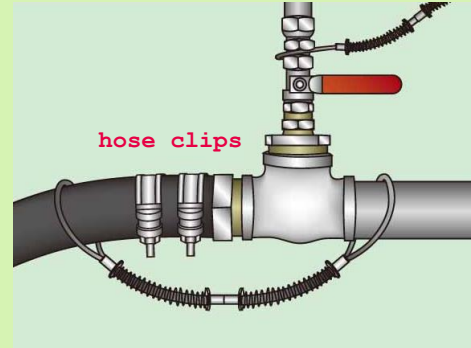


- 5.31.2 Always use the right hoses and fittings for the job, e.g. length, size, pressure rating etc. Conduct pre-work pressure test by using water to verify whether the hose is able to work under the maximum allowable working pressure.
- 5.31.3 The hoses shall be kept clean and free from corrosive materials or heat sources.
- 5.31.4 Check the condition of the hoses regularly for any signs of ageing, leakage, kinks, skinning and blistering. Defective hoses shall be replaced immediately.
- 5.31.5 The length of hoses should be kept as short as possible. They should be properly routed to avoid causing tripping hazards.
- 5.31.6 The hoses shall be properly supported and protected against mechanical damage. They should not be laid over sharp edges, e.g. top of steel sheetpiled wall or across traffic routes without proper protection.
- 5.31.7 Maintain smooth curvature. Avoid folds and excessive bending and tension.
- 5.31.8 All connections must be properly clamped. Loose connections can blow off causing the hose to whip back, which may cause injury.
- 5.31.9 Ensure that safety device, which restrains accidental release of the locking mechanism of a connector, is engaged, e.g. insert safety pins to stop accidental release of the lock levers as in the case of spigot and socket type couplings.

- 5.31.10 Add safety devices, which restrain connectors in the event of blow-off, e.g. use of whip-check, which is a short safety chain or wire sometimes comes with a spring, for compressed air hoses with push-on type couplings especially. Ensure that the nooses are of suitable size that passage of the coupling is impossible.



**Safety pin to keep lock lever in position**



**Whip-check to restrain movement of hose when detached**

- 5.31.11 Do not over-tighten the connections as this can result in the hose being cut, causing leakage and loss of pressure.
- 5.31.12 Use suitable personal protective equipment for the work and the hazardous materials that may come into contact with the skin and eyes, e.g. plastic gloves, safety goggles etc.
- 5.31.13 Provide adequate instruction and briefing to all workers and ensure they understand all hazards of the works involved as well as potential hazards in the vicinity that they are working.
- 5.31.14 Checking of any hoses and connections shall be included in the course of regular site safety inspections.

# Temporary Works and Working Platforms

## 5.32 Temporary Works

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### General

5.32.1 The temporary works, which are necessary for the erection of the permanent works, commonly employed in DSD's construction work are:-

- (a) "scaffolding" used for access to workplaces and working platform,
- (b) "formwork" used for casting concrete,
- (c) "falsework" used as supports for formwork,
- (d) "steel sheetpiled cofferdam" used to protect deep excavations, and
- (e) "shoring system" used to protect the cut face of pipe trenches, or any unstable face of a structure.

Other temporary structures on site, for which the safety precaution principles of temporary works shall also be applicable, include:-

- (a) "hoarding and signboards",
- (b) "site offices", and
- (c) "sheds" used for storage and shelter, etc.

5.32.2 Temporary works are more susceptible to risk than permanent works because:

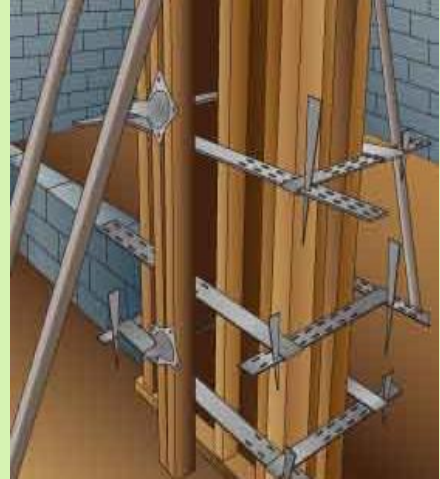
- (a) Their temporary nature has psychologically induced a tendency to neglect or overlook deficiencies and hazards as they are often considered to be too simple and do not need much attention.
- (b) They have no direct benefit to both the contractor and the user after the permanent works are erected.
- (c) They are dismantled and reused many times and in the process they tend to get damaged at critical locations such as joints and supports.
- (d) Their cost is usually absorbed in the rates of the permanent works concerned or preambles of the contract so that some contractors are less willing to pay the safety cost.

## Checking of Temporary Works

5.32.3 Be sure that the temporary works, whether they are in part or whole, are safe and stable at any stage, and at any time, during their erection and dismantling.

5.32.4 Particular attention should be paid to the following during inspection and checking of temporary works:-

- (a) The temporary works or structures are erected and altered in strict accordance with the certified design;
- (b) They are only erected, maintained and dismantled by competent workers, i.e. trained formworkers, scaffolders, falsework erectors etc.;
- (c) They are regularly inspected and thoroughly examined by competent persons according to the relevant regulations, codes of practice, etc.;
- (d) Ensure that no loads (e.g. plants and materials) are placed on struts, walings and bracings, etc., nor they are used as anchorage or support expediently, unless they have been designed for such purposes;
- (e) The materials (e.g. frames, tubes, fittings, joints, supports, planks, etc.) are sound and free from defects, deformations, damage and excessive wear and tear, especially the joints and supports;
- (f) Check all screw jack supports to ensure that they are securely tightened and wedged and are effectively supporting the formwork above;
- (g) Check if all standards are plumbed;
- (h) Check all load bearing members, especially the standards, to ensure that they are neither redundant nor overloaded but are effectively and actually carrying the loads intended;
- (i) Check the base of standards to see if they are securely rested and wedged on firm and level supports;
- (j) Check if all secondary members (e.g. ties, bracings, lashings etc.) are correctly and securely installed in place to prevent lateral movements;



**Timber formwork and falsework for a concrete column**



- (k) Check if the joints are securely connected, (e.g. screws, bolts and nuts are properly tightened, load-bearing couples are in-line, pins are securely fixed in place, lap lengths of members are sufficient, cramps and grips are firmly tightened, screw jacks are not excessively extended, hooks are securely anchored etc.);
- (l) Check ground support and watch out for softened ground after rain, which may result in differential settlement and ultimately affect the overall stability of the temporary structure, and use robust base plates to spread the vertical load as necessary;
- (m) Check and ensure that the temporary structure is not used to carry loads except those that have been designed for (e.g. never place a backhoe on struts of a shoring system);
- (n) Check if the temporary structure is securely tied, anchored and restrained, especially at its top, to prevent sway and horizontal movements;
- (o) Check if the temporary structure is properly protected against accidental collision by site vehicles and plants or other external forces and put up sufficient warning signs and barricades;
- (p) Check if all fixtures and services (e.g. ladders, stairs, access walkway, working platforms, handrails, toe boards, fencing, safety nets, electricity power cables, lightings, chutes etc.) are securely and safely mounted onto the temporary structures;
- (q) Watch out for missing parts (e.g. handrails, bracing, props and ties, etc.) which have been removed expediently for passage of plant and materials but were not put back in place;
- (r) Walking on struts, walings and bracings shall be prohibited. Proper ladders and gangways should be used.
- (s) Use temporary structures properly and treat them with due respect.

5.32.5 In summary, the checks aim to ensure that the designed loads can be safely and evenly transferred from the formwork, through the supports, members and joints of the falsework system, down to the ground without undue deformation, deflections or movements throughout the process of construction.

- 5.32.6 Apart from performing compliance checks in accordance with the regulations and contractual requirements, close supervision is essential to ensure that the temporary structures are erected to the certified design so as to make them function as intended. Special attention shall be paid to the control of material and workmanship during inspection.
- 5.32.7 The Guidance Notes, "Safety at Work, Falsework - Prevention of Collapse", published by Labour Department also highlights the good practice for prevention of collapse.

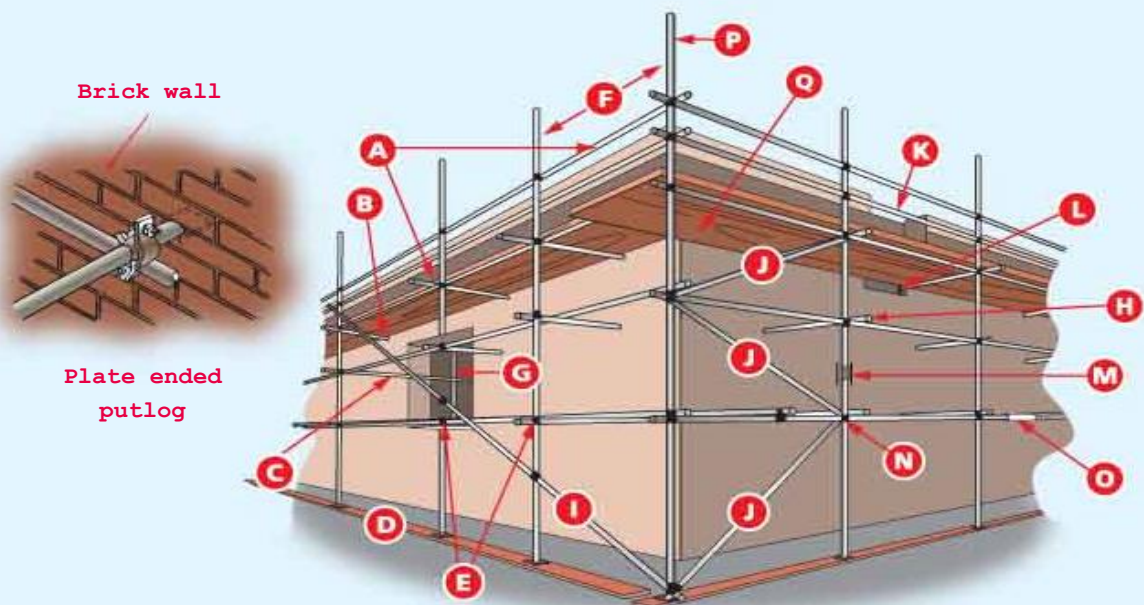
### **5.33 Working Platforms and Scaffolds**

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#### **General**

- 5.33.1 Working platforms and scaffolds shall be erected on firm and level bases and ground adequate to withstand the loads of the scaffold and working platforms. Pavement lights, manhole covers and nearby excavation shall be avoided.
- 5.33.2 Every scaffold and every part of it shall be:
- (a) of good conditions;
  - (b) made of strong and sound materials; and
  - (c) free from patent defects.
- 5.33.3 The following components of a scaffold shall be checked to ensure that they are in order before use: -
- (a) line of standards and ledgers;
  - (b) spacing of transoms;
  - (c) even support and line of boards;
  - (d) guardrails and toe boards;
  - (e) longitudinal and ledger bracing;
  - (f) security and correct use of fittings (e.g. couplers);
  - (g) number, positions and security of ties;
  - (h) security of stacked materials; and
  - (i) safe means of access and egress.

- 5.33.4 Every scaffold shall be inspected by a competent person: -
- (a) before it is used for the first time;
  - (b) after any substantial addition, partial dismantling or other alteration;
  - (c) after exposure to weather conditions likely to have affected its strength or stability; and
  - (d) within the immediate 14 days before use.
- 5.33.5 All scaffolds and every part of them shall be erected, altered, maintained and dismantled by competent workers under the immediate supervision of a competent person.
- 5.33.6 Suitable personal protective equipment such as safety helmets, safety belts and harnesses with lifelines or lanyards properly anchored to secured points, or safety nets shall be provided.



**Typical Scaffolding with Working Platform**

- |  |  |
|--|--|
| A - Guardrails and toe boards fixed to the standards                   | I - Diagonal or facade bracing   |
| B - Flat ended putlog (grouted into wall as shown in enlarged details) | J - Diagonal bracing in zig zag pattern  |
| C - Putlog through opening   | K - Opening in wall  |
| D - 38 X 225mm timber sole plate when standing on soil                 | L - Bridle (for bridging over opening)   |
| E - Ledger fixed with right angle couplers                             | M - Joint pin  |
| F - Bay length   | N - Swivel coupler   |
| G - Through tie (thro. opening)  | O - Ledger (with joint pin or sleeve coupler)  |
| H - Putlog with right angle couplers                                   | P - Standards (Posts)  |
|  | Q - Closely boarded working platform 400mm wide min. or 650mm min. for material transportation |

## **Working Platforms**

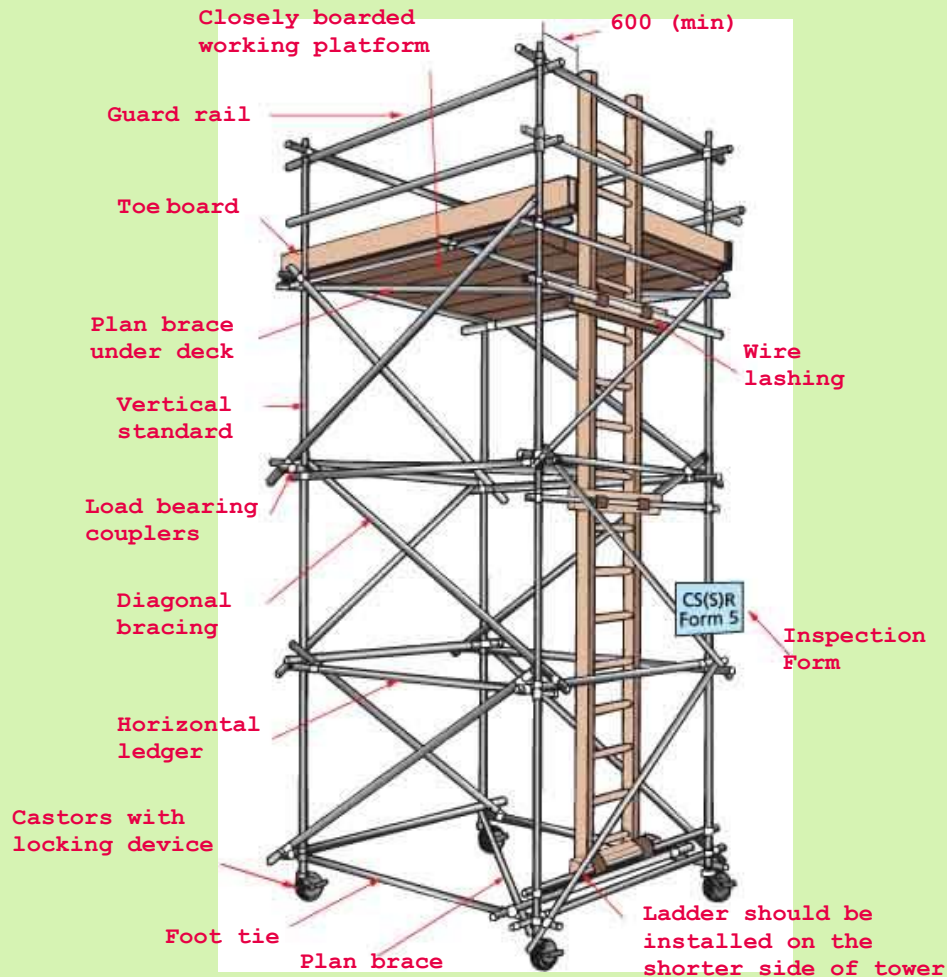
- 5.33.7 Every working platform from which a person is liable to fall a distance of more than 2m shall either be closely boarded, planked or plated, or shall be a platform consisting of open metal work having interstices none of which exceeds 4,000 sq.mm in area. The width of the working platform shall be at least 400mm wide.
- 5.33.8 Every board or plank forming part of a working platform shall be not less than 200mm in width and not less than 25mm in thickness or not less than 150mm in width when the board or plank exceeds 50mm thickness.
- 5.33.9 Every board or plank which forms part of a working platform shall not project beyond its end support to a distance exceeding 150mm unless it is sufficiently secured to prevent tipping.
- 5.33.10 Every side of a working platform from which a person is liable to fall a distance of more than 2m shall be provided with suitable guardrails of adequate strength with top rails at a height between 900mm and 1150mm, intermediate rails at a height between 450mm and 600mm and toe boards at a height not less than 200mm.
- 5.33.11 Every working platform shall be provided with a safe access and egress.

## **5.34 Mobile Scaffolds and Bamboo Scaffolds**

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### **Mobile Scaffolds**

- 5.34.1 Every wheel of a mobile tower scaffold shall be fitted with a locking device that cannot be accidentally released. All wheels shall be securely locked before the scaffold is used.
- 5.34.2 The wheels shall be securely fixed to the uprights so that they cannot fall out even they are not in contact with the ground.
- 5.34.3 The scaffold shall not be moved when people or materials are on the working platform.
- 5.34.4 The scaffold shall only be moved at the base.
- 5.34.5 The ratio of height to the least base dimension shall not exceed 3:1 for outdoor work, or 3.5:1 for indoor work, unless tied to suitable fixed points.
- 5.34.6 Minimum width of the scaffold at base shall be 1.2m.



- 5.34.7 The working area around the scaffold shall be fenced off and suitable warning notices to warn people and nearby traffic shall be displayed.

#### **Bamboo Scaffolds**

- 5.34.8 The effective diameter of bamboo used as standards shall not be less than 75mm and the wall thickness of these bamboo members shall not be less than 10mm.
- 5.34.9 The effective diameter of bamboo used as ledgers on the first lift of the scaffold shall not be less than 75mm and the wall thickness of these bamboo members shall not be less than 10mm.
- 5.34.10 For the rest of the ledgers, and all transoms and putlogs, bracing and rakers of the same scaffold, the effective diameter of bamboo used shall not be less than 40mm.
- 5.34.11 Bamboo used in the construction of scaffolds shall be straight, sound and free from cracks, gnarls, irregular knots, dry rots, worm-eaten spots and other defects affecting the strength of the bamboo greatly.
- 5.34.12 Suitable working platforms must be provided. It shall be noted that double row bamboo scaffold is one of the common ways to accommodate a safe working platform.

- 5.34.13 Scaffolds greater than 15m in height shall be designed by a professional engineer.
- 5.34.14 Distance between two adjacent standards shall not be greater than 1.3m. Distance between two adjacent transoms shall not be greater than 0.75m. Distance between two ledgers shall not be greater than 1.2m. Height of the boarded lift for forming working platform shall be between 1.9m to 2m.
- 5.34.15 Working platform on the double row bamboo scaffold shall be at least 400mm wide.
- 5.34.16 Scaffolds shall be provided with adequate cross bracings. The horizontal span of each 'X' shaped bracing shall not be greater than 9m. The members of the 'X' bracing shall not be erected at more than 60 deg. from the horizontal, and preferably be at 45 deg. from horizontal level.
- 5.34.17 For bamboo scaffolds higher than 7m, there shall be ties to fasten the scaffold securely to the building facade. The horizontal spacing and vertical spacing between ties shall be less than 7m and 4m respectively. Besides, at every tie, a short length of bamboo of effective diameter not less than 40mm shall be connected between the inner scaffold and the building facade to restrict any inward movement of the scaffold.
- 5.34.18 Overlapping of two bamboo members shall be 1.5m to 2m for standards, and at least 2m for ledgers and bracing.
- 5.34.19 Materials and tools shall be placed at the inner side of working platform on the scaffold to maintain the stability of the scaffold.
- 5.34.20 When dismantling the scaffold, work shall start from upper level to lower level, from exterior to interior and from non load-bearing parts to load bearing parts.
- 5.34.21 Reference shall also be made to the "Code of Practice for Bamboo Scaffolding Safety" published by Labour Department and the latest "Guidelines on Planking Arrangement for Providing Working Platforms on Bamboo Scaffolds" issued by the Construction Industry Council.

## 5.35 Ladders

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- 5.35.1 It should be borne in mind that ladders are to be used for access only and shall not be used as working platforms. Only under safe circumstances, should simple and light work be performed on a ladder, e.g. replacing a defective light bulb.



- 5.35.2 Before using a ladder as an access, always consider other safer means like mobile working platform, etc. in the first place.
- 5.35.3 When the use of ladders is considered acceptable in the workplace concerned, select step ladders with wide stepping rungs and bracing as far as possible, or platform ladder and hop up platform, which are preferable to vertical ladders.
- 5.35.4 Vertical ladders, including extendable ladder, are designed for climbing only.
- 5.35.5 Only properly constructed ladders shall be used. The use of home-made ladders improvised from wasted timber nailed together shall be strictly prohibited.
- 5.35.6 Do not stand and work on a ladder under the following circumstances:-
- (a) Standing on a ladder at a height of 2m or more.
  - (b) Standing on a ladder, even at a height of less than 2m, when:-
    - (i) the ladder is so close to the top of a parapet wall or guardrail of a building etc. that it is possible for the worker to fall over from it,
    - (ii) the ground condition and surroundings is likely to cause serious injury to a worker if fall from the ladder,
    - (iii) work of complicated nature and long duration has to be carried out, and
    - (iv) holding or moving heavy objects on the ladder is required.
- 5.35.7 Inspect thoroughly the ladder to ensure it is suitable for the job and without defects. Look for twisted, bent or dented stiles; cracked, worn, bent or loose rungs; missing or damaged tie rods; cracked or damaged welded joints, loose rivets or damaged stays.
- 5.35.8 Fasten the ladder to a secure anchorage point at the top end and/or hold it manually by another worker at the base to secure its stability.
- 5.35.9 Set vertical ladders (for ascending or descending purpose) at an angle of approximately 75 degrees to the horizontal.
- 5.35.10 Provide ladders with sufficient length so that the upper ends are about 1m above the upper landing places.
- 5.35.11 Carry out regular inspections and record the results of the inspections.

- 5.35.12 Repair damaged ladders and remove immediately those wooden ladders with cracks and defective ladders that are beyond repair in order to prevent other people from using them by mistake.
- 5.35.13 To facilitate inspections, do not cover the surface of wooden ladders with paint or wrappings.
- 5.35.14 Keep properly a list of types of ladders on site and records of inspection and maintenance.
- 5.35.15 Train workers in the proper selection and safe use of ladders.
- 5.35.16 Refrain from using ladders for work above ground unless all other means of access like working platforms are found not feasible and a permit-to-work for use of ladder has been issued with a thorough risk assessment conducted and all necessary safety measures related to use of ladder taken.

## Miscellaneous

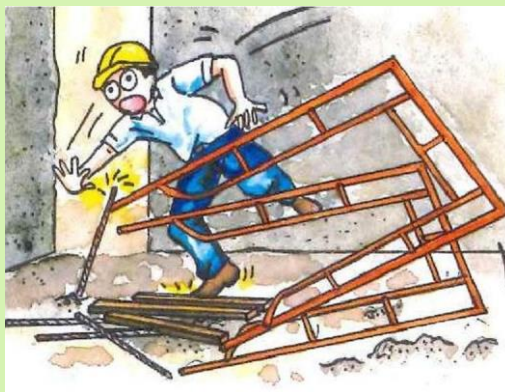
### 5.36 Safe Use of Mobile Phones on Construction Sites

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- 5.36.1 The use of mobile phones does not itself constitute a safety hazard but if used in improper time (e.g. driving or operating a machine, etc.) and/or at improper place (e.g. roads, construction sites especially), it does cause distraction and possibly lead to accidents.



- 5.36.2 Although this Section deals with the use of mobile phones on construction sites, it should be noted that from 1 July 2000, drivers of all motor vehicles are prohibited from holding a hand-held mobile phone or other hand-held "telecommunication equipment" such as radio phones, by hand or in between his head and shoulder, or holding its accessories including the microphone while the vehicle is in motion.



5.36.3 Do not use a mobile phone, whether making or receiving calls, sending or reading multimedia messages or else, when:-

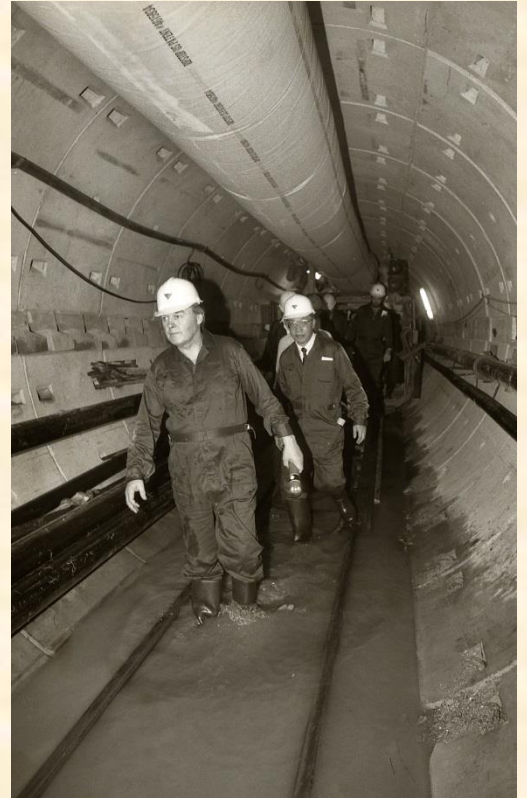
- (a) driving a vehicle or construction plant (e.g. a crawler crane, bull dozer, etc.), whether on public roads or on a construction site;
- (b) operating a machine (e.g. a crane, a boring rig, etc.) or equipment (e.g. a bench saw, gas welding equipment, etc.);
- (c) carrying out other work, especially those at height like erection and dismantling of scaffolding, and
- (d) walking on a construction site, especially at places of high risks (e.g. lifting zone, edges of excavations, etc.) where extra vigilance shall always be maintained.

5.36.4 Before using a mobile phone, ensure that: -

- (a) the operation or work in hand is temporarily suspended;
- (b) the location is confirmed safe, i.e. away from danger due to falling objects, movement of plants or objects, thunder strikes, etc., and
- (c) if mobile phone is used when walking on a construction site, the access is confirmed safe (i.e. free from hazards due to moving vehicles, plants or objects, trip and fall hazards due to obstruction or uneven surface, etc.).

5.36.5 Apart from above, always stay vigilant and pay attention to any audio-visual warning signals and any unsafe situation that may be suddenly arise when using a mobile.

6



**Safety of Maintenance Work of Drains and Sewers, Box-culverts, Watercourses, Channels, Nullahs and Outfalls**





# CHAPTER 6

## Safety of Maintenance Work of Drains and Sewers, Box-culverts, Watercourses, Channels, Nullahs and Outfalls

### 6.1 General

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6.1.1 The hazards normally encountered in maintenance of sewerage and drainage systems can be generally divided into the following three categories: -

- (a) **Physical Hazards:** those associated with working with electricity, working in adverse weather, working on highways, working over or near water, working in confined spaces (e.g. inside drains, manholes, box culverts, tunnels, etc.) and manual handling etc.
- (b) **Biological Hazards:** contraction of intestinal pathogens such as cholera, hepatitis, etc. through ingestion; bacterial or viral infections through direct skin or body contact such as tetanus, dermatitis, etc.; inhalation of living or dead organisms.
- (c) **Chemical Hazards:** inhalation of pulmonary agents such as carbon dioxide, carbon monoxide, methane, hydrogen sulfide; skin contact or ingestion of heavy metals, organics, caustic and corrosives substances in the sewage, which may be discharged from industrial undertakings.

Other hazards that might be induced by the plants and materials brought into the drains and sewers or the operation itself (e.g. welding, diving, etc.) shall also be taken into account before work commences.

6.1.2 In general, maintenance works to be carried out in drains and sewers, box culverts, watercourses, channels, nullahs and outfalls which involve man-entry are classified as high risk activities. A specific method statement, which covers the hazards identified and the control measures, shall be prepared and approved by the officer-in-charge before work commences. A method statement shall typically include information on: -

- (a) What the hazards and their controls are.
- (b) The person-in-charge of the operation and supporting personnel.
- (c) Safe means of access to all work areas.
- (d) Specific details of any equipment that is required such as lifting gear, protective clothing and breathing apparatus.
- (e) Details of storage of materials and methods of dealing with hazardous substances.

- (f) How the work is to be carried out, including items such as isolation of the workplace, flow diversion, hygiene arrangements, programme and liaison with other operational and maintenance staff.
- (g) Communication arrangement.
- (h) Emergency procedures including inter alia, specific means and procedures for evacuation and withdrawal of the injured in the event of emergency.

6.1.3 For the control of physical hazards, reference shall be made to the other sections of this Manual shown in the table below.

Physical Hazards	Relevant Sections in this Manual
Work in adverse weather	Section 5.7
Work on highways	Section 5.11
Work over or near water	Section 5.12
Work in confined spaces	Section 5.13
Electricity	Section 5.17
Manual handling and lifting	Section 5.20

6.1.4 Regarding the prevention and protection against biological and chemical hazards, all maintenance personnel shall: -

- (a) Minimize the need to enter sewers, streamcourses, box-culverts and nullahs, e.g. by using CCTV cameras, robots, etc. as far as reasonably practicable.
- (b) Use appropriate personal protective equipment to prevent skin or body contact with and inhalation of biological and chemical agents including:
  - (i) safety helmets;
  - (ii) eye protectors;
  - (iii) protective overalls;
  - (iv) hand gloves;
  - (v) safety shoes or wellingtons; and
  - (vi) respirators.
- (c) Maintain the personal protective equipment in a clean and dry condition.



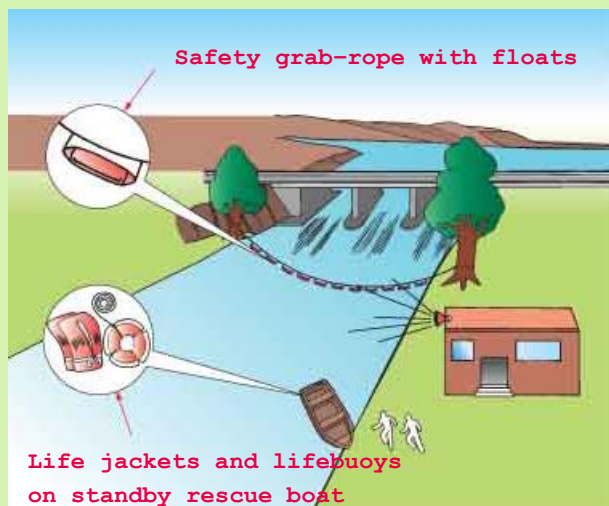
- (d) Observe the following rules on personal hygiene: -
  - (i) No smoking, eating and drinking while working.
  - (ii) Wash the body and hands thoroughly with clean water and soap after work.
  - (iii) Dry the body and hands with clean towels.
  - (iv) Store clean clothes and contaminated clothes separately.
- (e) Wash all hand tools and equipment and put them in plastic bag after work.
- (f) Any cut or abrasion made during the course of work shall be treated immediately as follow: -
  - (i) Clean the wounds immediately with soap and water.
  - (ii) Cover the wounds with a bandage (without medication).
  - (iii) Seek medical treatment from a doctor if necessary. Tell the doctor your occupation and if you have been in contact with sewage and foul materials.
- (g) Ensure that adequate and sufficient first aid facilities are readily available. The person-in-charge shall check and replenish the facilities regularly.
- (h) Provide the workers with suitable training and if necessary continuous health examination and monitoring.

## **6.2 Watercourses, Channels and Nullahs**

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- 6.2.1 Always check weather condition before work. Avoid working in watercourses, channels and nullahs in adverse weather.
- 6.2.2 Only known swimmers shall be chosen for the work whenever possible.
- 6.2.3 All workers working in watercourses, channels and nullahs shall wear suitable personal flotation device.
- 6.2.4 A team of at least two workers shall be assigned to work at the same time. One of them shall act as a standby person stationed above the watercourse, channel or nullah who shall monitor the weather and water flow situation and look after the safety of the worker(s) working in the watercourse, channel or nullah.

- 6.2.5 Look out for any possible dangers, e.g. sudden rise in water level, inflow of hazardous materials (e.g. chemicals or hot liquid) or contamination in the watercourses, channels and nullahs.
- 6.2.6 Always wear a safety harness attached with a lifeline anchored at a secure point when there is risk of fall into the water or being washed away.
- 6.2.7 The authority of any upstream/downstream flow regulating facilities (e.g. inflatable fabric dams, spillways, sluice gates etc.) shall be informed of the nature and extent of the works and period of isolation before the work commences. It is also necessary to ensure that all valves, gates and controls of these facilities are closed/opened by a suitable lock-out system and maintained untampered with throughout the course of the work.
- 6.2.8 Sufficient rescue equipment including rescue boats and lifebuoys attached with secure lines shall be provided at proper locations.



- 6.2.9 Sufficient lighting shall be provided for work at night or work in concealed areas.
- 6.2.10 Suitable audio and visual alarms shall be provided at strategic positions of the site.
- 6.2.11 Safe and secure access shall be provided at proper locations. An additional emergency means of access shall be provided when there is a risk of sudden rise of water in the watercourse, channels and nullahs.
- 6.2.12 Suitable temporary arresting device (e.g. safety grille, safety chain or grab-rope, etc.) shall be provided downstream of the site to stop workers from being washed away.
- 6.2.13 Suitable personal protective equipment such as protective clothing, respirators, safety goggles, etc. shall be worn by workers where appropriate.

## 6.3 Outfalls

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- 6.3.1 It should be borne in mind that apparently calm surface water may hide strong under-currents, and sudden flow of water may be caused by the opening of gates, valves, change of tide and starting of ships' engines.
- 6.3.2 A competent diving supervisor shall be appointed to supervise the diving work. The duties of the diving supervisor shall be those stated in the Code of Practice: "Safety and Health at Work for Industrial Diving" published by the Labour Department.
- 6.3.3 Always provide a standby diver on watch of any diving operation no matter how brief it is.
- 6.3.4 Provide a man-lifting device to which the lifeline of the working diver shall be anchored to for retrieving the diver in the event of emergency.
- 6.3.5 A permit-to-work system shall be established for all diving operations.
- 6.3.6 Ensure that all diving team members are physically fit and free from the effect of alcohol before the diving work commences.
- 6.3.7 Ensure that the plant operatives of the outfall are fully informed of the nature, extent and time of any planned diving operation, and that they have closed or opened all valves, gates, etc. as appropriate before the diving operation. The operation of the valves and gates shall be subject to a lock-out safety system controlled by the diving supervisor.
- 6.3.8 Effective communication amongst all diving team members shall be established. Communication can be done by using a lifeline with an established signalling system or by using a reliable radio communication system.
- 6.3.9 Drill for emergency situation shall be carried out regularly and before the work commences.
- 6.3.10 All protective clothing, apparatus and equipment shall be fully cleaned immediately after the diving operation.
- 6.3.11 Adequate welfare facilities, including clean water shower, soap, nailbrushes and disposable paper towels shall be provided.
- 6.3.12 Other general requirements for industrial diving as detailed in Section 5.19 of this Safety Manual shall also be observed.



## 6.4 Manual Rodding

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- 6.4.1 Working areas shall be kept clear of people. Robust barriers with warning signs should be erected to surround the manhole when its cover is opened.
- 6.4.2 All rattan or plastic rods shall be checked regularly. Any rods found with defects or scars shall be replaced immediately.
- 6.4.3 The brass ferrule shall be securely fixed to the rods.
- 6.4.4 The couplers between rods shall be tightened before putting the rods into drains.
- 6.4.5 A correct posture shall be adopted to avoid excessive strain on any parts of the body during rodding.
- 6.4.6 The workers shall stand on secure and non-slippery ground when working with the rods.
- 6.4.7 Care shall be taken of the flickering end of the rods while clearing of a drain is in progress.
- 6.4.8 Protective hand gloves and non-slip footwear shall be worn when working with the rods.



- 6.4.9 When blockage clearing work is to be carried out at the edge of slopes or other areas where there is a hazard of falling from height, suitable safety measures shall be taken such as wearing full-body safety harness or safety belt with lifeline attached to a secure point.
- 6.4.10 Avoid standing at downwind positions around manhole openings to minimize breathing in of foul gases.

- 6.4.11 All waste materials shall be kept in watertight and clearly labelled receptacles and disposed of properly.
- 6.4.12 All hand tools used to clear blockage shall be cleaned after use.
- 6.4.13 Use mechanical aid to remove and reinstall manhole covers as far as site condition permits. If the work has to be done manually, adopt the correct lifting postures and use lifting keys of suitable length.

## 6.5 Water-jetting and Suction Units

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- 6.5.1 Working areas shall be kept clear of people. Barriers should be erected around the working areas.
- 6.5.2 Warning and no-entry signs shall be displayed around the working area.
- 6.5.3 Suitable shields and barriers shall be erected around the working area to protect the public from being accidentally hit by water jets.



- 6.5.4 Care shall be taken to avoid tripping hazard to pedestrians when laying the hose across footpath from the water-jetting unit to rear lane or alike.
- 6.5.5 All components of the water-jetting or suction units shall be regularly checked, cleaned, maintained and tested.
- 6.5.6 The condition of the nozzles, hoses and couplings shall be checked each time before works commence. The nozzles, hoses and couplings shall be replaced immediately if any defect is found on them. Check all connections are secure before work commences.
- 6.5.7 Kinks, skinning and blistering in hoses shall be reported immediately for replacement.

- 6.5.8 Water-jetting involving man-entry in confined spaces shall be avoided as far as reasonably practicable. If this is unavoidable, additional safety measures as mentioned in Section 5.13 on working in confined space shall be followed too.
- 6.5.9 A trained team of at least two or three members shall be employed in any water jetting or suction work.
- 6.5.10 Water jetting and suction work shall be carried out only when the operators can stand on secure ground or working platform. Additional supports or other forms of restraints shall be used, where necessary, to prevent the operators from being tumbled by the reaction of the jet.
- 6.5.11 The pump shall only be started when the nozzle of the jetting or suction unit is aimed at the work. Never point the nozzle at any person whether or not the work is being carried out.
- 6.5.12 Before work commences, an investigation shall be carried out to determine the nature of materials to be removed and assess their associated potential hazards such as presence of abrasive particles or hazardous substances.
- 6.5.13 The following personal protective equipment shall be worn: -
- (a) suitable protective clothing;
  - (b) protective goggles or face shields;
  - (c) non-slip safety shoes or wellington boots;
  - (d) safety helmets with chin straps; and
  - (e) respirators or breathing apparatus, if hazardous gases will be released from the materials to be removed during the water-jetting or suction operation.
- 6.5.14 Team members shall communicate with each other with clear signals.
- 6.5.15 An emergency shut-down procedure shall be in place before work commences.
- 6.5.16 All waste materials collected shall be kept in water-tight receptacles and disposed of properly.

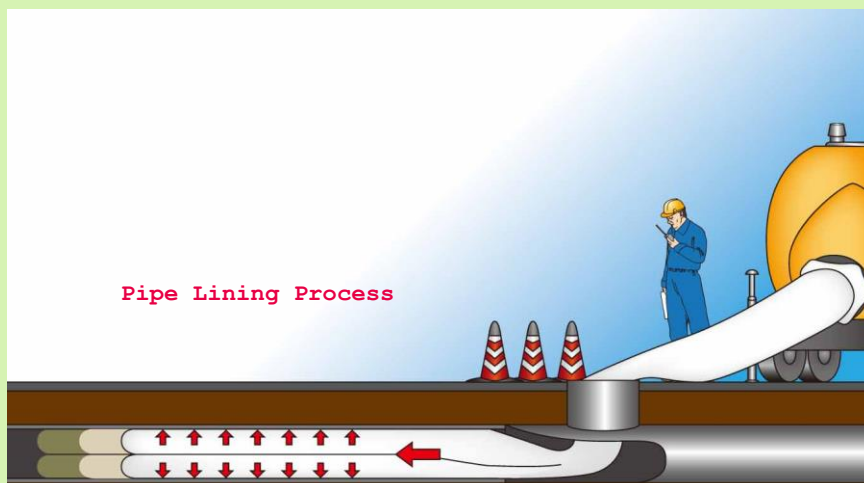
## **6.6 Pipe Lining**

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- 6.6.1 Insitu lining is commonly used for rehabilitation and local repair of drainage pipes. There are different liner products available in the market, which suit pipes of different sizes and lengths.



6.6.2 The liner is first impregnated with proprietary resins. It is then inserted into the pipe to be repaired from the connecting manhole, either by "pull-in-place" method using winched cable or "inversion method" using pressurized air or water with both ends sealed. After the impregnated liner is fully extended and inflated to cover the length of pipe to be repaired, it is cured by heated water or steam. The ends of the hardened liner are then trimmed to flush with the manhole wall and the annular space between the liner and the pipe wall is filled with sealants, e.g. rapid-hardening and non-shrinking cement, and the lining work is complete.



6.6.3 Before the lining work commences, it is important to ensure that the preparation work is properly completed, including:

- (a) The contractor's method statement has been checked and considered suitable for the work to be performed, including the contingency plan to abort the operation, e.g. in case a closed major road cannot be reopened for public use before 04:30.
- (b) The length of pipe to be repaired is cleared, i.e. any protruding services, roots, debris, silting or obstructions are removed, and confirmed by CCTV survey.
- (c) The manufacturer's certificates of the liner and resins delivered to site are checked and confirmed correct.
- (d) Temporary traffic arrangement (TTA) is set up and maintained in strict accordance with the approved plan and Code of Practice for the Lighting, Signing and Guarding of Road Works.
- (e) The flow is diverted and the manholes and pipes concerned are effectively isolated, e.g. by inflatable plugs and bypass pumping, and there is no sudden ingress of sewage or other substances throughout the course of work.

- (f) Preparation work for working in confined space, i.e. for man-entry into the manhole, is ready, including the conduct of a risk assessment, preparation of a permit-to-work and taking of necessary safety precautionary measures, e.g. provision of all safety and rescue equipment, etc.
- (g) The equipment, including the boilers for curing process, robotic cutter for trimming obstructions in pipes, etc., is checked and maintained in good working order.
- (h) The connections of pipes and hoses conveying compressed air, heated water or steam are securely locked and fastened by whip-checks or other safety devices like locking pins, etc.
- (i) The workers are briefed of the safety precautionary measures before work, including the wearing of reflective vests, etc.

6.6.4 When work is in process, the following should be observed:

- (a) Always work in the designated works area and pay attention to the moving traffic, especially on high-speed roads. Properly protect the pipes and hoses against possible damage by running vehicles.
- (b) Monitor the curing temperature and pressure of the heated water or steam to ensure that they are within the specified range to prevent over-heating or excessively high pressure.
- (c) Use suitable personal protective equipment (PPE) for the curing work, e.g. heat-resistant clothing, gloves, etc. to prevent scalding.
- (d) When man-entry into manhole is required, the safety precautionary measures as required by the Factories and Industrial Undertakings (Confined Spaces) Regulation shall be strictly followed. Reference should also be made to Section 5.13 and the DSD Practice Note No. 3/2012 - "Safety Supervision of Work in Confined Space".
- (e) Maintain closed supervision, especially during man-entry into manholes or pipes for trimming of ends of the hardened liner and sealing work, or cutting of lateral openings.
- (f) Strictly follow the manufacturer's safety instructions regarding the use, transport, storage and handling of the resins or sealants.
- (g) Wear proper PPE and/or respiratory protective equipment (RPE) and provide sufficient ventilation when working with resins or sealants. Do not mix the resins or sealants inside a manhole where ventilation is poor. Consult the Material Safety Data Sheet (MSDS) and the supplier if necessary.

- (h) During the curing process, if it is necessary to leave the manhole covers open, suitable lighting, signing and guarding should be placed around the manhole openings.

6.6.5 After all work is completed and the newly installed liner is confirmed functional,

- (a) Retrieve all plant, labourers and materials from the manholes and cancel the permit-to-work for confined space.
- (b) Clean up the site and remove all debris and waste.
- (c) Reinstate the diverted flow.
- (d) Remove the TTA and reopen the closed traffic lanes.

## 6.7 Grass Cutting

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6.7.1 Grass cutting work is regularly needed for engineering channels and natural streamcourses for restoring the flow capacity. Weed cutter, or power weeder, is commonly used for grass cutting work in view of its efficiency and mobility. In general, models come with a 2-stroke internal combustion engine are preferred to those with a 4-stroke engine due to the lighter weight and higher productivity. Further, backpack hanging design is preferred to shoulder and/or waist hanging design, especially for prolonged grass cutting work.



6.7.2 The working area shall be kept clear of the public. Adopt the safety measures described in Section 6.2 when grass cutting operation is to be carried out near watercourses, channels and nullahs. When work on steep slopes or river embankments, use safety belt/harness attached with a lifeline anchored at a secure point to prevent falls of persons.

- 6.7.3 Operate and maintain the power weeder in accordance with the manufacturer's instruction, in particular, always put the guard on during operation.
- 6.7.4 Select suitable cutting tools (i.e. the attachments) for cutting weeds (nylon wire), and shrubs (saw blades).
- 6.7.5 Don the power weeder properly; stand and walk and operate in an upright posture to avoid back injury and fatigue. Wear shoulder and/or waist pads to protect the body against excessive vibration or injury due to prolonged working.
- 6.7.6 Wear suitable PPE, including, inter alia, goggles or face shield (eye protection), earmuff (hearing protection), anti-vibration gloves (hand protection), long sleeve clothing and boots (body protection) to protect against insect and snake bites.
- 6.7.7 Do not smoke especially during dry season.



7

# Safety of Operation and Maintenance of Sewage Treatment Facilities and Pumping Stations



# CHAPTER 7

## Safety of Operation and Maintenance of Sewage Treatment Facilities and Pumping Stations

### General

#### 7.1 Plant Security

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- 7.1.1 Security control shall be maintained at all plants, whether they are manned or unmanned. The entrance of a plant shall always be locked when the plant is unattended.
- 7.1.2 Any damage at the boundary wall or wire mesh fencing shall be repaired immediately.
- 7.1.3 If there is any construction or maintenance work being carried out in the plant, the daily in-and-out of the contractor's staff and workers shall be controlled and recorded.
- 7.1.4 The officer-in-charge shall keep records of visitors to the sewage treatment facilities and pumping stations.
- 7.1.5 The officer-in-charge shall be aware of the total number of persons within the plant all the times including DSD's staff, contractor's staff and visitors.

#### 7.2 Access and Flooring

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- 7.2.1 The surface of all accesses and floors in sewage treatment facilities and pumping stations shall be constructed and maintained in an even and non-slippery condition. All accesses and floors shall be free from any obstruction or tripping hazard.
- 7.2.2 Vessels containing any scalding, corrosive or poisonous liquid shall be securely fenced around to a height of not less than 1100 mm.
- 7.2.3 Rises and falls in accesses and floors shall be marked with yellow and black strips to make them conspicuous.



- 7.2.4 Every workplace, access, stair, platform, pit, tank, opening or other dangerous place through or from which any person is liable to fall a distance of more than 2m shall be provided with guard-rails and toe boards. The guard-rails shall be of adequate strength to a height of between 900 mm and 1150 mm above the surface from which persons are liable to fall. Intermediate guard-rails shall also be provided such that the unprotected gap in between rails does not exceed 470 mm. The toe board shall be of 200 mm high and of adequate strength. Chains, ropes, barrier tapes and other non-rigid materials are not suitable for the purposes of fencing.
- 7.2.5 Suitable permanent access shall be provided and fixed guard-rails shall be installed on roofs to which regular access is required to prevent falling from edges.
- 7.2.6 The surface of accesses and floors shall be kept clean, dry and non-slippery, especially in the polymer handling and dosing areas where wetted polymer can constitute slipping hazards.
- 7.2.7 Ensure the walkways around the aeration tanks, sedimentation tanks are free of chemicals, solids or other substances that may create slippery conditions.
- 7.2.8 Access stairs should be properly designed and constructed as per BS 5395-1:2010. As far as the site condition permits, each flight should have no more than 16 steps and landings of 800mm wide minimum should be provided between flights. The depth of treads should be no less than 275mm (11 inches) and the height of risers no more than 175mm (7 inches) to form a gentle and safe gradient. Ship-type ladders should be avoided as far as practicable and its length should be limited if used.
- 7.2.9 Spiral stairs (i.e. stairs in a helix with a centre column supporting the treads) and helical stairs (i.e. the same with a void in the middle) should be designed in accordance with BS 5395-2:1984.
- 7.2.10 Vertical ladders from which a person is liable to fall for 2m or more shall be guarded with a safety cage. The free edge at the top landing should be guarded with a removable safety chain, which shall be kept taut and hooked except during passage of personnel.
- 7.2.11 The traditional design of having Fiber Reinforced Plastic (FRP) flooring supported by steel beams or frames with ends seated on angle brackets bolted to the interior walls of a tank or chamber shall not be allowed, as the support, including the bracket itself, anchor bolts and the embedding concrete, might fail after prolonged exposure to the corrosive atmosphere inside the tank or chamber. If FRP flooring is used, the supporting beams or frames must be seated on the top of concrete walls or concrete recess.

## 7.3 Working Environment and Housekeeping

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### 7.3.1 Lighting

- (a) The inner and outer surfaces of all glazed windows and skylights shall be kept clean. The path for direct natural lighting should be free from obstruction.
- (b) All sewage treatment facilities and pumping stations shall be adequately illuminated. The interior and external areas shall be illuminated in accordance with the recommendations by The Chartered Institution of Building Services Engineers (CIBSE). The following table provides a general guide for the recommended illumination levels for the activities being carried out in sewage treatment facilities and pumping stations: -

Illuminance (Lux)	Locations/Work activities
50	Cable tunnels, indoor storage tanks, walkways, etc.
100	Corridors, changing rooms, storerooms, treatment process areas, etc.
200	Loading bays, switchrooms, pump houses, sewage treatment plant houses, mechanical plant rooms, automatic processes monitoring, machine halls, etc.
300	Control rooms, rough bench and machine work in mechanical workshop, etc.
500	Engine assembly, painting and spraying, medium bench and machine work in mechanical workshop, etc.
1000	Electronic component assembly, gauge and tool rooms, retouching paintwork, etc.

- (c) Fluorescent lighting installed at plant room areas should be provided with suitable type of diffusers.
- (d) Diffusers of artificial lightings shall be cleaned regularly.
- (e) Defective lighting shall be repaired as soon as possible.
- (f) Emergency lighting shall be checked and maintained regularly to ensure that they are in good working condition at all times.

### 7.3.2 Ventilation

- (a) Ventilation system of offices in sewage treatment facilities and

pumping stations shall be regularly cleaned and maintained. The ventilation system includes fan coil units, filters, air handling units, air ducts, condensers etc.

- (b) The fresh air intake point shall be located away from exhaust gas and fumes or any other sources of hazardous gases and contaminants.
- (c) In addition to office areas, indoor areas of sewage treatment facilities and pumping stations shall be adequately ventilated, particularly the wet wells, inlet works, mechanical screens room, grit chamber, etc. In general, the following air change rates shall be maintained for various areas in sewage treatment facilities and pumping stations: -

Recommended number of air changes/hour	Room or building type
5 - 10	General workshop, plant room, toilet, wet well, dry well
10 - 15	Laboratories
15 - 30	Boiler houses and engine rooms, screenings chambers, grit chambers

- (d) Concentration of hazardous gases, including hydrogen sulfide, carbon monoxide, flammable gases like methane and the oxygen level, shall be monitored continuously by gas detectors in poorly ventilated locations and confined areas of the plant, e.g. underground mechanical screen chamber, inlet wet well, etc.
- (e) Ensure that the deodorisation plant is properly maintained to give satisfactory performance, especially when the Environmental Impact Assessment recommends that the exhaust shall undergo deodorisation process before it is discharged into the atmosphere.

### 7.3.3 Housekeeping

- (a) Plant areas shall be regularly cleaned and kept dry after washing, in particular grit classifier house, activated sludge pump house, sludge dewatering house, polymer dosing area etc.
- (b) Dirt and refuse shall be removed daily not only from the floor but also from benches of workplaces, staircases and passages. The floor of every workplace shall be cleaned at least weekly by washing or, if it is effective and suitable, by sweeping or other methods.
- (c) The interior of every workplace including walls and ceilings, shall be limewashed at regular intervals.

- (d) The landscaping within the boundary of a sewage treatment works or pumping station shall be maintained regularly, e.g. grass shall be mowed, trees shall be trimmed at regular intervals and the health conditions of the trees shall be regularly inspected by trained arboriculture personnel. The refuses from landscaping, e.g. cut grass, trimmed branches and dry leaves shall be removed as soon as possible to avoid potential fire hazards.
- (e) Planting of fruits or vegetables at the yard of sewage treatment facilities or pumping stations is not recommended. The plants may be contaminated by water containing heavy metals.
- (f) Garbage areas shall be designated for the temporary storage of waste materials generated by operation and maintenance activities. The refuses shall be removed at regular intervals.
- (g) Empty vessels of consumed materials shall be disposed of as soon as possible.
- (h) Screenings temporarily held in skips shall be covered. They shall be removed regularly and frequently to avoid environmental nuisance.

#### 7.3.4 Storage of Material

- (a) All goods and materials shall be stored, stacked and arranged in such a manner that they cause no danger to any person.
- (b) Materials shall be separately stored and properly labelled according to their properties, e.g. dangerous goods classified under the Dangerous Goods (Classification) Regulations.
- (c) Dangerous goods exceeding the exempted quantities shall be kept in appropriate dangerous goods store approved and licensed by the Fire Services Department. The dangerous goods commonly found in sewage treatment facilities and pumping stations include diesel, sodium hypochlorite, oxygen gas cylinders, acetylene gas cylinders, nitrogen gas cylinders, paint and thinner, etc.
- (d) Other chemicals not classified as dangerous goods, e.g. ferric chloride, shall also be stored properly in designated stores with appropriate labels. The relevant Material Safety Data Sheets (MSDS) of the concerned chemicals shall be consulted on the appropriate storage methods.
- (e) Empty vessels used to contain dangerous goods or chemicals shall be disposed of properly and as soon as possible.

#### 7.3.5 Waste Disposal

- (a) Labelled vessels shall be provided for the collection and disposal

of various chemical wastes produced during the sewage treatment process or normal plant maintenance work. The chemical wastes are specified in the Schedule 1 of the Waste Disposal (Chemical Waste) (General) Regulation. Producers of chemical waste are required to register with Environmental Protection Department. They are also required to arrange proper collection, transport and disposal of their chemical wastes by licensed contractors.



- (b) Garbage area shall be designated for the temporary storage of waste materials pending for disposal. The collected waste materials shall be removed and disposed of regularly and frequently to avoid prolonged storage in the sewage treatment facilities and pumping stations.

## 7.4 Personal Hygiene

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7.4.1 The outfit of operating staff should be suitable for the work to be carried out in sewage treatment facilities and pumping stations. This includes the clothing, footwear, haircut and personal protective equipment (PPE) suitable for the job. Information on the requirements of personal protective equipment is given in Chapter 12.

7.4.2 If sewage or foul matter has splashed on the skin, it should be washed and cleaned with soap and water as soon as possible. Working clothes shall be washed daily after work.



7.4.3 Do not use petrol, kerosene, lubricating oil or solvents for cleaning hands. Suitable type of hand cleansing agent should be used instead.

7.4.4 Never use compressed air to blow off the dust and dirt trapped by clothes.

7.4.5 Operators shall wear appropriate personal protective equipment when they are likely to contact with wastewater or hazardous substances and chemical.

- 7.4.6 Operators should keep their fingers away from nose, mouth and eyes at all times and they should wash their hands thoroughly prior to having meal.
- 7.4.7 Cooking, eating and drinking shall be forbidden in plant areas except at the designated areas, e.g. kitchen, mess room.
- 7.4.8 Sufficient toilets, washing basins and sanitary facilities shall be provided and properly maintained. Doors of toilets shall be kept closed at all times.

## 7.5 Noise and Vibration Control

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### 7.5.1 Noise

- (a) Common industrial noise sources include fan noise, duct noise, pipe noise and machinery noise. Some of the problems are simple in nature and can be dealt with by changing fan speed, avoiding sudden change of flow, adding of cushion, lagging or damping materials etc. During the design stage of sewage treatment facilities and pumping stations, priority shall be given to the silent type machinery.
- (b) The noise generated by machinery or the working process shall be confined at the source as far as practicable so as to minimize the effect on others. Staff working in the vicinity of the noise sources shall be provided with approved type of hearing protectors and their exposure to the noise sources shall be minimized.
- (c) Noise assessment shall be carried out for suspected noisy areas by a competent person to evaluate the risk and obtain information for the preparation of proper control measures. When a "Ear Protection Zone" is demarcated, staff shall wear the approved type of hearing protectors when they work in the zone.
- (d) The interior of rooms where noisy plants are located shall be lined with acoustic materials if situation warrants.

### 7.5.2 Vibration Control

#### **Hand-arm Vibration**

- (a) Hand-arm vibration can be caused by operating hand-held power tools, hand-guided equipment or by holding materials being processed by machines. Occasional exposure is unlikely to cause ill health. However, regular and frequent exposure to hand-arm vibration can cause a range of conditions known as Hand Arm Vibration Syndrome (HAVS), which includes vibration white fingers (VWF) and carpal tunnel syndrome (CTS).





**Rock Breaking**

**Grinding**

**Drilling**

- (b) To control the hand-arm vibration risk at work, look for alternative work methods which eliminate or reduce exposure to vibration. Mechanise or automate the work if possible.
- (c) Select the lowest vibration tool that is suitable and can do the work efficiently to avoid exposure to vibration longer than is necessary. Worn equipment should be replaced with ones, which are suitable for the work, efficient and of lower vibration.
- (d) Maintain the plant, tools and equipment in good working condition according to the manufacturer's recommendations to prevent avoidable increases in vibration. Replace consumable items such as grinding wheels and cutting bits to ensure the equipment is effective and efficient so as to minimize exposure to vibration.
- (e) Improve the workstation design to minimize loads on hands, wrists and arms induced by poor posture.
- (f) Arrange rest break at work and job rotation among staff to avoid prolonged and continuous exposure to vibration.
- (g) Provide PPE like anti-vibration gloves or other protective clothing when necessary to keep hands warm and dry. This will encourage good blood circulation, which should help protect them from developing vibration white fingers (VWF).

**Whole-body Vibration**

- (a) Whole-body vibration is the shaking or jolting of the human body through a supporting surface, usually a seat or the floor. Most exposure to whole-body vibration at work is unlikely on its own to cause back pain. It may however pose a risk when there is unusually high vibration or jolting or the vibration is uncomfortable for a long time on most working days.
- (b) Most people who drive road-going vehicles at work are not likely to experience high levels of whole-body vibration. However, mobile machine operators and drivers, especially those who work off-road, are at increased risk from back pain.
- (c) In some cases whole-body vibration can aggravate a back problem caused by another activity, e.g. muscle strain caused by improper

manual handling or sporting activity.

- (d) Select vehicles and machines with the appropriate size, power and capacity for the work and the ground conditions. Driver seat should have appropriate suspension system and be adjustable to provide adequate support, ease of reach for foot and hand controls and good lines of sight to avoid poor posture.
- (e) Maintain vehicle suspension systems regularly and correctly. Replace solid tyres on machines like fork-lift trucks before they reach their wear limits.
- (f) Make sure that paved surfaces or roadways are well maintained.
- (g) Train and instruct operators and drivers to properly adjust the seat before starting work, adjust the vehicle speed to suit the ground conditions, operate the machine smoothly and follow workplace routes to avoid travelling over rough, uneven or poor surfaces.
- (h) Introduce work schedule and roster to avoid prolonged and continuous period of exposure to vibration and allow for breaks where possible.
- (i) Avoid high levels of vibration and prolonged exposure for vulnerable persons, e.g. older persons or those with back problems etc.

## **7.6 Odour Control**

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- 7.6.1 During the design stage of sewage treatment facilities and pumping stations, an environmental impact assessment (EIA) should be conducted where appropriate to see if deodorising facilities are necessary. Hydrogen sulphide is the major constituent of the odour emitted from sewage treatment processes and it can be adsorbed by deodorisation units.
- 7.6.2 The source of odour shall be enclosed to prevent dispersion. Doors and windows in areas where odour-generating processes are taking place shall be kept closed and the ventilation and deodorisation system shall be switched on. Screenings shall not be exposed to give off odour.
- 7.6.3 Staff shall put on appropriate personal protective equipment when handling chemical impregnated activated carbon of deodorisation units. The disposal of saturated activated carbon and ventilation filters shall be done in accordance with the requirements of the Waste Disposal Ordinance.

- 7.6.4 If the deodoriser employs hazardous chemical substances such as deodorizing agents, safety precautionary measures and handling procedures shall be established and implemented in accordance with the relevant Material Safety Data Sheet. Plant operators shall be conversant with such control measures and procedures.
- 7.6.5 No naked flame is allowed in the vicinity during the replacement of the activated carbon of deodorization units.

## **7.7 Traffic Control**

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- 7.7.1 This Section covers control of vehicles including lorries, cars, golf carts, tricycles and bicycles and the like used for transporting personnel, plants and materials in sewage treatment facilities and pumping stations. Whilst these vehicles can greatly enhance the efficiency of transportation, they can create hazards in the workplace. The common accidents associated with vehicles include knocking down of personnel, collision, overturning or fall on slope of vehicles, fall of objects from vehicles and fall of personnel from bicycle, etc.
- 7.7.2 The layout of sewage treatment facilities and pumping stations should be designed in such a way to ensure safe traffic condition. Vehicular access, cycle tracks and pedestrian access should be separated as far as practicable. Proper parking spaces, loading and unloading areas and works areas should be clearly demarcated.
- 7.7.3 Control traffic in the sewage treatment facilities and pumping stations through gates, barriers, traffic signs, speed and height limits etc. Road humps, cross view mirrors or other similar devices should be provided to prevent accident where necessary. Ensure sufficient illumination to the roads.
- 7.7.4 Fasten the load on the vehicle securely. Do not overload the vehicle or allow the load to extend beyond the safe limits.
- 7.7.5 Vehicles should be equipped with reversing video devices, rear view mirror, parking sensor, reversing alarm and warning light as appropriate. They should be free from patent defect or damage and should be properly maintained.
- 7.7.6 Employ qualified mechanics to maintain the vehicles regularly, in particular the brake, seat belt and other safety devices. Keep a register of all vehicles in the sewage treatment facilities and pumping station and their maintenance record.
- 7.7.7 Never drive under the influence of drugs or alcohol. Drivers and workers working on road should wear reflective jackets.

- 7.7.8 Always drive at safe speed and observe the traffic rules as if driving on public roads, in particular, do not use hand-held telecommunication equipment, including mobile phones, while vehicles are in motion.
- 7.7.9 Be sure oneself is physically fit for cycling and the bicycles/tricycles are maintained in a good and safe condition. Always cycle at a safe speed and avoid carrying persons and heavy loads. Take extra care when cycling in inclement weather and watch out for strong wind, slippery road surface and impaired visibility.
- 7.7.10 Safety briefing should be given to drivers, cyclists and workers of the designated traffic routes and rules in the sewage treatment works or pumping station concerned. Job specific training for banksmen covering safety rules and instructions on traffic and communication system should be arranged if needed.

## 7.8 Fire Prevention

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### 7.8.1 Doors and Fire Escapes

- (a) Every door, other than a sliding door, shall be kept closed by means of a self-closing mechanism at all times. Both the door and the closing mechanism shall be fully operational and maintained in a good working order.
- (b) The designed fire-resisting period of a door shall not be decreased after replacement of the door.
- (c) Emergency fire escape doors shall not be locked or fastened in such a manner that they cannot be easily and immediately opened from inside without using a key.
- (d) Emergency fire escape routes and emergency doors shall be made known to every staff concerned.



- (e) Emergency escape routes shall be free from obstruction and clearly indicated by direction signs. Emergency lights shall be provided along the escape routes and at emergency exits.

- (f) Maps showing the fire escape routes shall be posted at prominent positions in the sewage treatment facilities and pumping stations.
- (g) Every person shall know the location of the gathering point whenever a fire evacuation is initiated.
- (h) The Emergency Vehicular Access (EVA) for fire engines shall be free from obstruction.

#### 7.8.2 Firefighting Equipment

- (a) The firefighting installations, e.g. fire extinguishers, sprinklers system and automatic fire alarm (AFA) system shall be maintained and tested at regular intervals to ensure that they are in good working condition. Fire extinguishers shall not be exposed to prolonged sunlight.
- (b) Access to the firefighting equipment and fire alarm switches shall be free from obstruction. Signs indicating the locations of firefighting equipment shall be placed at prominent positions, if required.
- (c) Testing of the fire alarm systems shall be carried out at regular intervals. The test shall include the alarm initiation, transmission and acknowledgement by the relevant fire station.
- (d) Drills on the use of firefighting equipment, with demonstration by the nearby fire station if needed, shall be held at regular intervals.

#### 7.8.3 Smoking and Naked Flame

- (a) Nobody shall be allowed to smoke in any part of sewage treatment facilities and pumping stations especially in gas risk areas.
- (b) No naked flame shall be allowed unless a hot work permit is issued by the officer-in-charge.
- (c) "No Smoking" warning notices shall be posted at prominent positions within sewage treatment facilities and pumping stations. Replacement of these notices shall be arranged when the words become illegible.
- (d) Whenever hot work is carried out, the workplace shall be kept clear of combustibles and flammable materials.
- (e) All electrical apparatus and components that are liable to give off sparks or become hot shall not be installed in areas where flammable substances are used and the presence of flammable gases is expected.

- (f) No cotton fluff shall be allowed to deposit on light fittings, motors, electrical switches, sockets and other similar electrical appliances that are liable to give off sparks or become hot in order to prevent ignition of the cotton fluff.

#### 7.8.4 Flammable Substances

- (a) Dangerous goods exceeding the exempted quantities shall be stored in dangerous goods stores of appropriate category and class.
- (b) Flammable substances exceeding 35 litres in aggregate shall be stored in suitable closed containers and the containers shall be kept in a storeroom approved by the Fire Services Department.
- (c) Flammable substances not exceeding 35 litres in aggregate shall be stored in suitable closed containers and the containers shall be kept in a metal cupboard or bin. The metal cupboard or bin shall be situated in a position where it is least likely that the flammable substances will catch fire.
- (d) Every container, storeroom, cupboard and bin used for storing flammable substances shall be clearly and boldly marked in English and Chinese "Flammable Substances". (易燃物品)
- (e) Flammable substances used on work benches shall be contained in non-spillable metal containers with suitable lids to prevent release of vapours from the flammable substances into the atmosphere of the workplace.
- (f) All rooms in which flammable substances are used and handled shall be ventilated by an efficient mechanical system discharging to open air.
- (g) All cotton wastes or other materials, which are liable to spontaneous combustion or materials contaminated with flammable substances, shall be disposed of as soon as practicable in a metal container having a self-closing lid and shall be removed without delay to a safe place.

#### 7.8.5 Hot work in Areas Protected by Automatic Fire Fighting System

To ensure the safety of all persons entering or working in switchroom protected by fixed automatic firefighting system (using water, gas or chemical), the following procedures shall be followed: -

- (a) The automatic control of the firefighting system shall be disabled or put into manual operation mode.
- (b) A notice indicating the control is on "manual" or "disabled" shall be fixed to the control panel.



- (c) The automatic control shall be restored immediately after the completion of work and access is no longer required.

## **7.9 Contingency Plan**

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- 7.9.1 Officer-in-charge of sewage treatment facilities and pumping stations shall draw up contingency plan for the sewage treatment facilities and pumping stations under their control to deal with any possible emergency events, e.g. fire, serious accident, chemical spillage, environmental pollution, etc. according to the actual need and the particular situation. Reference shall be made to the provisions regarding emergency preparedness and accident reporting and investigation as detailed in Chapter 14 and 15 of this Manual.
- 7.9.2 Staff working in sewage treatment facilities and pumping stations shall familiarize themselves with the procedures as stipulated in the contingency plan of the sewage treatment facilities and pumping stations where they work.

## **Safety of Various Types of Works**

### **7.10 Work in Confined Spaces**

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- 7.10.1 In typical sewage treatment facilities and pumping stations, there are many areas, due to their enclosed nature and the possible hazards that may exist, like wet wells, chambers, tanks etc., are classified as a confined space. Reference shall be made to the Factories and Industrial Undertakings (Confined Spaces) Regulation for the definition of a confined space.
- 7.10.2 For works to be carried out in confined space located in sewage treatment facilities and pumping stations, the safety guidelines set out in Section 5.13 of this Safety Manual shall be followed.

### **7.11 Work in Gas Risk Areas**

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#### 7.11.1 General

- (a) Gas risk areas in sewage treatment facilities and pumping stations

are areas where accumulation of flammable and combustible gases is likely to be present, e.g. the inside and the vicinity of gas holders, digestion tanks, pipe gallery and inlet works, etc. Smoking in these areas shall be strictly forbidden.

- (b) Prior to any work is carried out in gas risk areas, the following safety precautions shall be observed and implemented: -
- (i) Normally work involves naked flame shall not be allowed.
  - (ii) Any work activities, especially hot work, to be carried out in gas risk areas shall be carefully planned. A risk assessment should be conducted by a competent person to identify the possible hazards and recommend proper safety measures. Works shall only commence when all safety measures are implemented and a permit-to-work is issued.
  - (iii) Concentration of the combustible gases shall be checked and continuously monitored.
  - (iv) Adequate ventilation shall be maintained.
  - (v) All hand tools and equipment to be used in gas risk areas shall be explosion proof type of appropriate class or intrinsically safe type.
  - (vi) All electrical equipment, including measurement devices, used in the work shall be of explosion proof type of appropriate class or intrinsically safe type and certified to the relevant international standards before installation / use.
  - (vii) All cabling work and accessories shall be of flameproof construction. These include the connections, termination boxes, cable glands etc.
  - (viii) All metallic parts shall be continuously and equipotentially bonded.
  - (ix) The electrical circuit control components shall preferably be located outside the gas risk area.
  - (x) Reference shall be made to BS EN 60079-10 or other equivalent international standards for the proper selection of equipment in gas risk areas.

#### 7.11.2 Gas Holders

- (a) Dry-sealed gas holders are common in major sewage treatment works. For works related to inspection, examination and maintenance of them, reference shall be made to the "Guide to Inspection,

Examination and Maintenance of Dry-Sealed Gasholder" (second edition April 2006) published by the ST1 Division.

- (b) The major risks associated with gas holders are: -
- (i) work in confined spaces,
  - (ii) work at height, and
  - (iii) fire and explosion.



(c) Work outside Gas Holders

- (i) As gas holders contain highly combustible gases, access into which shall be restricted and controlled unless approval from plant manager or his delegates has been granted.
- (ii) The neighbourhood of a gas holder is considered as gas risk area and the general precautions as stated in Section 7.11.1 of this Safety Manual shall apply.
- (iii) When work is carried out at the top of a gas holder, safety precautions for working at height shall be taken, e.g. staff shall wear full body safety harness attached with lifeline securely anchored to a fixed point, etc.
- (iv) Guarding shall be installed to prevent persons from accessing to the area immediately beneath the counter-weight of the level indicator.

(d) Work inside Gas Holder

- (i) The interior of a gas holder shall be treated as a confined space. Staff working inside a gas holder shall follow the procedures as described in Section 7.10 of this Manual.

- (ii) The piston of a gas holder separates the interior of a gas holder into two parts, air side and gas side. The air side of a gas holder is the part of gas holder above the piston deck. The gas side is the part of gas holder confined by the piston and its seal and it contains bio-gases generated during sludge digestion process. Normally staff is required to enter the air side of the piston for inspection at regular intervals. Nobody shall enter the gas side of a gas holder unless the gas holder has been completely isolated, purged, ventilated and proved safe for entry.
- (iii) If work is to be carried out in the gas side of a gas holder, the gas holder shall be first shut down and completely isolated from the plant. The gas holder shall then be purged with nitrogen both before and after work so as to ensure that no methane or hazardous gas is present. The gas trapped between the piston seal shall also be diluted by slight movements of the piston.
- (iv) Workers shall wear suitable protective clothing and face shield to prevent from direct contact with sludge prior to opening the manhole covers at the piston deck for the installation of propping to support the piston.
- (v) Workers shall then follow the procedures and precautions for working in confined spaces.

## 7.12 Work at Height

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### 7.12.1 Working Platforms and Ladders

- (a) All open sides of a workplace from which a person is liable to fall by more than 2m shall be protected by guardrails and toe boards. The height of the guardrails shall be between 900mm and 1150mm, the height of the intermediate guard-rails shall be between 450mm to 600mm and the height of the toe boards shall be at least 200mm.
- (b) Working platforms with guardrails and toe boards shall be erected for workplaces at height. If provision of working platform is impractical, all workers employed at the elevated workplaces shall be protected from falling by means of appropriate safety nets, safety belts and harnesses with lifelines or



lanyards properly attached to secure anchorage points.

- (c) All workers shall be suitably trained in the use of safety belts and harnesses and briefed about the hazards and safety precautions before commencing work at height. Increase the level of supervision on site if necessary.
- (d) All equipment shall be regularly inspected for damage and that there is a system of reporting defects to the supervisors.
- (e) All elevated workplaces and working platforms shall be provided with safe and suitable means of access and egress such as stairs, ramps and ladders.
- (f) Breaks in handrailing or fencing for passage of personnel or materials, e.g. landing point of cat-ladders, etc., shall be protected by removable safety chains of suitable length at the top rail level and mid-level.
- (g) Never lean against safety chains.
- (h) Ensure that all safety chains are securely fastened at all times except during passage and remain taut with no more than 70 mm of droop. Safety chains are not suitable for wide openings, which shall be protected by removable or openable rigid fencing or gate instead.
- (i) All portable ladders used shall meet the following requirements: -
  - (i) Securely fixed near the top, or if impracticable, near the bottom.
  - (ii) Rest on a firm level footing.
  - (iii) Extend at least 1 m above landing place, unless other suitable handhold is provided.
  - (iv) Vertical run not to exceed 9m, unless an intermediate landing is provided.
  - (v) Set ladders at a slope of 4 to 1 approximately.
  - (vi) The rungs shall be free from moisture, dirt and grease.
  - (vii) Always face a ladder when going up or down and use both hands to grasp the rungs for support. Use a tool holster to carry hand tools to spare hands for holding the ladder.



- (viii) All portable ladders shall be inspected and maintained at regular intervals with records.
- (ix) Never paint wooden ladder as it may conceal defects.
- (j) Never throw materials from height. Use enclosed chutes.
- (k) Works at height in adverse weather conditions, e.g. high winds or when surfaces may be slippery due to rain, shall be avoided if possible.
- (l) Safety nets and properly constructed catch fans shall be erected to prevent any person from being injured by falling objects.
- (m) Never improvise expedient access to a workplace at height.

#### 7.12.2 Mobile Scaffolds

- (a) A mobile scaffold shall be completed with full width working platform, access ladders, handrailing and toe boards. After it has been erected, it shall be inspected by competent person and recorded at regular intervals.
- (b) Every wheel of a mobile scaffold shall be fitted with a locking device that cannot be accidentally released. All wheels shall be securely locked before the scaffold is used.
- (c) The wheels shall be securely fixed to the uprights so that they cannot fall out even when they are not in contact with the ground.
- (d) The scaffold shall not be moved when people or materials are on the working platform.
- (e) The scaffold shall only be moved at the base.
- (f) The ratio of height to the least base dimension shall not exceed 3:1 for outdoor work, or 3.5:1 for indoor work, unless tied to suitable fixed points.
- (g) Minimum width of the scaffold at base shall be 1.2m.
- (h) The working areas shall be fenced off and a suitable warning notice shall be erected to warn people and traffic.
- (i) Install mesh and warning notice on the sides of scaffolds to prevent unauthorized use.

#### 7.12.3 Personal Protective Equipment (PPE)

- (a) The personal protective equipment for working at height include



safety belts, full body safety harnesses, fall arrestors, lifelines, lanyards and shock absorbers.

- (b) Staff working at height shall be provided with PPE suitable for the work. The staff shall wear and use the PPE properly at all times during work.
- (c) Before works commence, suitable type of safety belt and anchorage system shall be selected, e.g. work of peripatetic nature may need a taut wire as anchorage. The "Guidance Notes on Classification and Use of Safety Belts and their Anchorage Systems" published by Labour Department has suggested the following common methods of anchorage of safety belt: -
  - (i) fixed anchorage,
  - (ii) vertical independent lifeline, and
  - (iii) horizontal lifeline.

## **7.13 Work over or near Water**

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- 7.13.1 Staff shall not work alone in areas over or near water where there is a risk of falling into water and drowning. These include the inlet works, sedimentation tanks, aeration tanks, wet wells etc. in sewage treatment facilities and pumping stations.
- 7.13.2 Reference shall be made to Section 10.3 of this Manual if working alone cannot be avoided.
- 7.13.3 Plants and equipment shall be designed to minimize the need of work over or near water, e.g. install remote control switch for operating equipment away from waterfront and install CCTV cameras for remote monitoring.
- 7.13.4 Fences or nets of adequate strength shall be provided along all edges where workers may be liable to fall into water. If it is not possible to provide such fences and nets, persons working over or near water shall wear a life jacket and a safety harness attached to a lifeline securely anchored at a fixed point as appropriate.
- 7.13.5 Lifejackets shall preferably be the self-inflatable type with whistle for calling for help during emergency. They shall comply with BS EN ISO 12402-3:2006 and shall be capable of supporting an unconscious person face-upwards.
- 7.13.6 Suitable rescue equipment shall be made readily available at the place

of work. The rescue equipment includes lifebuoys with lifeline, rescue lines and resuscitator, etc. During the selection of rescue equipment, consideration shall be given to the depth and velocity of water, equipment installed under water, etc. It shall be noted that the specific gravity of water in aeration tank is much less than 1.

- 7.13.7 Workers shall be trained for the rescue of others falling into water.
- 7.13.8 Establish a "permit-to-work" system, where necessary, to control operation and maintenance work over or near water. This is to ensure that all safety precautionary measures including but not limited to life jackets, lifebuoys, lifelines, temporary working platforms, means of communication, no lone work, isolation procedure, authorized hours of working (preferably in day time), members of working team, and etc. as the case may be, are duly implemented before work is allowed to be carried out.
- 7.13.9 Put up warning notices at prominent positions in areas over or near water where access is restricted or prohibited.
- 7.13.10 Arrange safety talk on work over or near water at regular intervals or incorporate it in the regular safety training in order to upkeep the safety awareness of all staff concerned.

## 7.14 Manual Handling and Lifting

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- 7.14.1 Robust trolley is one of the suitable tools for transporting heavy loads horizontally.
- 7.14.2 Staff shall wear appropriate personal protective equipment to protect themselves from being injured during work, e.g. gloves to protect against cuts, scratches or punctures, safety shoes or boots with steel toe-cap and mid-sole to protect against falling objects and stepping on sharp objects, etc.
- 7.14.3 Size up the load and check overall conditions; for instance, its shape, dimensions and weight, also check for grease, oil, sharp edges.
- 7.14.4 Do not attempt to lift alone if it appears too heavy or awkward. Consider getting assistance from colleagues or use mechanical aid.
- 7.14.5 Staff shall plan and check the routing of transportation prior to work.



The routing shall be free from obstruction and tripping hazards. Staff shall also plan for the location where and how the object will be let down.

7.14.6 For lifting and transporting a load, the following procedures are recommended: -

- (a) Make certain of good balance. Keep feet shoulder-width apart; place one foot beside and the other foot behind the load to be lifted.



- (b) Bend the knees; do not stoop. Keep the back straight. Tuck in the chin and straighten the back.
- (c) Grip the load with palms of the hands and the fingers. With grip taken, tuck in the chin to make certain the back is straight.
- (d) Make a trial lift of the load for a few inches.
- (e) Use the body weight to start the load moving and then lift by pushing up with the legs, making full use of the strongest set of muscles.
- (f) Keep the arms and elbows close to the body when lifting.
- (g) Do not twist the body. To change direction, shift the foot position and turn the whole body.
- (h) If the load is to be lowered, bend the knees; do not stoop. To deposit load on a bench, shelf or table, place it on the edge and push it into position.

## 7.15 Electrical Work

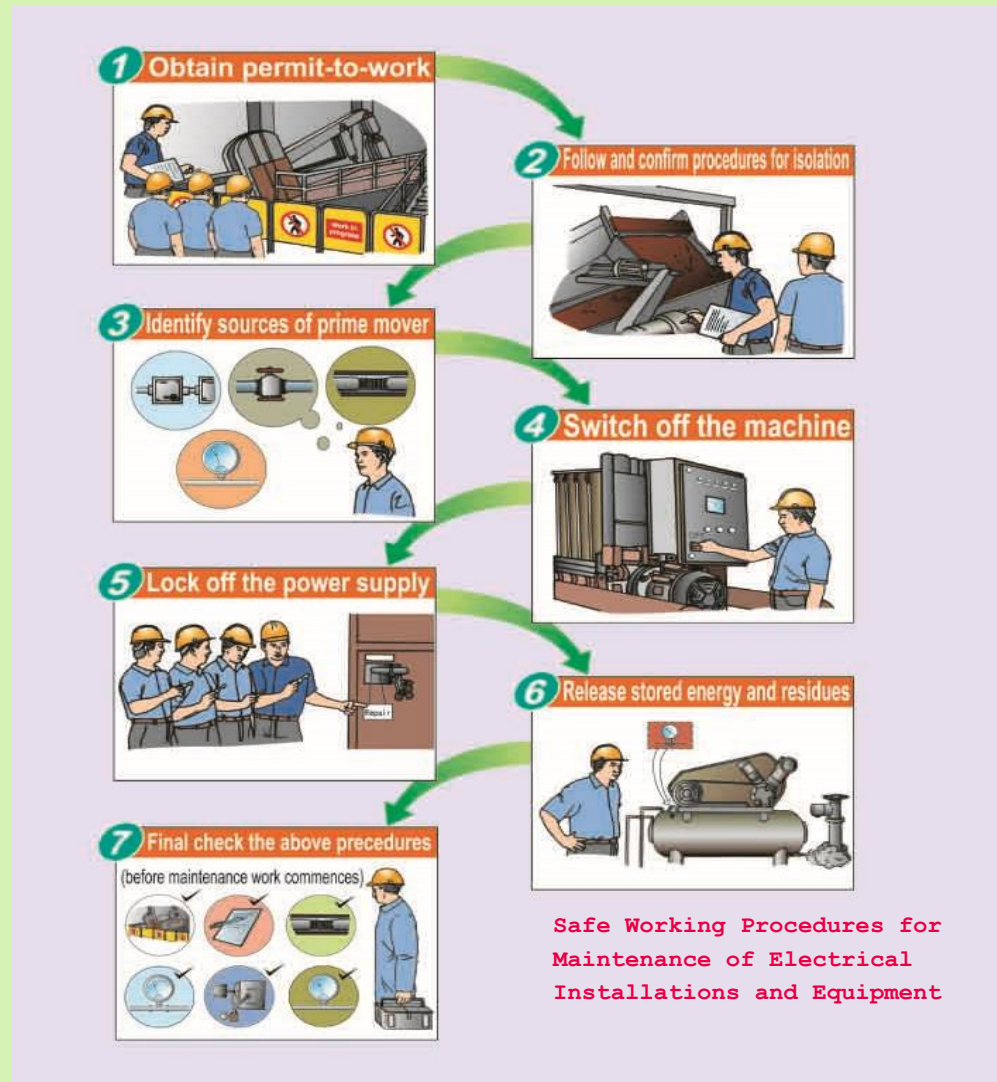
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7.15.1 General

- (a) Staff working on electrical apparatus shall make reference to the requirements as recommended by "Electricity Work (General) Safety Guide" and "The Code of Practice for The Electricity (Wiring)

Regulations" published by the Electrical and Mechanical Services Department.

- (b) All electrical work shall be carried out by qualified Registered Electrical Workers (REW) of the appropriate grade registered under the Electricity (Registration) Regulations.



- (c) Regular inspection and maintenance of fixed electrical installations shall be carried out and recorded in accordance with the requirements of the Electricity Ordinance.

- (d) Working on live electrical apparatus is generally not allowed. No electrical apparatus is allowed to work on unless it has been made dead, isolated and earthed, and a permit-to-work has been issued.

- (e) Only Registered Electrical Worker (REW) with appropriate experience shall be allowed to carry out fault diagnosis on live circuits.

- (f) Switching on high voltage electrical apparatus shall only be

carried out by Authorized Persons.

- (g) Only Authorized Persons or persons under their immediate supervision shall be allowed to carry out the following tests on high voltage apparatus and that the tests shall be carried out with extreme precautions and appropriate control measures: -
  - (i) insulation tests on high voltage cables,
  - (ii) phasing out of high voltage feeders,
  - (iii) continuity test of cables,
  - (iv) primary injection test, and
  - (v) high pressure test.
- (h) Gloves complying with BS EN 60903:2003 shall be worn when carrying out phasing out test and high-pressure test.
- (i) Rubber mats to BS EN 61111:2009 shall be placed in front of switchboards.
- (j) Safety posters, instructions, one-line diagram, etc. shall be affixed at designated locations as required by the Electricity (Wiring) Regulations.
- (k) All electrical apparatus shall be designed and constructed to guard against direct and indirect contact by persons.

#### 7.15.2 Main Switch Room

- (a) Adequate ventilation shall be provided and maintained in the switch room to avoid excessive heat accumulation.
- (b) Activities irrelevant to switching, modification, testing and maintenance of electrical apparatus shall not be carried out inside the switch room.
- (c) Switch room shall be free of drainage downpipes, water pipes or fire hydrant water pipes, etc.
- (d) Temporary covers shall be provided for the uncovered cable trenches during cabling work inside the main switch room.
- (e) Magnitude of the nominal voltage of a switchboard shall be displayed at the front of the switchboard.
- (f) Works area shall be delineated by fencing and adequate warning signs. Warning notices shall be affixed at the front and the back of the switchboard when work is being carried out on a switchboard

or any part of it.

- (g) When work is carried out on non-Form 4 switchboards, particular care shall be taken as adjacent circuits without full barrier or partition may be live.
- (h) Work on busbar chamber shall be carried out only when the complete switchboard has been made dead.
- (i) All terminations at any compartments of a switchboard shall be shrouded. Apart from that, adequate warning signs shall be affixed to the terminations if the wirings at these terminations are powered by other circuits housed in other compartments or panels.
- (j) Even the main power isolator of a compartment has been switched off, staff shall pay particular attention to the terminations at the upstream side of the isolator which are still live.
- (k) All isolators at the switchboard for electrical circuits shall be padlockable to prevent from being accidentally switched on by others.
- (l) The control circuit of an electrical apparatus shall be dead when the isolator for the main supply to the apparatus is switched off.
- (m) All circuits shall be adequately protected against overcurrent, undervoltage, loss of phase and earth fault.

### 7.15.3 Electrical Apparatus

- (a) The degree of protection provided by the enclosure of electrical apparatus shall not be degraded after work.
- (b) Emergency stop push button shall be installed in the immediate vicinity of the motor.
- (c) Control components such as switches, fuses and circuit breakers shall not be installed in areas with a fire risk unless these components are housed in flameproof enclosures.
- (d) When a motor is stopped due to fluctuation of supply voltage or failure of electricity supply, the motor shall not be restarted automatically when the supply is resumed.
- (e) Starting circuits of appropriate type shall be installed to limit the starting current.
- (f) It is recommended that the voltage for the sensing circuits in the field, e.g. limit switch, flow switch, etc. shall be of Extra Low Voltage, i.e. 50V with centre zero or less. If the sensors are located in areas where flammable gases are likely to be present,



both the voltage and energy for the sensing circuit shall be further reduced by barriers for intrinsically safe circuits.

- (g) Exposed live terminations are forbidden.
- (h) Never bypass the protection devices for electrical apparatus.

#### 7.15.4 Wiring and Installation

- (a) All cables shall run on cable trays or in concealed conduits and protected against mechanical damages.
- (b) Various categories of circuit shall be segregated along cabling routes.
- (c) Neutral conductors shall be clearly distinguished from the phase conductors when single core cables are used.
- (d) Overhead lines shall be mounted on supports of adequate strength. The minimum height above ground of overhead lines shall comply with the "Code of Practice for the Electricity (Wiring) Regulations" published by Electrical and Mechanical Services Department in order to protect persons or equipment passing underneath against contacting live conductors.
- (e) No joints shall be allowed throughout the length of the flexible cable between the electrical equipment and the power supply point unless jointing is made of properly designed cable couplers of appropriate ratings.

## 7.16 Hotwork

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### 7.16.1 General

- (a) Welders shall wear appropriate approved personal protective equipment prior to carrying out welding work. These include face shields, goggles, aprons, gloves, safety shoes and spats, etc.
- (b) Welding shall be carried out by experienced workers with appropriate certificate.
- (c) Welding shall not be carried out in the vicinity of flammable or combustible substances.
- (d) Firefighting equipment, e.g. fire extinguishers, sand buckets, hose reels etc. shall be made readily available. Access to firefighting equipment shall be free from obstruction.

- (e) Steps shall be taken to confirm that sparks from the welding and cutting work are extinguished before leaving the workplace.
- (f) If welding is to take place inside a confined space, the procedures and recommendation as mentioned in Section 7.10 shall also be complied with adequate ventilation and exhaust extraction shall be provided. Gas cylinders shall stay outside the confined space and the torch together with the hoses shall be withdrawn from the confined space when unattended.
- (g) A hotwork permit system shall be in place and strictly implemented.
- (h) The welding process shall be screened off by welding screen in order to minimize the effects on other persons in the vicinity.

#### 7.16.2 Arc Welding

- (a) Adequate and proper ventilation shall be provided and maintained. When work is carried out indoors, local exhaust ventilation (LEV) shall be provided to extract the toxic fumes or gases such as lead, cadmium, beryllium and zinc given off during welding.

- (b) Welding transformers shall be designed, constructed, protected and maintained to prevent electrical hazards. All exposed conductive parts of the transformer shall be properly shrouded or grounded. Transformers with exposed terminals shall not be used.



- (c) Equipment and the workpiece shall be properly and effectively earthed.
- (d) The welding electrode holder shall not be placed on metallic objects or surfaces.
- (e) The process shall not be carried out on wet floor or in humid condition.
- (f) The welding equipment shall not be left unattended while the welding transformer is switched on.
- (g) The welding machine shall be equipped with no-load voltage reducing device so as to limit the voltage to extra-low voltage when it is in idle mode.

- (h) The welding machine shall be switched off and the return cable shall be detached from any metallic surfaces when the welding electrode cable is being relocated. The welder shall not relocate these two cables at the same time.
- (i) Welders shall avoid allowing any part of their body to complete the electric circuit by touching any live parts with wet or damaged clothing, gloves or boots.

#### 7.16.3 Gas Welding and Flame Cutting

- (a) Ensure that gas welding and flame cutting work are only performed by a person who holds a valid certificate under the Factories and Industrial Undertakings (Gas Welding and Flame Cutting) Regulation or is undergoing training under the supervision of a person who holds a valid certificate.
- (b) The acetylene and oxygen cylinders shall only be transported by specially designed trolley equipped with a fire extinguisher of suitable type.
- (c) Gas cylinders shall not be used to support loads.
- (d) Suitable and effective flashback arrestors shall be fitted to the acetylene and oxygen cylinders.
- (e) The gas cylinders shall be kept in upright position and as far away from the hot work as possible. They shall be protected against direct sunlight and heat.
- (f) Gas cylinders shall not be allowed to stand freely. They shall be properly secured by means of racks, chains, etc. to prevent from tipping.
- (g) The equipment assembly shall always be checked for damage. Leaked or broken hoses and mal-functioned pressure regulators and gauges shall be replaced immediately.
- (h) Gas shut off valve at the top of gas cylinder and all other hose connections shall be kept free from oil and grease.
- (i) Only connect the correct type of regulator to the cylinder.
- (j) Always shut off the valve at the top of the cylinders when the gas cylinders are unattended.
- (k) Cylinder valves shall only be operated by standard keys, which shall be kept by the welder at work. Never leave the cylinder key at the top of the gas cylinders.
- (l) Cylinders of oxygen and acetylene shall be stored separately in

dangerous goods store of the appropriate category and class.

- (m) Empty cylinders shall be clearly marked and removed from workplace as soon as possible.
- (n) Before lighting the torch, purge the oxygen and acetylene passages individually in order to expel foreign gases and then adjust the regulator while the gas is flowing.
- (o) Light the fuel gas before opening the oxygen valve on the torch. Torches shall be lit by means of proper sources, such as friction lighter and stationary pilot flames. Never use matches, cigarettes, or cigarette lighters.
- (p) Hose lines shall be coloured in accordance with the gas being conveyed. Red hose shall be used for acetylene and hydrogen, orange hose for propane or other LPGs and blue hose for oxygen.
- (q) The hoses for oxygen and acetylene shall be of equal lengths.
- (r) Hoses shall be arranged so that they are not likely to be tripped over, cut or damaged by moving objects. They shall not be rested on sharp edges.
- (s) Compressed air shall not be used to purge any hose as it may contain oil residue from the air compressor.
- (t) The pressure trapped inside the gas hoses shall be released after work.
- (u) Use of pure oxygen inside confined space shall be forbidden.

## **Tools, Plants and Machinery**

### **7.17 Lifting Appliances and Lifting Gear**

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7.17.1 Officer-in-charge of the sewage treatment facilities and pumping stations shall keep records of the lifting appliances and lifting gear installed in the premises. Apart from the number, type and safe working loads of the lifting appliances and lifting gear, the officer-in-charge shall also keep records of the relevant certificates signed by the competent persons and competent examiners after tests.

7.17.2 The officer-in-charge shall arrange the cranes to undergo appropriate

tests or examinations by competent persons or examiners at scheduled intervals. Reference shall be made to the "Frequency of Test, Examination and Inspection" and the prescribed forms to be used as required by the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations.

7.17.3 If there is any major alteration or repair to the lifting appliances, the lifting appliances in question shall be examined and certified by a competent examiner prior to resuming service.

7.17.4 No lifting appliance and lifting gear shall be used without the valid forms or certificates issued by competent persons or examiners. A lifting appliance can be considered as not in use after it has been isolated from all sources of power and warning notices have been affixed in prominent positions near the lifting appliance concerned.

7.17.5 The safe working load (SWL) certified by a competent examiner shall be clearly marked on the lifting appliances in both English and Chinese.

7.17.6 After tests, the officer-in-charge shall display copy of the valid statutory forms in prominent locations.

7.17.7 Any lifting appliances and lifting gear, which are considered not suitable for lifting, shall be removed from the sewage treatment facilities and pumping stations as soon as possible.

#### 7.17.8 Electrical Equipment

(a) For floor operated cranes, the control pendant shall be supported to avoid the control cable against strain.

(b) The push-buttons in the control pendant shall be able to automatically return to the "OFF" position whenever the push-buttons are released by the crane operator.

(c) The braking system of the crane shall be of fail-safe design.

(d) The power supply to the runway conductors shall be protected by a padlockable isolator accessible from the floor.

#### 7.17.9 Crane Operation

(a) The lifting appliances shall be operated by staff who has completed the relevant approved training courses.

(b) Load shall not be left suspended by a lifting appliance unattended.

(c) Under all circumstances, the load being lifted shall not exceed the safe working load certified by competent examiners.

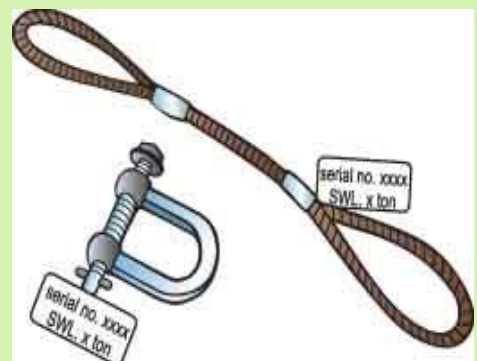
(d) If a signalman is employed to assist lifting operation, ensure

that the adopted system of communication of signals is mutually understood by both the crane operator and the signalman.

- (e) Before a load is hoisted or lowered, the following conditions shall be noted: -
  - (i) Hoist chain or hoist rope shall be free from kinks or twists and shall not be wrapped around the load.
  - (ii) The safety catch of the lifting hook shall prevent the hoist chain or hoist rope from slipping off the hook.
  - (iii) The movements of the suspended load, including hoisting, lowering and travelling shall be free from obstructions.
- (f) During hoisting, ensure that there is no sudden acceleration or deceleration of the moving load.
- (g) Cranes shall not be used for side pulls.
- (h) No hoisting, lowering or travelling is allowed whenever anybody is on the load.
- (i) The operator shall test the brakes whenever a load is about to be hoisted or lowered.

#### 7.17.10 Lifting Gear

- (a) The officer-in-charge of sewage treatment facilities and pumping stations shall ensure that all lifting gears are examined at regular intervals in accordance with the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations.
- (b) The condition of the lifting gear shall be checked prior to use. The lifting gear shall not be used if abnormal condition, e.g. cracks, deformation, corrosion is found.
- (c) Ensure that the safety catch on the hook can operate freely.
- (d) An eye-bolt shall not be used if damaged threads are found.
- (e) The shoulder or collar of an eye-bolt shall be flat, free from damage, and at right angle to the threaded portion.
- (f) Do not overload a shackle, sling or chain. Check for the safe working load (SWL) of a shackle and sling prior to use.





- (g) The pin of a shackle shall be free, but not loose, in tapped hole.
- (h) Do not use fibre or rope slings for hot loads and keep them away from welding or flame cutting operations.
- (i) Slings shall be protected by suitable packing against sharp edges or corners of the load.
- (j) The slings shall be returned to store after the job is completed.
- (k) Do not shorten a chain by making knots.
- (l) Do not lengthen a chain by joining short pieces together.
- (m) Do not expose chains to acids or other corrosive substances, e.g. ferric chloride.

## 7.18 Forklift Trucks and Dumpers

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### 7.18.1 General

- (a) Forklift trucks and dumpers shall not be used unless they are properly maintained in good condition.
- (b) Forklift trucks and dumpers can only be used for transporting goods. Horseplay or transporting of persons shall be forbidden.



- (c) Forklift trucks and dumpers shall only be driven by qualified drivers complying with the Factories and Industrial Undertakings (Loadshifting Machinery) Regulation.
- (d) All parts of the body of the driver shall be kept inside the running

lines of truck during driving.

- (e) Switches shall be turned off when leaving the truck.
- (f) The engine shall be shut off when refuelling. No smoking shall be allowed around the fuelling point.
- (g) Adequate headroom shall be available along the route of the truck.
- (h) No one shall be allowed to stand on or pass under elevated forks.

#### 7.18.2 Driving

- (a) Drivers shall face the direction of travel.
- (b) Empty forks shall be lowered to approximately between 50mm and 150mm above the ground during driving.
- (c) Do not brake the truck suddenly except in emergency, whether or not it is loaded.
- (d) The load shall not be carried at the front when driving down from inclines.
- (e) Trucks shall not be turned on a ramp. Trucks shall always stay away from edges of platforms and bridge plates.
- (f) Never drive up to anyone who is standing in front of a bench, wall or any fixed object.
- (g) Sound horn at crossings.
- (h) Special care shall be taken when driving by or through doorways and around corners where vision is restricted.
- (i) Overspeeding shall be strictly prohibited.

#### 7.18.3 Load Handling

- (a) Loads shall be spread evenly between forks.
- (b) Pallets shall be used for carrying irregular loads.
- (c) Do not pick up loads, which would cause loss of balance of the truck, i.e. the combined centre of gravity of the loads and the truck would be shifted beyond the front wheels of the fork lift truck.
- (d) Do not overload the truck and the forks. Check the weight of the load and the lifting capacity of the forks.

- (e) Tilt load back slightly.

## **7.19 Pressure Vessels**

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- 7.19.1 In accordance with the requirements of the Boilers and Pressure Vessels Ordinance and its Regulations, every new boiler, air receiver, its fittings and attachments shall be examined by an Appointed Examiner before it is put into use. Certificate of Fitness will be issued if the Appointed Examiner is satisfied with the examinations.
- 7.19.2 The boiler, air receiver, its fittings and attachments shall be re-examined by an Appointed Examiner at regular intervals after the date of any certificate of fitness. The interval of re-examination for boiler is 14 months and that for air receiver is 26 months.
- 7.19.3 The officer-in-charge of sewage treatment facilities and pumping stations shall keep records of the registration numbers of the boilers, air receivers and the corresponding safety valves being in service. The registration numbers shall be engraved in conspicuous positions and clearly legible at all times.
- 7.19.4 No isolating device, in the form of valve or the like, shall be fitted between the safety valve and the system to be protected.
- 7.19.5 Safety valves shall be dismantled and inspected periodically.
- 7.19.6 Boilers
  - (a) In general, a boiler shall be fitted with the following features: -
    - (i) safety valve,
    - (ii) water level gauge,
    - (iii) low water level alarm,
    - (iv) stop valve,
    - (v) air vent,
    - (vi) bottom blowdown or drain,
    - (vii) pressure gauge, and
    - (viii) water feed check valve.
  - (b) The heat insulation materials shall be asbestos free.
  - (c) Clearance around the boiler shall be allowed for maintenance

purposes.

- (d) Boiler operator shall inspect all essential parts of the boiler frequently, such as valves, pumps etc.

#### 7.19.7 Air Compressors

- (a) The following information shall be engraved on a plate fixed at a compressor: -
  - (i) the year of construction,
  - (ii) capacity of the compressor,
  - (iii) deliver pressure,
  - (iv) speed, i.e. the number of revolutions per minute (rpm), and
  - (v) power rating.
- (b) All moving parts of compressors shall be effectively guarded against direct contact by persons.
- (c) Air supplied to compressors shall be clean and free from any explosive, flammable or toxic contaminants.

#### 7.19.8 Air Receivers

- (a) In accordance with the Boilers and Pressure Vessels Ordinance, the essential safety requirements for an air receiver are: -

- (i) If an air receiver is connected to a compressor, the receiver shall be constructed to withstand the maximum pressure that can be obtained from the compressor or be fitted with a suitable reducing valve or other suitable appliance to prevent the maximum permissible working pressure of the air receiver being exceeded.



- (ii) It shall be fitted with a spring-loaded safety valve.
- (iii) It shall be fitted with a correct pressure gauge in kPa to indicate the pressure in the receiver.
- (iv) It shall be fitted with drain valve.

- (v) Manhole, handhole or other means shall be provided for interior cleaning.
  - (vi) Distinct mark shall be made when more than one air receiver is being used within a workplace.
  - (vii) The maximum permissible working pressure and the date of last examination shall be legibly marked.
- (b) The compressed air transmission pipeline shall be isolated when compressed air is not required for the process.
  - (c) No work shall be carried out to the pressure vessel and its accessories unless the source of the compressed air, e.g. air compressor, has been isolated and the pressure inside the receiver has been released.

## **7.20 Workshop Machinery and Hand Tools**

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### 7.20.1 General

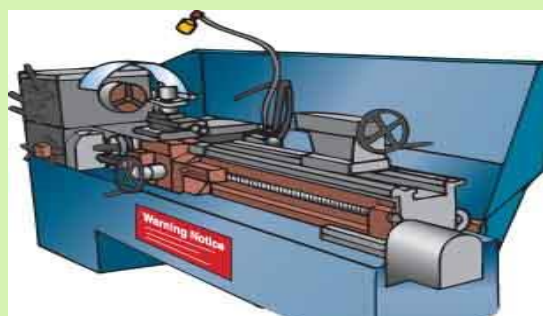
- (a) The Factories and Industrial Undertakings (Guarding and Operation of Machinery) Regulations require that dangerous parts of machinery or plant must be effectively guarded. Details are given in Section 7.23 below.
- (b) Adequate clearances shall be defined for the normal motions of the machine and adequate spaces shall be allowed for the maintenance of the machine.
- (c) The passageway in the workshop shall be identified by marking yellow lines on the floor.
- (d) The workshop shall be adequately illuminated and ventilated.
- (e) Latch type push button or trip-wire shall be installed adjacent to every machine within the reach of the operator. Access to such emergency stop controls shall be free from obstruction.
- (f) Facilities to prevent a machine from restarting automatically when power supply is resumed after interruption shall be installed.
- (g) Padlockable isolator shall be provided for every machine.
- (h) Machinery shall never be left running unattended.
- (i) Operators shall not wear loosely fitted clothing, neckties,

scarves, gloves, watches, rings, bracelets etc. that may entangle with the moving parts of a machine.

- (j) Operators shall wear appropriate personal protective equipment.
- (k) The machine or workpiece shall only be adjusted when the machine is switched off and the corresponding isolator is in the "OFF" position.
- (l) Machine shall only be repaired when the control of the machine is switched off and the corresponding isolator is padlocked in the "OFF" position. Caution notice shall be affixed to the isolator and the machine to prevent the machine from being switched on inadvertently.
- (m) Whenever a machine is isolated for maintenance, a works area for maintenance shall be identified and fenced off. The works area shall preferably be bounded by yellow barrier tapes and shall be free from loose material or slippery substances. Only maintenance personnel shall be allowed to enter the works area.
- (n) Areas shall be assigned for the storage of semi-finished workpieces.
- (o) Apart from the machine operation, all operators shall be trained on other general safety practices, including, among other things, the following: -
  - (i) Do not apply rags or other loose material close to any moving parts of a machine.
  - (ii) Do not attempt to calliper or gauge a workpiece whilst the machine is in operation.
  - (iii) Do not use hands or other objects to stop any moving parts of the machine.

#### 7.20.2 Lathes

- (a) Tools and loose parts shall not be left lying on the machine, especially the chuck wrench or key shall be removed from the chuck immediately after use.





- (b) Effective chuck guard shall be used when a workpiece is being machined by lathe.
- (c) All tools shall be securely fixed onto proper tool holders.
- (d) Unduly long swarf shall be avoided. Removal of swarf by bare hands is strictly forbidden.
- (e) If the workpiece is very long and projects beyond the headstock, the protruded part of the workpiece shall be fenced thoroughly.

#### 7.20.3 Pedestal Drilling Machines

- (a) The drilling machine shall not be used without an effective guard over the complete chuck with drills and the gear mechanism.
- (b) The chuck key shall be removed from the chuck immediately after use.
- (c) Operator shall not hold the workpiece by hand. It shall be held by a proper tool clamp.
- (d) Operator shall wear approved type eyes protection equipment prior to using the machine.



#### 7.20.4 Abrasive Wheels

- (a) Operator shall wear approved type of eye protective equipment, e.g. goggles or face shield, prior to using the abrasive wheels.
- (b) The abrasive wheels shall be properly guarded and shielded.
- (c) The tool rest shall be properly adjusted to give minimum clearance.
- (d) A double-headed abrasive wheel shall not be used by two persons at the same time.
- (e) Abrasive wheels shall only be changed, dressed, examined and tested by a competent person.

#### 7.20.5 Woodworking Machines

- (a) The moving parts of every woodworking machine shall be properly guarded.

- (b) Sufficient clear and unobstructed space around the machine shall be maintained.
- (c) Saw dust shall be removed from the machine at regular intervals of at least once a day.
- (d) Provisions shall be allowed to prevent the working environment from filling with saw dust, e.g. local extraction system.
- (e) Naked flame or smoking is strictly forbidden.
- (f) Adequate number of appropriate type of fire extinguishers shall be provided in the vicinity of the machine.
- (g) Circular saws shall be equipped with the following safety features: -
  - (i) adjustable top guard,
  - (ii) riving knife,
  - (iii) under bench plate,
  - (iv) push-sticks, and
  - (v) emergency stop button.
- (h) Planing machine shall be equipped with the following safety features: -
  - (i) bridge guard,
  - (ii) guide board,
  - (iii) machine table,
  - (iv) push-block, and
  - (v) emergency stop button.

#### 7.20.6 Disc Cutters

- (a) The workpiece shall be held in position by the clamp.
- (b) The protruding ends of the workpiece shall be fenced off and adequate warning notices shall be provided.
- (c) Operators shall wear approved type eye protectors.
- (d) Ensure that the guarding of the cutter shall be in a good condition.

#### 7.20.7 Band Saws

- (a) Adequate space shall be allowed for the movement of the head.

The area around the saw shall be fenced off.

- (b) The workpiece shall be securely held by the clamp.
- (c) Do not leave the workpiece unattended.

#### 7.20.8 Pneumatic Tools

- (a) Air supply hose lines shall be adequately protected against mechanical damage.
- (b) Hoses and connections for portable pneumatic tools shall be properly designed for the pressure and fastened securely to the pipe outlet and equipped with a safety chain.
- (c) Air inlet valve at the portable pneumatic tools shall be closed automatically when the operator's hand is removed.
- (d) Pneumatic tools shall be disconnected from the source of power and the pressure in hose lines shall be released after use.
- (e) Before disconnecting hose lines, the isolating valve at air supply line shall be shut off.

#### 7.20.9 Hand-held Drills

- (a) Operator shall wear suitable eyes protective equipment and respiratory equipment prior to using the hand-held drills.
- (b) The chuck key shall be removed from the chuck immediately after use.
- (c) Operator shall not stop the chuck by hands.
- (d) Other workers working in the surroundings of where hand-held drill is being used shall be warned.

#### 7.20.10 Disc Grinders

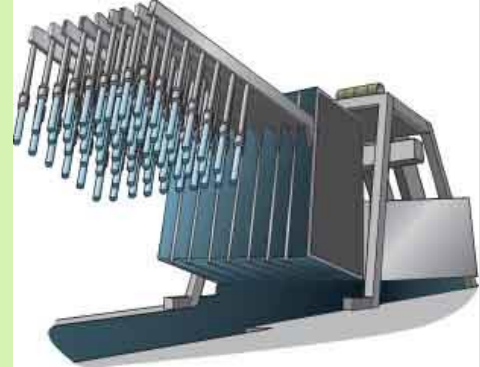
- (a) Operator shall wear suitable eyes protective equipment and respiratory equipment as necessary prior to using the disc grinders.
- (b) The surroundings shall be fenced off and screened to protect other workers working nearby against flying debris from the workpiece.

## 7.21 Protection Against Ultra Violet Radiation

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7.21.1 Ultra violet (UV) ray is now commonly used as disinfection agent in sewage treatment process. It can cause serious damage to unprotected skin and eyes. The UV disinfectant shall be always submerged in wastewater except during maintenance after it has been effectively isolated before being lifted from the wastewater.

7.21.2 Even when the ultra violet disinfectant is submerged in wastewater, no one shall look at it directly or get too close to it without putting on appropriate personal protective equipment, e.g. eye goggles with UV filters complying with BS EN 170:2002, long sleeve ultra violet protective clothing, gloves etc.



7.21.3 Any UV disinfectant removed from wastewater shall be adequately flushed with water before maintenance work commences.

7.21.4 No work shall be carried out in the channel where ultra violet disinfectant is operating. The disinfection process shall be stopped and staff shall follow the relevant safety procedures to cater for the risks of working in confined spaces, working on or near water, working at height and working with electricity etc. whenever any work is to be carried out in the channel.

## 7.22 Elevated Working Platforms and Proprietary Metal Scaffolds

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7.22.1 Elevated working platforms and proprietary metal scaffolds are commonly used for work at height in sewage treatment works and pumping stations. Other types of working platforms and scaffolding, e.g. mobile scaffold, bamboo scaffold, etc., are described in Sections 5.32 to 5.33 of this Manual. Reference shall be made to such sections where applicable.

### **Elevated Working Platforms**

7.22.2 Elevated working platforms may be classified as below according to their modes of operation: -

- (a) articulating boom type,

- (b) telescopic boom type,
  - (c) scissors type, and
  - (d) vertical mast type.
- 7.22.3 Choose elevated working platform suitable for the workplace and nature of work.
- 7.22.4 Carry out installations, erections, re-erections or dismantling under the supervision of competent person and in accordance with the safety instructions of the manufacturer.
- 7.22.5 Set the plant on a firm and level ground and at a safe distance from any installation, electrical equipment or potentially hazardous locations.
- 7.22.6 Install all safety devices and fully extend all outriggers or supports.
- 7.22.7 Carry out periodic examinations, testing and inspections in accordance with the manufacturer's design and safety instructions.
- 7.22.8 Ensure that all parts and devices are thoroughly inspected by a competent person before operation.
- 7.22.9 Provide training for workers in the operation of the relevant models of elevated working platforms and award certificate to trained workers.
- 7.22.10 Take measures to prevent other persons from being endangered.
- 7.22.11 Display notices stating the safe working load (SWL), the maximum number of persons allowed to be carried and the rules on safe operation of the elevated working platform.
- 7.22.12 Do not extend the height, operating angle or working radius of the elevated platform beyond the range set in the design by the manufacturer.
- 7.22.13 Do not overload.
- 7.22.14 Ensure that workers wear personal protective equipment required by the law and recommended by the manufacturer.
- 7.22.15 Ensure that workers do not overstep the area designated for standing and staying on the elevated working platform.
- 7.22.16 Do not move an elevated working platform carrying workers unless this is allowed by the manufacturer's design or instructions.

- 7.22.17 Immediately replace any parts found rusting, distorted or damaged.
- 7.22.18 Carry out examinations, testing and inspections in accordance with the manufacturer's design and safety instructions after substantial repair of the platforms and before re-use.
- 7.22.19 Ensure that all records of examinations, test, inspections, maintenance and repairs are documented and properly kept.

#### **Proprietary Metal Scaffolds**

- 7.22.20 Ensure that the erection, extension and dismantling are carried out by trained workers with adequate experience in accordance with the engineer's design and the manufacturer's safety instruction and technical standards and under the supervision of a competent person.
- 7.22.21 Ensure that the ratio of the height of the erected scaffold to the shortest distance between the external anchors does not exceed 3.5:1 for indoor locations, and 3:1 for outdoor locations, and the scaffold is securely anchored to prevent tilting and falling.
- 7.22.22 Provide the scaffold with safe means of access and egress.
- 7.22.23 Provide working platforms with top guard rails of 900mm to 1150mm in height, intermediate guard-rails of 450mm to 600mm in height and toe-boards of 200mm in height.
- 7.22.24 Ensure that inspections are carried out by a competent person and the scaffold and working platform are certified safe for use under the following conditions: -
  - (a) Before the scaffold is used for the first time after its erection, and within 14 days before each use.
  - (b) After its extension, partial dismantling or alteration.
  - (c) After exposure to inclement weather likely to affect its strength and stability.
  - (d) After the scaffold has been relocated.
- 7.22.25 Ensure that workers use the designated route and method for gaining access to and egress from the scaffold. Do not climb scaffold members in any improper way to avoid affecting the stability of the scaffold, especially a mobile scaffold.
- 7.22.26 Ensure that each worker wears a safety belt and anchors the safety belt to an independent lifeline or a suitable anchorage.
- 7.22.27 Do not relocate any mobile scaffold with worker on it.

- 7.22.28 Carry out regular and special maintenance. Immediately replace damaged parts to ensure the safety and stability of the scaffold.
- 7.22.29 Ensure that all inspection reports and maintenance records are properly kept at the workplace where the scaffold is used.

## 7.23 Guarding of Machinery and Electrical Equipment

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### General

- 7.23.1 Injuries resulting from machinery accidents can often be serious and lead to amputation of fingers, limbs and to various degree of permanent incapacity.
- 7.23.2 Statistics on machinery accidents indicates clearly that not many of these accidents involve prime movers or transmission machinery. Particular attention should therefore be paid to the design, construction, installation and maintenance of guards provided for points of operation.
- 7.23.3 Proper guarding can ensure safe operation at all times, help increase productivity and give confidence to operatives.
- 7.23.4 The Factories and Industrial Undertakings (Guarding and Operation of Machinery) Regulations require that dangerous parts of machinery or plant must be effectively guarded by any one of the following types of methods or by a combination of them: -
- (a) Fixed guard - A fixed guard by its design and construction prevents access to the dangerous part of a machine for which it is provided. Such a guard has no moving parts associated with or dependent upon the machine to which it is fitted. It is a reliable guard and requires little maintenance.
  - (b) Interlocking guard - An interlocking guard is designed to operate in such a manner that the machine on which it is installed cannot be operated unless the interlocking guard is in a closed position; and the guard cannot be opened unless the machine is not in motion. The interlocking devices should be so constructed and located that they cannot be readily tampered with or defeated.
  - (c) Automatic guard - An automatic guard is designed to automatically prevent an operator or his hands from coming into contact with the dangerous part of a machine when that part is in motion. The movable part of the guard should be positively actuated by the movement of the dangerous part of the machinery.
  - (d) Trip guard - A mechanical trip guard consists essentially of a pivoted grid or frame connected to a mechanism which can stop



the machine by throwing out the clutch or belt-striking gear and applying a brake. Another form of a trip guard is the photoelectric safety device, i.e. electric eye.

- (e) Two-hand control device - A two-hand control device is so designed that the operator's hands must continuously engage the controls of the machine in order that its cycle of operation can be completed and if one or both of the operator's hands cease to engage the controls, the machine stops immediately. It is important to install a timer mechanism in a two-hand control device so that the controls must be engaged simultaneously before a cycle of operation can be set in motion.

### **Construction of Guards**

- 7.23.5 Every guard must be rigid and of substantial construction, and the materials incombustible.
- 7.23.6 Wherever practicable, guards should be made from solid material in preference to perforated or open mesh construction. If sheet steel is used, the minimum thickness should be S.W.G.18 (1.2mm).
- 7.23.7 Where open mesh guarding is chosen, the apertures should be such that finger access to the dangerous parts is not possible.
- 7.23.8 Wing nuts or similar fastenings should not be used to secure the various sections of guard because they can be easily removed. The sections should be bolted or riveted.

### **Maintenance of Guards**

- 7.23.9 Guards should be secured in position, and regular and frequent checks should be made to ensure that they are in a good state of repair and kept in position.
- 7.23.10 On many machines, guarding is by enclosure with hinged sections or access doors. Secure locking devices should be fitted to them and measures should be taken to ensure that they are kept in the closed and locked position whenever the machinery is in motion.
- 7.23.11 In cases where a section of a guard has to be removed frequently to afford access, it is a good practice to interlock the section of the guard with the operating mechanism.
- 7.23.12 Investigations into machinery accidents confirm the absolute need for regular inspection and testing of all interlocking guards, automatic guards, trip guards and two-hand control devices.
- 7.23.13 It is strongly recommended that inspections and testing should be

carried out at regular intervals by a competent and responsible person, and that a record should be kept of the results and any action taken.

### **Warning Labels for Electrical Equipment**

- 7.23.14 Warning Labels in English and Chinese shall be provided to warn operation staff and contractors of dangerous or potentially dangerous electrical equipment. In particular, "Danger" labels in both English and Chinese shall be provided on all electrical equipment having removable panels giving access to bare conductors, busbars or exposed terminals.
- 7.23.15 Adequate safety warning signs shall be provided around an electrical equipment under installation, maintenance, testing or operation. Warning signs in both Chinese and English shall be provided around all items of the equipment under automatic control.

## **Safe Use, Handling, Storage, Transport and Disposal of Dangerous Substances**

### **7.24 Chemical and Biological Hazards and Control Measures**

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- 7.24.1 During purchase of chemicals or hazardous substances, Material Safety Data Sheet (MSDS) for the materials concerned shall be obtained beforehand in order to identify the risks and prepare for the precautionary and control measures.



- 7.24.2 Always make reference to the manufacturer's recommendation on the instructions and safety precautions for the use, handling, transport and storage of the chemicals and eventually the disposal of their wastes.
- 7.24.3 Staff who is in the use of or liable to come into contact with chemicals or hazardous substances shall be made known of the information and safety precautions for transportation, storage, handling, use and disposal of the substances. They shall also be informed of the restrictions about mixing the chemicals or hazardous substance with other substances.

7.24.4 Chemicals and hazardous substances shall be properly labelled in accordance with the requirements of the Factories and Industrial Undertakings (Dangerous Substances) Regulations.



7.24.5 Staff shall put on appropriate personal protective equipment (PPE) according to the recommendation stated on the Material Safety Data Sheet or recommendation of the manufacturer prior to handling chemicals and hazardous substances. The PPE commonly used for handling chemicals and hazardous substances are protective clothing, apron, chemical resistant gloves, face shield, etc.

7.24.6 If a chemical or hazardous substance is classified as dangerous goods in accordance with the Schedule 1 of the Dangerous Goods (Application and Exemption) Regulations and the quantity of which exceeds the exempted quantity, it shall be stored in dangerous goods store of appropriate category and class.

7.24.7 Emergency decontamination facilities shall be made readily available in the vicinity of the chemical being handled. The most common decontamination facilities are emergency shower and eyewash fountain operated by foot pedal.

7.24.8 Chemical storage tanks and the associated accessory plants shall be inspected for leaks at regular intervals.

7.24.9 Before carrying out overhaul work of equipment and machinery used to hold chemicals, the equipment and machinery shall be thoroughly flushed with water prior to work.

7.24.10 Contaminated flushing water shall be guided to a wastewater collection point inside the sewage treatment facilities.

7.24.11 Vehicles for transportation of chemicals and hazardous substances shall comply with the requirements of the Transport Department and with appropriate labels affixed on them.

7.24.12 Only compatible chemicals shall be transported in the same vehicle. Different chemicals shall be separated by compartments during transportation.

- 7.24.13 Staff shall be reminded of maintaining personal hygiene during work, e.g. wash hands after work and before eating.
- 7.24.14 Ensure that wounds have been properly protected prior to handling chemicals or hazardous substances.
- 7.24.15 Eating, drinking and smoking are forbidden while handling chemicals or hazardous substances.

## 7.25 Storage of Dangerous Goods

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- 7.25.1 Dangerous goods exceeding the exempted quantity shall be stored in dangerous goods stores of appropriate category and class. The category and class of dangerous goods commonly used in sewage treatment facilities and pumping stations are shown in the table below: -

Dangerous Goods	Category	Class	Exempted Quantity
Oxygen	2	1	2 Cylinders
Acetylene	2	3	2 Cylinders
Compressed air	2	3	2 Cylinders
Battery Electrolyte			
(a) Sulphuric Acid of strength not exceeding 50% by weight	3		25 litres
(b) Sulphuric Acid of strength exceeding 50% by weight	3		10 litres
(c) Solution of Potassium Hydroxide (Caustic Potash)	3		50 litres
Benzine (Petroleum spirit)	5	1	20 litres
Bleaching powder (Chloride of lime, calcium hypochlorite)	4	1	250 kg
Chlorine	2	2	Nil

Diesel	5	3	2,500 litres
Lacquer/paint thinners	5	1	20 litres
Paint, lacquers and varnish	5	1	Not exceeding an aggregate of 250 litres
Sodium hypochlorite solutions	4	1	250 litres
Turpentine and turpentine substitutes	5	2	20 litres



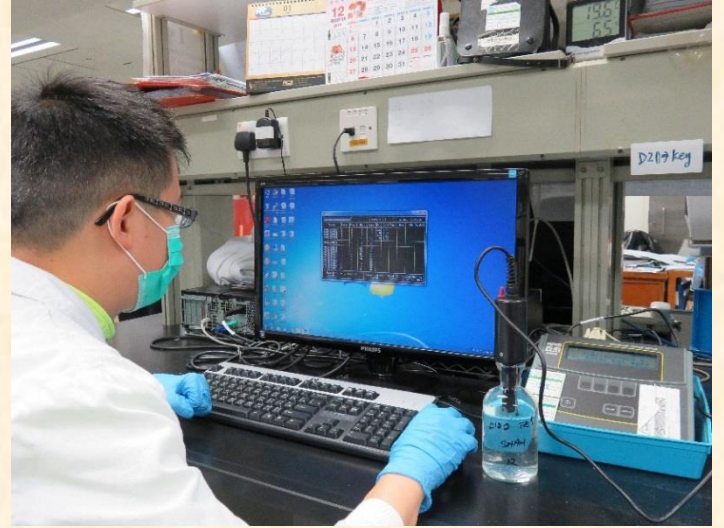
**Dangerous Goods Store**

## 7.26 Spillage of Chemicals

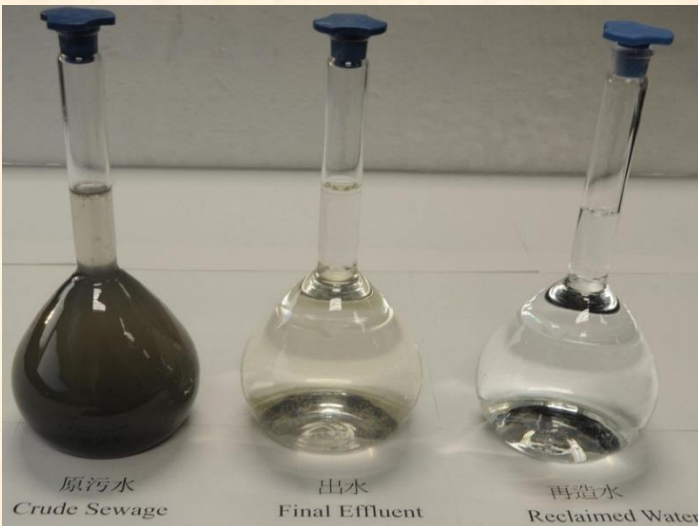
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- 7.26.1 In case of minor spillage of chemicals and hazardous substances in the laboratory or other workplaces in sewage treatment facilities and pumping stations, reference shall be made to the safety measures regarding handling, cleaning and disposal of spilled substances as detailed in Section 8.7 of this Manual.
- 7.26.2 For larger area of spillage that may lead to serious incident, the relevant contingency plan shall be invoked to control the spillage and prevent injury to persons nearby. The incident shall be reported to the management according to the divisional instruction or departmental technical circular for monitoring of the situation and review.
- 7.26.3 Regular drills on accident spillage of chemicals and hazardous substances should be conducted in order to ensure staff working there to familiarize themselves with the relevant contingency plan.





# SAFETY IN LABORATORY



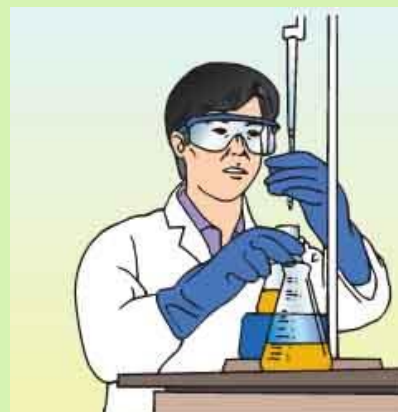
# CHAPTER 8

## Safety in Laboratory

### 8.1 General

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- 8.1.1 Staff working in laboratories shall be fully conversant with DSD's "Safety Guidelines for Laboratory Staff (issue date 03/05/11)".
- 8.1.2 Every staff shall be alert of any unsafe conditions and unsafe acts in the laboratory and shall report the same to the officer-in-charge if discovered.
- 8.1.3 Eating, drinking and smoking are not permitted in the laboratory.
- 8.1.4 No food or drink is allowed to be stored in the refrigeration units used in the laboratory.
- 8.1.5 No running and horseplay in the laboratory.
- 8.1.6 Hands must be washed before work, and before leaving the laboratory.
- 8.1.7 Hair shall be tied back and off the shoulders to keep out of inadvertent contact with hazardous chemicals or any machinery.
- 8.1.8 Avoid wearing loose or over-sized clothing.
- 8.1.9 Proper footwear shall be worn in laboratory. Sandals and high heels shall not be worn.
- 8.1.10 Eye protection such as safety goggles or face shields must be worn when handling hazardous chemicals. Full face shield shall be worn when dealing with corrosive chemicals.
- 8.1.11 Staff wearing contact lenses are not recommended to perform experiments without wearing safety goggles or face shield.
- 8.1.12 Experiments shall not be left unattended. An experiment is considered to be unattended if no one in the laboratory is knowledgeable of the operation and the shutdown procedures to be followed in case of emergency.



**Wearing of Suitable PPE**



8.1.13 Experiments involving the use of toxic or odious chemicals or substances shall be carried out in fume cupboards. When work is being carried out in fume cupboards, the following points shall be noted: -

- (a) Verify that the fume cupboard is exhausting and air recirculation is not allowed.
- (b) Work with the sash at the designed location and the hood shall not be used with the sash above this location.
- (c) Locate the work at not less than 150mm away from the edges of the working surface.
- (d) Maintain visibility at the face of the hood.
- (e) Papers and other light materials inside the fume cupboard shall be secured.



**Flume Cupboard**

8.1.14 Do not use broken or chipped glassware. Do not leave pipettes sticking out of bottles, flasks or beakers.

8.1.15 Never pipette chemicals by mouth.

8.1.16 Always point the mouth of a test tube or flask away from people while a reaction is underway.

8.1.17 Do not mix chemicals unless instructed.

## 8.2 Security

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8.2.1 Unauthorized access to laboratory shall not be permitted unless approval from the officer-in-charge has been obtained.

8.2.2 Attendance log shall be maintained to record the persons attending and leaving a laboratory.

8.2.3 Laboratory staff shall not work in the laboratory alone without prior approval by the officer-in-charge.

8.2.4 Do not take away any apparatus, materials or chemicals from the laboratory without permission.



**Access Control**

## 8.3 Working Environment and Housekeeping

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8.3.1 Laboratories shall be adequately illuminated.

8.3.2 Ventilation of the laboratory shall not be less than ten air changes of 100% fresh air per hour. It shall be designed to carry contaminants away effectively from the breathing zone of the personnel.

8.3.3 The laboratory area must be kept neat and orderly.

8.3.4 The design of floor of the laboratory shall enable easy cleaning e.g. seamless floors and curved joints to walls.



**Housekeeping**

8.3.5 Bench tops shall be resistant to the attacks of acids, bases, solvents and heat and shall not absorb water.

8.3.6 Benches and floor shall be maintained clean, tidy and dry.

8.3.7 Used equipment, bags, refuses etc. must not be left on benches.

8.3.8 Insoluble wastes shall not be disposed of in the sink.

8.3.9 All chemicals shall be correctly and clearly labelled. The label shall include the common name or chemical name and the hazards of the chemical in accordance with the Material Safety Data Sheets (MSDS).

8.3.10 Bottles containing chemicals shall not be stored in shelves or cabinets at high levels.

8.3.11 Shelves and cabinets for storing chemicals shall be robust enough.

8.3.12 Spillage of water on the floor must be mopped up immediately.

8.3.13 Reagents shall be stored according to their compatibilities.

8.3.14 All gas cylinders shall be secured properly. No free-standing gas cylinder shall be allowed.

## 8.4 Handling of Glass

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- 8.4.1 The risk of injury from the storage, use, handling of glassware and disposal of broken glass exists in most workplaces. Broken glass can cause lacerations, cuts and puncture wounds, which may result in severed arteries or tendons, amputations, eye injuries, or exposure to disease.
- 8.4.2 Keep glass containers off machines, work benches or window sills and off the floor. Never throw glass in part or whole into open receptacles since there is danger of flying broken glass.
- 8.4.3 Glass light fixtures in the workplace shall be guarded to prevent accidental breakage.
- 8.4.4 Suitable gloves and goggles shall be worn in workplace where glass is handled frequently and where there is the possibility of exposure to disease, toxic substances, harmful irritants and flying glass fragments etc.
- 8.4.5 A warning sign should be posted in the area with glass breakage. Never handle broken glass with bare hands. Use pieces of cardboard, heavy paper, dustpan and brush to collect broken glass. Small particles should be picked up with sufficiently thick wet paper towels and discarded. Do not use cloth napkins, cloth towels, sponges or ordinary mops for clean up since they can harbour tiny glass particles. For broken glass containers with liquids, use an ordinary long-range rubber squeegee or broom with a dustpan for safe removal.
- 8.4.6 Separate broken or discarded glassware from other waste to prevent injury, in particular if it is contaminated with hazardous material. Pack and place it alongside the waste basket and mark it clearly.
- 8.4.7 Where glass particles may be flushed down drains, solid interceptors should be installed to collect the particles. The interceptor should be cleaned by wet vacuuming before starting any work on the drains.

## 8.5 Fire Prevention

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- 8.5.1 Every person working in the laboratory shall know the locations of the fire fighting equipment, fire escape routes and gathering place.
- 8.5.2 All emergency exits must be free from obstruction.
- 8.5.3 All naked flames must be off when the experiment is unattended.

- 8.5.4 All firefighting facilities including fire extinguishers, automatic fire alarm system etc. shall be maintained regularly.
- 8.5.5 Fire extinguishers shall be refilled after discharge.
- 8.5.6 Fire blankets shall be made available for extinguishing fires on clothing and other small fires.
- 8.5.7 No more than one cylinder of highly flammable gas shall be kept in one room. Standby cylinders whether full or empty must not be stored in the laboratory.
- 8.5.8 Valves of all flammable gas cylinders shall be shut off when the laboratory is unattended.
- 8.5.9 Never pour flammable liquids into the sink or the drainage system.
- 8.5.10 Before lighting a flame, confirm with colleagues working in the vicinity that no inflammable solvents are being used.



## **8.6 Transportation, Storage, Handling, Use and Disposal of Chemicals and Hazardous Substances**

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- 8.6.1 Every chemical shall be labelled. The relevant information of the chemical safety data sheets (CSDS) on the handling practices, inventory and storage principles shall be shown.
- 8.6.2 Chemicals shall not be handled with bare hands, especially concentrated acids and bases.
- 8.6.3 When using volatile solvents, bases and acids, the work shall be carried out inside a fume cupboard.
- 8.6.4 Refuses from chemical processes shall be disposed of at designated vessels with proper label for bulk disposal. Incompatible wastes shall never be mixed. If in doubt, consult a more knowledgeable person.
- 8.6.5 Expired and obsolete chemicals shall be disposed of through a chemical waste disposal programme. The programme shall comply with the requirements of the Waste Disposal Ordinance.

## 8.7 Accidental Spillage of Chemicals and Hazardous Substances

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- 8.7.1 In case of spillage of chemicals and hazardous substances, the officer-in-charge shall be informed. The officer-in-charge shall order to proceed with the emergency procedures to control the spillage or the hazards to persons working in the laboratory.
- 8.7.2 If the spilt substance is a dry or non-volatile material, which has become aerosols, the laboratory shall be evacuated and confined with doors and windows closed and fume cupboards shut off in order to allow the aerosols to settle.
- 8.7.3 If the spilt substance is volatile, leave ventilation on and vacate the laboratory with the door closed.
- 8.7.4 If the spillage is a biological liquid, pour the decontaminating solution appropriate to the nature of the material and work from the perimeter of the spill inwards.
- 8.7.5 For a liquid carcinogen or other hazardous chemical spill, wipe up the spill with absorbent towel. Wash down all surfaces with the decontaminating solution appropriate to the nature of the material.
- 8.7.6 For a dry chemical or biological spill, wash down all surfaces with an appropriate solvent to neutralize and remove the substance.
- 8.7.7 All contaminated materials must be placed in proper impermeable containers and sealed. Disposal of which shall follow the proper procedures.



Handling of Spillage

## 8.8 Manual Handling

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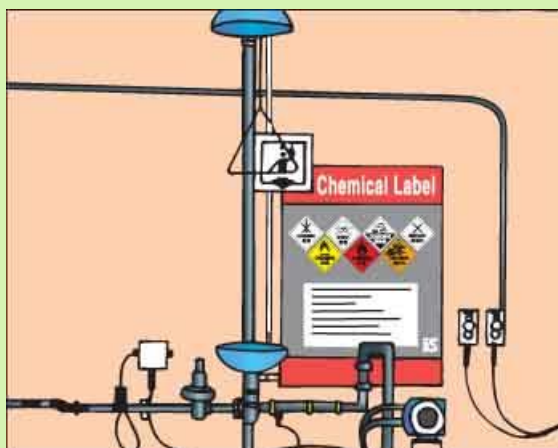
- 8.8.1 The general safety precautions for preventing muscular strain and injury during manual handling as detailed in Section 7.14 shall be taken. The correct steps and postures shall be adopted for lifting and handling any heavy objects in the laboratory.
- 8.8.2 Extra precautions shall be taken to look out for any possible danger of spillage of the chemicals or hazardous substances being handled. The lids of any containers shall be tightened before lifting and transportation. Whenever necessary, suitable protective clothing and face shield shall be worn during handling of corrosive substances.

- 8.8.3 Always plan ahead for the lifting method, the route of travel, the landing place and the emergency procedure to tackle any possible spillage of chemicals.

## 8.9 Emergency Preparedness

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- 8.9.1 Escape routes and emergency exits must be clear of obstruction and exit doors must be able to open from inside at all times.
- 8.9.2 All staff shall know the locations of the emergency facilities including eye wash fountain, emergency shower, fire alarm switch, fire extinguisher, first aid box, etc.



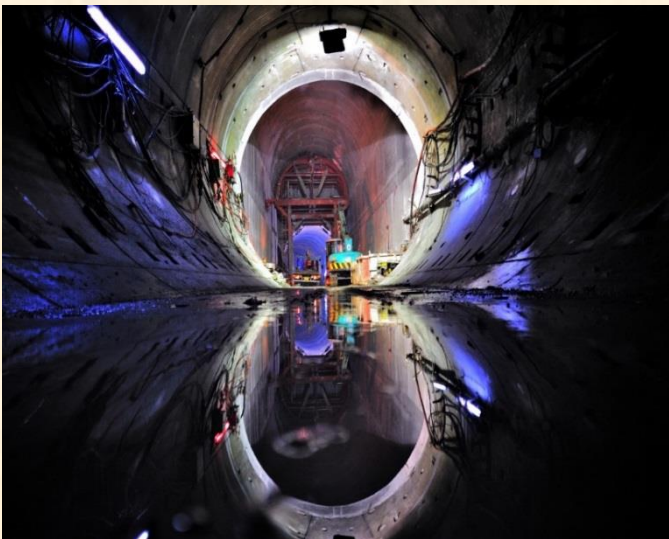
**Emergency shower and eye wash fountain**

- 8.9.3 When the emergency alarm is triggered, all staff shall leave the laboratory orderly. The naked flames shall be shut off before leaving.
- 8.9.4 In case of emergency, the following procedures shall be followed: -
- Alert colleagues in the vicinity of a fire or abnormal situation and they shall be informed of the nature and effect of the abnormalities.
  - The fire or abnormalities shall be confined by all resources available.
  - Inform the officer-in-charge, who shall order to proceed with the emergency procedures.
  - Evacuation of the entire building may be required if the abnormalities are out of control.

8.9.5 The officer-in-charge of a laboratory shall draw up and keep updating emergency procedures to deal with situations like fire, explosion, spillage or leakage of hazardous chemicals, serious injuries, etc. The emergency procedures shall be made known to all staff concerned especially those newly recruited. Emergency drill shall be carried out at regular intervals.



# 9



## *Safety of Construction and Maintenance of Tunnels*

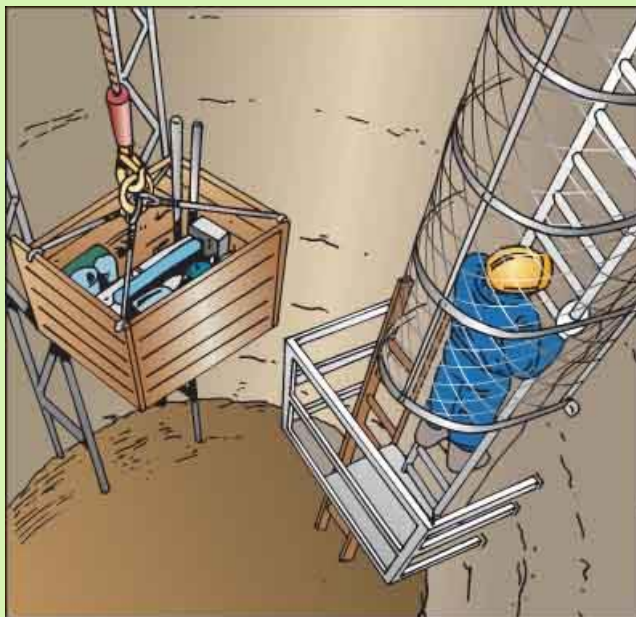
# CHAPTER 9

## Safety of Construction and Maintenance of Tunnels

### 9.1 General

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- 9.1.1 Information shall be obtained regarding the locations of any landfills, sewers or gas mains in the vicinity of the tunnels to identify possible sources of toxic or explosive gases, which may find their way through joints or fissures into the tunnels.
- 9.1.2 It shall be the duty of all persons to report any abnormal circumstances thought likely to give rise to an emergency.
- 9.1.3 Means of access such as ladders and walkways, which are independent of hoists or other mechanical equipment shall be provided inside the access shafts in all cases.

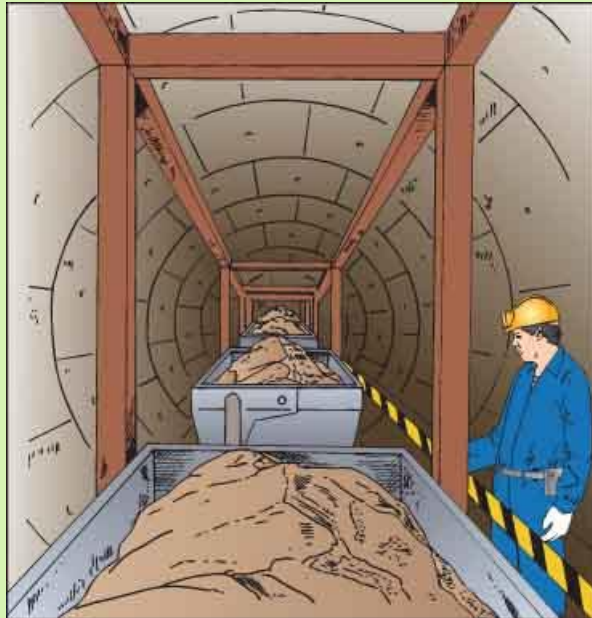


- 9.1.4 A clear, durable and up-to-date diagram showing the layout of the underground works including tunnels, adits and access shafts etc. shall be posted at conspicuous locations at each entrances.
- 9.1.5 Entry into the tunnel shall be prohibited after a break in the work inside the tunnel or operation of the ventilation system, unless it is declared safe to enter after the atmosphere of the entire tunnel has been thoroughly checked.
- 9.1.6 If explosives are used, the whole tunnel shall be evacuated prior to blasting.

- 9.1.7 In the case that the tunnel is constructed by drill and blast method, scaling down of loose rock shall be done by experienced persons in a systematic manner working towards the face. The areas that have been previously scaled shall also be checked again, in addition to checking the area of the ground that has just been fired.
- 9.1.8 Workers shall be certified physically fit and properly trained prior to working in compressed air environment.
- 9.1.9 In the case that the tunnel is accessed through a shaft, provisions at ground surface shall be erected to prevent falling of persons and to protect workers below against falling objects.
- 9.1.10 The tunnel shall be evacuated in the case of ventilation failure or imminent danger, e.g. collapse of the roof and sides, flash flood or presence of flammable gases being detected.
- 9.1.11 The use of laser in the tunnel alignment control work shall be governed by the "Laser Safety Guidance Notes for Industry, Display and Entertainment (2005)" published by Electrical and Mechanical Services Department, Hong Kong Government. A Designated Laser Safety Officer (DLSO) shall be appointed to take charge of all the safety issues related to the use of laser in the tunnel, regardless of the class of laser products. The DLSO shall have received training provided by the manufacturer of the laser equipment on the safe use of the equipment and attended a certificate course entitled "Laser Safety" run by the Occupational Safety and Health Council (OSHC), or its equivalent.
- 9.1.12 Electric arc welding and flame cutting and welding shall be strictly controlled by a hotwork permit system. Smoking, naked fire and other sources of ignition shall be strictly prohibited. No worker shall be allowed to bring into the tunnel matches or cigarette lighters.
- 9.1.13 Workers shall be provided with suitable personal protective equipment (PPE) including waterproof clothing with reflective strip, rubber boots with steel toe cap and mid-sole, gloves suitable for the work, ear muffs or ear plugs, mask or other suitable respiratory protection equipment, emergency breathing apparatus (chemical type), helmet fitted with chin strap and cap light, flameproof torch, etc. A suitable tag-in and tag-out system for recording the number of workers in the tunnel shall be implemented.
- 9.1.14 All areas inside the tunnel shall be thoroughly examined for determining the suitable types of ground supporting system such as arches, soil nails, rock anchors and shotcrete, etc. Areas not requiring any supporting system shall be inspected and checked regularly to ensure that they are safe.
- 9.1.15 If locomotives are used for transportation in the tunnel, a minimum clearance of 500mm between any part of the vehicles and fixed equipment at the sides of the tunnel shall be maintained. Where walkway is provided



in the tunnel, precautions shall be taken to ensure the safety of personnel using it during the passage of vehicles unless the simultaneous passage of personnel and vehicles is prevented. Adequate clearance shall be provided and extra clearance shall be allowed for side throw and sway of vehicles. Where continuously adequate clearance is not possible, refuges can be provided at intervals of no more than 18m. The refuge can be cut into the side of the tunnel or be prefabricated platforms fixed to the tunnel sides with guardrails and can be accessed easily.



9.1.16 Vaporizing liquid extinguishers shall not be used in tunnels as the toxic nature of the products of combustion makes them dangerous in a confined space.

9.1.17 In the case that tunnel construction involves ground injection, the following safety measures shall be observed: -

- (a) Arrangements for collection and disposal of waste shall be made in advance and approved by the relevant authorities.
- (b) Provision of protective clothing and full washing facilities especially when the grouts to be handled are toxic.
- (c) Provision to maintain a high standard of cleanliness and ample supply of fresh air.
- (d) Protective measures to safeguard adjacent ground, services and property.

9.1.18 In the case that tunnel construction involves compressed air, the following safety measures shall be observed: -

- (a) Control of air pressure shall be exercised by qualified and experienced persons.

- (b) Protection against ground settlement or uplifting.
- (c) No burning or welding shall be done unless there is a fire watchman in attendance equipped to extinguish any spark or fire. Pressurized fire extinguishers shall not be used unless specifically proved to be suitable for the compressed air conditions.
- (d) Only self-contained breathing apparatus (SCBA) shall be used.

9.1.19 The quantity of gas cylinders, oil fuels, explosives, or other combustibles brought into the tunnel shall never be more than that is needed for immediate use.

9.1.20 Reference shall also be made to BS 6164:2011 - "Code of Practice for Health and Safety in Tunnelling in the Construction Industry".

## **9.2 Working Environment**

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### **Ventilation**

- 9.2.1 An alternating ventilation system (i.e. dual purposes for supplying fresh air and extracting smoke according to the prevailing situation) shall be a minimum requirement. The quantity of fresh air supplied to a tunnel shall be determined by taking into account the breathing requirements, necessity of diluting pollutants and requirements for cooling purposes. Other suitable types of ventilation shall be used depending on the particular circumstances of each case.
- 9.2.2 Particular attention shall be paid on dangers, which could arise in areas where there is little circulation of air. Gases denser than air, such as carbon dioxide and hydrogen sulphide, tend to flow to low points and remain there. Methane is lighter than air and any accumulation will be at high level.
- 9.2.3 The radon concentration in the tunnel shall be less than 900Bq/m<sup>3</sup>.
- 9.2.4 A minimum oxygen concentration of 19.5% and a maximum of 23% by volume shall be maintained in the tunnel.
- 9.2.5 The wet-bulb temperature in the tunnel shall preferably be kept below 27°C. At higher temperature, medically fit persons shall be preferably employed and safety precautionary measures against heat stress shall be implemented.
- 9.2.6 The atmosphere in the tunnel shall be monitored on a regular basis, but under no circumstance shall be less than once every day. The concentration limits of various dangerous gases likely to be found in tunnels are given below: -

Gas	Relative Density	Concentration shall not exceed (p.p.m.)	Explosive limits (%)	
			Lower	Upper
Carbon Monoxide (CO)	0.97	50	-	-
Carbon Dioxide (CO <sub>2</sub> )	1.53	5000	-	-
Nitric Oxide (NO)	1.04	25	-	-
Nitrogen Dioxide (NO <sub>2</sub> )	1.60	3	-	-
Methane (CH <sub>4</sub> )	0.60	-	5.3	14
Hydrogen Sulphide (H <sub>2</sub> S)	1.70	10	4.3	46
Sulphur Dioxide (SO <sub>2</sub> )	2.30	2	-	-
Propane	1.55	-	2.2	9.5
Butane	2.10	600	1.5	8.5
Acetylene	0.91	-	2.5	81.0
Petrol/Diesel Vapour	-	-	1.3	7.5
Ozone	1.6	0.1	-	-

## Dust

9.2.7 Dust generation shall be suppressed at source by water spraying and extract ventilation.

9.2.8 In any case exposure of any person to dust average over a shift shall not exceed the occupational exposure limit (OEL-TWA) for an 8-hours working day. The most common form of crystalline silica in Hong Kong is quartz and the occupational exposure limit (OEL-TWA) for quartz in dust form shall be 0.1mg/m<sup>3</sup>.

9.2.9 When the percentage of quartz in a dust sample cannot be immediately

determined, a dust level of 1.25 mg/m<sup>3</sup> shall be adopted. When this level is exceeded, adequate respiratory protective equipment (RPE) shall be worn by all persons at risk, or the generating processes shall be stopped or controlled until the dust levels are reduced.

9.2.10 Dust hoods, in the form of enclosures with extraction, shall be fitted to known dust sources, such as at belt conveyor transfer points.

9.2.11 Respiratory protective equipment (RPE) shall not be used as a means of permanent protection. It shall only be used for short periods when general control measures cannot effectively limit dust levels at certain places where men need to work.

9.2.12 Workers exposed to dust containing crystalline silica shall be under medical surveillance with regular examination to determine fitness and detect any adverse health effects at an early stage.

9.2.13 The dust levels in tunnels shall be regularly monitored.

#### **Illumination**

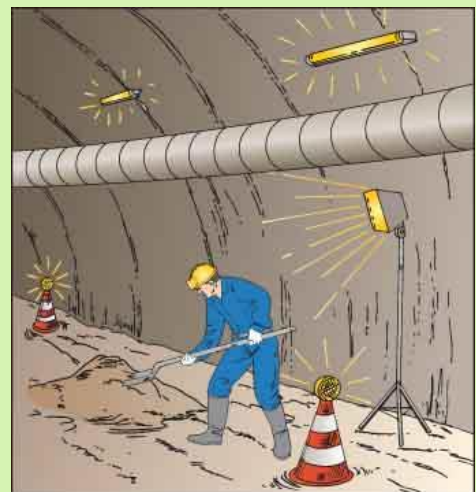
9.2.14 The intensity of light shall not be less than the following figures: -

(a) 10 lux at surface level for walkways and tracks, and

(b) 100 lux at working surfaces for general working areas.

9.2.15 The work face, crane lifting point and any areas in which excavating or lifting machines are working shall be floodlit from at least two sources separated as widely as possible and to a level not less than 100 lux.

9.2.16 All lamps shall be fixed as high as possible in the tunnel to obtain maximum uniformity of lighting and reduced contrast and to minimize vulnerability to damage. Glare shall be avoided by proper siting and angling, and the use of diffusers and screening.



9.2.17 Separate standby emergency lighting appropriate to the scale and scope of the work shall be provided.

9.2.18 Emergency lights at appropriate spacing shall be provided along the tunnel in case of power blackout.

#### **Noise**

9.2.19 Noise assessment shall be carried out by a competent person for every



noise producing operation as per Factories and Industrial Undertakings (Noise at Work) Regulation. The competent person shall give instructions on the necessary precautionary measures to be observed by the site personnel.

- 9.2.20 All plants or equipment shall be selected with due consideration of sound power levels (SPL) and shall be silenced to the greatest degree practicable.
- 9.2.21 All noise limiting devices shall be properly maintained.
- 9.2.22 Ear muffs or ear plugs shall be worn in accordance with manufacturers' instructions. Suitable types of ear muffs and ear plugs shall be selected and they shall be those approved by the Commissioner for Labour.
- 9.2.23 Arrangement shall be made for excessively noisy operations to be temporarily suspended so that necessary directions can be given clearly.
- 9.2.24 Visual alarm signals shall be provided in addition to audio ones in noisy areas along the tunnel.

## **9.3 Plant and Equipment**

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### **Lifting Equipment**

- 9.3.1 All lifting appliances and lifting gear shall be inspected, examined and tested in accordance with the requirements of the Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations.
- 9.3.2 All passenger hoists shall be inspected, examined and tested in accordance with the requirements of the Builders' Lifts and Tower Working Platform (Safety) Ordinance.
- 9.3.3 Special precautions shall be taken to minimize ground settlement in the vicinity of shafts. Loading due to crane footings shall be spread as widely as possible and excessive lateral loads against the ground near the shaft lining shall be avoided.
- 9.3.4 Precautions shall be taken during lifting so that: -
  - (a) the load or skip does not swing as to cause it to strike the shaft lining or other structures; and
  - (b) the load or skip does not catch a ledge as to cause it to tip over and spill out its contents.

## Transport

9.3.5 All locomotives used in a tunnel shall have at least the following features:

- (a) Adequate, effective and fail-safe braking system.
- (b) Headlights at both ends to enable driver to be aware of obstacles and alert other workforce along the rail.
- (c) An effective "deadman" control to prevent the locomotive from running away under power.
- (d) A flashing beacon and horn capable of alerting personnel some distance ahead of the locomotive.
- (e) Construction in non-combustible materials throughout and with properly designed robust containers, suitably ventilated, for all liquids such as battery acid or fuel oil.
- (f) The exhaust system shall be fitted with a catalytic reactor to convert the nitrogen oxides in the exhaust gas into nitrogen and water.
- (g) Provision of portable fire extinguisher of suitable type.



9.3.6 A competent person shall check and if required, service the locomotive at least weekly when in use.

9.3.7 For battery-operated locomotives the charging of batteries shall be carried out in a designated area, which is well ventilated to disperse the hydrogen given off during charging and is near a supply of clean water to wash off the spilt acid. The correct type of charger shall be used for each battery to ensure a safe rate of charging and eliminate excessive heat generation and possible explosion of cells.

9.3.8 If belt conveyors are used for muck disposal, all moving parts shall be properly guarded and continuous trip-wire actuated emergency stop switches, which are easily accessible shall be installed at both sides throughout the whole length of the conveyors.

## Emergency Power Supply

9.3.9 In case of supply mains failure, the following services for the tunnel shall be powered by emergency generator in as a short period of time

as is reasonably practicable after the supply mains failure: -

- (a) mechanical ventilation inside the tunnel,
- (b) water pumps,
- (c) illumination inside the tunnel,
- (d) compressors for pressurized tunnels, and
- (e) signalling and communication system.

9.3.10 Visual and audio alarm system shall be provided to give out alarms should there be any abnormalities and/or interruptions to important services, e.g. failure in the electrical supply and control accessories, isolators for any one of the equipment being switched off accidentally, etc.

#### **Electrical Equipment and Accessories**

9.3.11 All electrical equipment used in tunnels shall be of explosion proof type or of intrinsically safe type complying with BS EN 60079-1:2014 and BS EN 60079-11:2012 respectively.

9.3.12 All hand-held portable tools shall be double-insulated at voltage not exceeding 25V.

9.3.13 All electrical circuits in tunnels shall be protected against earth leakage with appropriate settings.

9.3.14 The insulation of the cables used in tunnels shall be of zero halogen low smoke emission type complying with BS 6724:2016, BS 7211:2012 or BS 7629-1:2015. PVC insulated cables shall be forbidden for use in tunnels.

9.3.15 If switchgear is used in tunnels, it shall be of vacuum or gas insulated type switchgear.

9.3.16 Silicon oil conforming to BS EN 60836:2015 shall be used as insulating liquid in electrical apparatus in tunnels.

#### **Pneumatic Tools**

9.3.17 All supply lines and flexible hoses shall be protected and secured.

9.3.18 Hoses shall be adequate for the working pressure and equipped with properly fitted connectors and safety devices to prevent detachment, e.g. safety pins, whip checks, etc. They shall be regularly inspected for damage.

9.3.19 All pneumatic tools shall be fitted with silencers and means of dust suppression.

#### **Hydraulically Operated Plant**

9.3.20 The hydraulic oil for hydraulically operated plant for use in tunnels shall be of fire resistant type complying with BS EN ISO 7287:2002.

9.3.21 All hydraulic hoses shall be selected to suit the maximum circuit pressure and they shall be properly protected and maintained. A colouring system shall be adopted for the hydraulic hoses to make them easily identifiable in the dim and congested working environment in tunnels.

#### **Internal Combustion Engines**

9.3.22 Diesel engines, whether used for haulage of other mobile equipment or for stationary plant, shall not be used unless adequate provision has been made for ventilation and for the storage and handling of fuel.

9.3.23 Petrol engines shall not be used underground except in an emergency when other alternatives are impracticable. The following measures shall be taken when this type of equipment is used: -

- (a) The number of persons underground shall be restricted.
- (b) Adequate ventilation shall be provided and maintained.
- (c) The time of operation shall be limited.
- (d) Immediate transportation of the equipment to the surface on completion of operations shall be ensured.

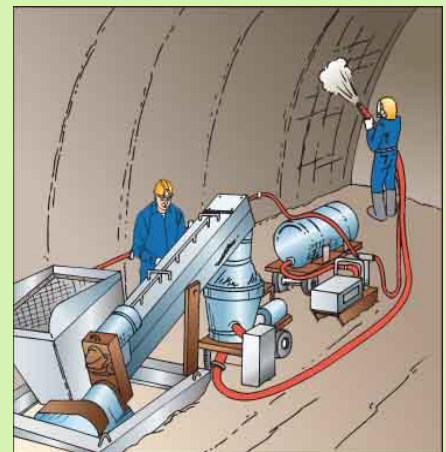
9.3.24 Internal combustion engines used at the ground surface shall be so sited that exhaust fumes cannot enter the ventilation system or compressed air intakes or enter the tunnel by any shaft or other openings.

#### **Shotcreting Plant**

9.3.25 Only suitable hoses, pipes and couplings shall be used for pressure pumping. Standard pipe coupling may be unsuitable for higher pressure applications and advice shall be sought from the pump supplier.

9.3.26 Always aim the lance at the work. Never point it at any person whether or not work is being carried out.

9.3.27 Suitable personal protective equipment



such as goggles, respirator, protective clothing and gloves shall be worn.

9.3.28 Only a trained team shall be allowed to carry out shotcreting work.

## 9.4 Alarm System

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9.4.1 Suitable audio and/or visual alarm system commensurate with the working conditions in the tunnel shall be provided. The alarm shall be clearly perceptible to all persons at work inside the tunnel and the key personnel above ground. The signalling arrangement shall include any of the following as appropriate: -



- (a) horn,
- (b) suitable telephone communications,
- (c) hand or electrically operated bells or sirens, and
- (d) special flashing lights or flashing of the main lighting circuits.

9.4.2 A separate and distinct signal ordering the immediate evacuation of the tunnel shall be provided in addition to those provided under paragraph 9.4.1.

9.4.3 All installed alarm systems shall be regularly tested and properly maintained.

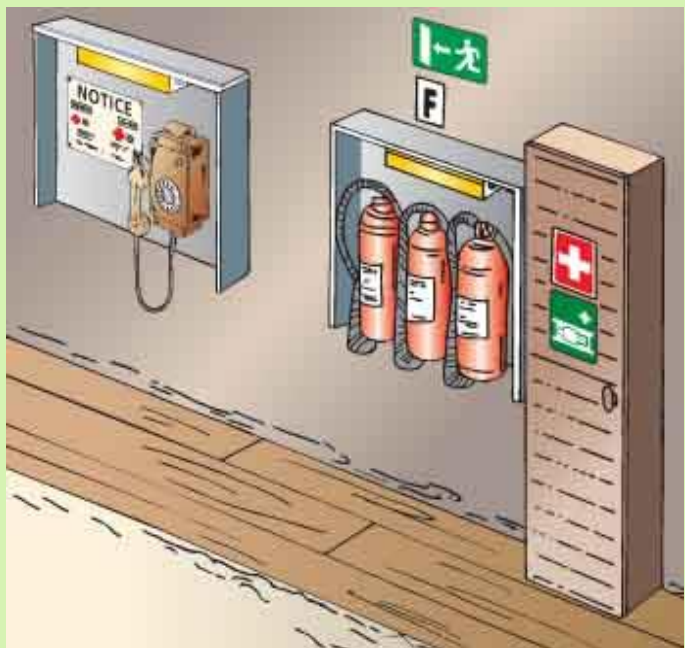
9.4.4 All personnel shall be instructed of the procedures to be followed in the event of emergency and regular drills shall be arranged to enable the personnel to familiarize with the procedures.

## 9.5 Emergency Preparedness

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9.5.1 Emergency procedures and evacuation plan shall be developed and familiarization drills shall be arranged for all site personnel. The emergency procedures shall cover those arising from natural hazards as well as from fire, accidents, and from plant and power failures and stoppages.

- 9.5.2 For compressed air tunnels, a specially trained fire and rescue team shall be set up.
- 9.5.3 Regular liaison and familiarization programme shall be established with the Fire Services Department during the whole construction period to enable the Fire Services Department personnel to be familiar with the working environment inside the tunnel and learn how to operate transportation equipment. This is to ensure that Fire Services Department can carry out rescue and fire fighting in the tunnel immediately and effectively.
- 9.5.4 Rules for housekeeping, schedules for maintenance of plant and equipment and procedures for safe working inside the tunnel shall be developed and updated regularly.
- 9.5.5 A direct telephone line linked to an emergency control room shall be provided inside the tunnel. The emergency control room shall be located above ground within the site in the vicinity of the access to the tunnel and shall be equipped with chairs, tables and plans of the works.
- 9.5.6 Telephones shall be provided at strategic locations, e.g. access points, junctions and all work locations, etc. in the tunnel. The telephones shall be powered by battery backup and shall be explosion protected.
- 9.5.7 An emergency coordinator and a deputy shall be appointed. The duties for each of them shall be clearly stated.
- 9.5.8 A system for recording the numbers and whereabouts of the personnel in the tunnels, e.g. in-out name tags, and procedures for controlling of pedestrian traffic in the tunnel shall be developed.
- 9.5.9 Emergency equipment of sufficient quantity including respiratory protective equipment (RPE) for escape (e.g. self-contained open-circuit type breathing apparatus), torch, and first aid box shall be provided at the entrance and strategic locations inside the tunnel.
- 9.5.10 Specially designed trolleys or other means of transport for injured personnel and rescue equipment, etc. shall be provided for emergency rescue purposes.



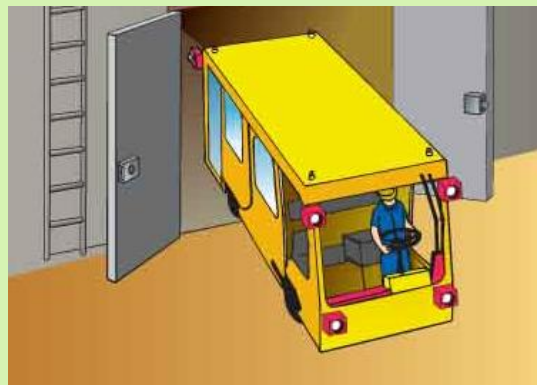


- 9.5.11 Routes of escape shall be planned and provided to enable the injured on stretchers to be withdrawn safely and quickly.
- 9.5.12 Appropriately designed emergency exit signs at suitable intervals along the tunnel shall be provided to facilitate correct movement of personnel during emergency situations. The signs should be of self-illuminated type in the event of blackout.
- 9.5.13 Secondary power supply to support operation of passenger hoists, ventilation, lighting and pumps shall be provided.
- 9.5.14 An alarm or siren, located above ground and activated from within underground working locations, shall be provided.
- 9.5.15 All combustibles to be used in the shafts and tunnels shall be identified and their storage including maximum quantities shall be properly worked out and complied with.
- 9.5.16 The location of storage for dangerous goods and explosive on the ground surface shall be identified.
- 9.5.17 Methods for dispensing diesel fuel in shafts and tunnels, including spill control, and spill response procedures shall be established.
- 9.5.18 Smoking within the shafts and tunnels shall be strictly prohibited.
- 9.5.19 Appropriate type of fire extinguishers shall be provided at intervals along the tunnel.
- 9.5.20 Tap points of water supply for firefighting purpose fitted with suitable couplings to which the Fire Services Department fire hoses can be readily connected to shall be provided as far as practicable.
- 9.5.21 Appropriate firefighting equipment for suppression of electric fire or burning of hydraulic oil, etc. shall be made readily available to all tunnel boring machines (TBM) or major electrical and hydraulic plants used in tunnel construction.
- 9.5.22 All personnel entering the tunnel shall be provided with self-rescue breathing apparatus and trained on its proper use.
- 9.5.23 A maintenance programme shall be developed for all safety and rescue equipment.
- 9.5.24 A "permit-to-work" system shall be implemented for any work which is likely to create hazards when carried out inside the tunnel, e.g. welding or flame-cutting, etc.

## 9.6 Inspection and Maintenance

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- 9.6.1 It shall be borne in mind that inspection and maintenance involving man-entry into live tunnels, which carry stormwater, raw sewage or sewage effluent, is a high risk operation and shall be replaced by other methods as far as practicable.
- 9.6.2 Information on the flow conditions and the construction (e.g. size, length, gradients, access points, etc.) of the tunnel shall be obtained for planning of the inspection and maintenance work.
- 9.6.3 The length of the tunnel to be worked on at any one time shall be ascertained beforehand with due consideration of all constraints including the working duration of the breathing apparatus, limitation of communication and emergency rescue, diurnal variation of flow, etc. The time required to complete the work shall be accurately predicted preferably by rehearsing the operation on the ground surface and making due allowance for the adverse conditions in the tunnel (e.g. gradient, wet and slippery floor, etc.).
- 9.6.4 Reference shall be made to the requirements for inspection, and maintenance as appropriate, of tunnels operated under partial flow conditions or where the tunnel can be inspected under dry conditions after the sewage is temporarily diverted as given in Section 9 of the Sewerage Manual (Part 1) published by the Drainage Services Department.
- 9.6.5 All safety measures given in Section 5.13 of this Manual on "Work in Confined Space" shall be followed when carrying out inspection and maintenance work in tunnels.
- 9.6.6 Tunnel inspection vehicle, if any, shall be of spark proof construction.
- 9.6.7 The officer-in-charge of any sewage treatment facilities, pumping stations, flow regulating facilities and the like whether upstream or downstream of the tunnel to be worked on shall be consulted of the flow condition and pattern. An un-mistakable shut down procedure for the operation of such facilities to cope with the work to be carried out in the tunnel inclusive of the emergency plan shall be developed and fully understood by the maintenance team and the officer-in-charge of such facilities.
- 9.6.8 As the design of each tunnel may differ considerably, such as their sizes, functional arrangement, access details, etc., each tunnel shall therefore be treated individually. A well planned safety procedure for inspection and maintenance of each tunnel shall be developed and



reference shall be made to the O&M Manual provided by the designer.

- 9.6.9 Fire Services Department shall be informed of details of inspection and maintenance activities in advance.

## 9.7 Headings

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### Use of Headings

- 9.7.1 Headings are sometimes used in drainage works construction to replace traditional open-cut method in order to reduce the impact on traffic, especially in urban areas. When the ground condition favours, i.e. in soft ground (earth) or rock, heading is preferred because of its simplicity and flexibility. The heading works in this Section shall mean the digging of a small temporary tunnel for subsequent laying of drainage pipes.
- 9.7.2 When headings are dug through soft ground like clay, silt, sand, gravel or mud, the standup time, i.e. the time the ground will safely stand by itself at the work face, is generally short and cave-in is a constant threat. A shield, which is usually a steel cylinder, or a specially designed temporary earth-supporting structure, is pushed into the soft ground to support the surrounding earth to enable excavation and lining construction to be performed safely. After a section is completed, the shield is pushed forward by jacks and the process repeats.
- 9.7.3 The nature and risks of heading construction are similar to those of tunnels and the safety guidelines set out in Chapter 9 shall be observed. This Section focused on the control measures against the potential dangers of heading works, particularly those due to ground settlement and flooding. Reference shall also be made to the "Guidance Notes on Safety and Health of Hand-dug Tunnelling Work" published by the Labour Department for other general safety guidelines.
- 9.7.4 It should be emphasized that heading construction is a high risk activity and should be avoided if other practical engineering solutions are available. The ground condition may vary as the heading proceeds and that other unforeseen events may also pose a threat to the work in progress, e.g. bursting of nearby water mains, etc. The longer the heading is, the higher the risk will be. Under normal circumstances, the use of headings should be limited to forming short tunnels, e.g. crossing busy roads or junctions that open cut method is not practical. Tunnels of longer lengths should be constructed by other no-dig alternatives.
- 9.7.5 Provisions for hiring an Independent Geotechnical Engineer (IGE) to oversee the site investigation (SI), design and construction of the

heading works shall be added to the contract. Reference can be made to Highways Department's letter ref. (2B0B) in HRD 19/2/1 dated 23.5.2008 regarding the recommended qualification and experience of the IGE.

### **Control against Ground Settlement**

- 9.7.6 Ground settlement can be caused by various factors, including vibration during driving and extraction of sheetpiles, deformation of the access shaft, excessive drawdown of water table, overbreaking, inadequate closure of working faces, etc.
- 9.7.7 Excessive ground settlement can cause the shield to deform or even the heading works to collapse at worst, which threatens the lives of the workers working therein.
- 9.7.8 The following measures can be adopted to reduce ground settlement where practicable.
- (a) Before heading work commences, conduct thorough site reconnaissance to appreciate the actual site condition and identify possible constraints and risks in respect of the construction of heading works. This may include the initial condition survey of adjacent structures, location of existing utilities by trial pits and/or cable detectors, detection of voids in ground by ground penetrating radar or shallow seismic reflection method, ground investigation to ascertain soil parameters and ground conditions, etc.
  - (b) Further condition surveys should be conducted during the course of heading works to ascertain the results of the initial condition survey and to detect any possible changes.
  - (c) Establish a monitoring system for ground movement, utilities settlement and movement of adjacent structures, etc. including the installation of monitoring stations, e.g. vertical and horizontal settlement stations, tilting monitoring points, utilities settlement markers, standpipes and piezometers, etc., and record of baseline readings.
  - (d) The design of the shield and temporary works of the access shaft should be checked and endorsed by an Independent Checking Engineer (ICE).
  - (e) Ensure that the construction work and installation of temporary works are carried out in strict accordance with the certified design and approved method statements.
  - (f) Fill up voids around sheet piles being driven or extracted with wetted sandy materials. Besides, sheet piled shoring can be replaced by alternative designs, e.g. contiguous piles by rotary drilling, etc. to reduce the vibration during construction.

- (g) Adopt a more robust design of the temporary works for constructing the access shaft to limit possible ground movement, e.g. closer spacing of struts and ties to improve the structural performance of the temporary works as a whole.
- (h) Avoid over-dewatering by careful monitoring of the design ground water table (GWL). Apply low pressure curtain grouting to control excessive inflow of ground water when necessary.
- (i) Avoid over-breaking. Obtain information on the soil properties ahead by probing. Check the quantity of excavated materials against the progress of run to identify over-breaking or ingress of soil.
- (j) Check and ensure that the structural design of the temporary closure of the heading front is able to offer full support of the work face. Keep the face advancement within the range of the next steel frame support to be installed. Maintain the sheet piles or horizontal support intact along the tunnel perimeter.
- (k) Inspect carefully and frequently the surroundings of the heading works including road surface, buildings and structures etc. to detect signs of ground movement like cracks, subsidence or transverse movements.
- (l) Check regularly the inside face of the heading works to detect signs of distress, potential failure, abnormal amount of water ingress, deformation of shield, cracks in soil faces, etc. Sudden increase of water and soil could be a pre-warning of ground subsistence, which may be caused by bursting of nearby mains.
- (m) Closely monitor the ground movement, utilities settlement and movement of adjacent structures, etc. as heading works proceeds. Continue the monitoring for a period, say one to two months, after the heading works is fully completed to observe the ground response.

### **Control against Flooding**

9.7.9 Flooding of the heading and the access shaft can occur as a consequence of sudden inrush of water from exposed faces due to bursting of nearby watermains or heavy rainfall, failure of grout curtains, fissures or underground water paths being encountered, malfunctioning of pumps, etc.

9.7.10 It is important to maintain the heading works watertight in order to prevent flooding. Attention should be paid to the temporary works of the access shaft and work face and other exposed faces of the heading. The following measures can be adopted to reduce the risk of flooding of the heading works where practicable.

- (a) Apply grouting where necessary as heading proceeds. Grouting serves dual purposes namely stabilization and consolidation of the ground to enable safe excavation and prevent excessive inrush of ground water.
- (b) Should the contract so permit, employ an Independent Geotechnical Engineer (IGE) to oversee the heading works and continuously monitor the ground conditions, and when grouting is needed to determine the suitable grout mix, grouting sequence and locations, as well as on-site control of the grouting pressure and grouting rate.
- (c) Enhance the watertightness performance of the temporary works by better design. Seal exposed faces as far as possible by shotcrete or other means to cut off ingress of underground water. Use grout curtains to reduce seepage through sheet piled walls and exposed faces.
- (d) Maintain pumps in good working order and provide standby pumps. Provide emergency power backup to cater for blackout.
- (e) Obtain information on nearby watermains, especially asbestos pipes, to evaluate risk of flooding as a result of bursting of such mains.
- (f) Monitor weather condition for oncoming heavy rains and take necessary safety precautions to prevent ingress of rainwater into the heading works.
- (g) Protect the access shaft against ingress of rainwater by erecting canvas or shelter and building of dykes around the shaft opening.
- (h) If the access shaft is located at or near the low point of basin type topography, it might render a "sink hole" effect during heavy rainfall. Consideration should be given to provide temporary barrier for preventing ingress of surface runoff from the surrounding.

#### **Checklists for Safety Monitoring**

9.7.11 It is advisable to develop checklists to monitor the safety provisions as well as the allocation of checking tasks to site supervisory staff at different stages of construction, namely at commencement of work, during work and after work. The checklists should be specific having regard to the nature and scope of the heading works and the method of design and construction. Details of the checklists are given below for reference.

9.7.12 The checklist at the commencement of work should include checking of but not limited to the following items:

- (a) utilities drawings, SI information, etc.,
- (b) initial condition survey of adjacent structures and buildings, underground utilities, etc.,
- (c) non-destructive void detection or probing test results,
- (d) baseline readings of ground movement monitoring stations,
- (e) contractor's method statement, safety plan and risk assessment report whichever is appropriate,
- (f) ICE's certified method statement and temporary works design, and
- (g) site supervision plan and competence of supervising personnel, etc.

9.7.13 The checklist to be used when work is in progress should contain but not limited to the following items:

- (a) safe access from and egress to the heading works, including ladders, gangways, ground surface, etc.,
- (b) integrity of guardrail, toe board and water barrier around the edge of shaft,
- (c) display of sufficient warning notices,
- (d) compliance with the safety requirement of working in confined space, including risk assessment report, permit-to-work, certified workers, etc.,
- (e) compliance of the as-built temporary works including interlocking sheet piles, portal frames, etc. with the ICE certified design, e.g. member sizes, spacing and connection, etc.,
- (f) daily readings of ground movement monitoring stations,
- (g) quantity of seepage,
- (h) daily walk-around inspection of adjacent areas to detect possible signs of ground movements, water seepage or grout leakage, etc.,
- (i) non-destructive void detection probing results and pre-grouting work,
- (j) quantity of excavated materials against the progress of run,
- (k) daily record photos,
- (l) maintenance certificates of lifting appliances, etc.,
- (m) shut boards and strutted backings at the cutting face before close



of each working day, and

- (n) emergency preparedness, including firefighting equipment, first aid box, evacuation plan, display of names of emergency personnel and their contact telephone numbers, etc.

9.7.14 The checklist after work mainly consists of the continuous checking of the readings recorded at different ground movement monitoring stations at weekly intervals, or any interval as the Engineer sees fit, after completion of the heading works. The monitoring should last for a few months to see if there is any post-work effect on the surroundings and utilities.

#### **Emergency Preparedness**

9.7.15 The general emergency provisions set out in Chapter 14, as well as the specific provisions set out in Section 9.5 for tunnelling works should be followed wherever applicable.

9.7.16 Establish an action plan to deal with different levels of ground movements recorded and occurrence of flooding, e.g. "alert level ", "action level" and "emergency level", where appropriate.

9.7.17 Establish a communication channel between the contractor and site supervisory staff to ensure that any abnormality is immediately reported and attended to before the situation worsens.

9.7.18 Provide an audio-visual alarm system for the workers at work to alert the others on ground surface of any danger, and vice versa, in case of emergency.

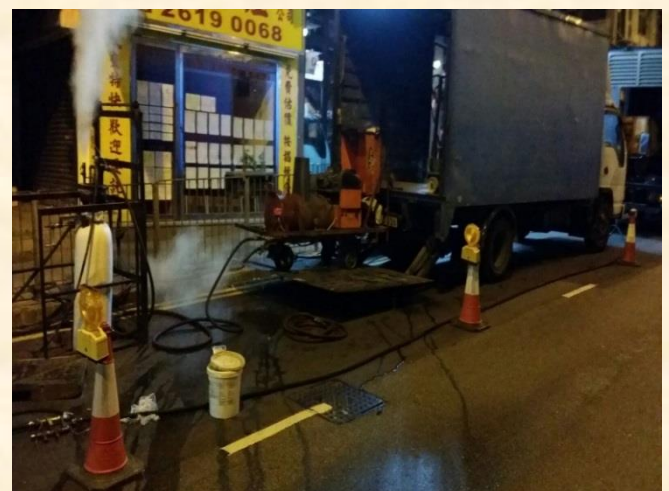
9.7.18 Establish an emergency evacuation plan, having regard to the specific site condition, and make known to all persons concerned. Tool box talks and drills should be held regularly to train the workers on what to do and how to do in the event of emergency, e.g. escape route, use of alarms and safety equipment, etc.

9.7.19 Provide sufficient alert and communication means like walkie-talkie or intercommunication system to maintain communication between the workers working underground and the standby person on ground surface during the progress of work.

# 10



Safety of Other Outdoor Work, Site  
Reconnaissance, Engineering Survey,  
Wastewater Sampling, etc.



# CHAPTER 10

## Safety of Other Outdoor Work, Site Reconnaissance, Engineering Survey, Wastewater Sampling, etc.

### 10.1 General

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- 10.1.1 Staff working outdoors shall always be alert of the potential hazards in the surrounding environment of the work.
- 10.1.2 A proper monitoring system shall be established to enable the supervisors to know the whereabouts of the staff while on outdoor duties (i.e. visit schedules with details of locations, times, telephone numbers and expected time of completion of outdoor assignments).
- 10.1.3 Staff working outdoors shall ensure that an effective communication means is maintained with their supervisors in office while on duties.
- 10.1.4 Staff working outdoors shall obtain information on the work location, environment and the weather condition. They shall identify and evaluate the possible hazards associated with the working environment before they access to the work location. The common hazards are working in adverse weather, working at height, working on or near water, working on or near slope, working under live electrical overhead lines, working on highways, walking on slippery surfaces, working in hilly or forested areas and marshy land, etc.
- 10.1.5 Staff shall prepare for the safety measures necessary for the job and bring along appropriate safety equipment and personal protective equipment to the work location.
- 10.1.6 Staff shall be watchful for situations of potential threats of violence or signs of risks of personal safety if the nature of the work is expected to entail opposition.
- 10.1.7 Staff working outdoors shall report to their supervisor, and if situation warrants, the Police as soon as possible in the event of intimidation, possible disturbance, assault or potential violence. Close liaison with the local police at the district level before the



work commences will be important to enlist the necessary Police assistance speedily.

10.1.8 Incidents of assault shall be thoroughly investigated with recommendations for preventive measures to be implemented.

10.1.9 New and inexperienced staff shall receive proper induction training in the handling of violent or potential violent situations.

10.1.10 Guidelines and work procedures developed for outdoor work shall be regularly reviewed and updated in the light of changes in operational circumstances.

## 10.2 Work in Adverse Weather

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### Rainy and Stormy Weather Conditions

10.2.1 When typhoon signal No. 1 or 3 are hoisted and the staff are working outdoors, they shall pay attention to the weather forecast and determine whether the work shall be postponed.



10.2.2 When the Red Rainstorm Signal is issued during working hours, staff working outdoors shall temporarily suspend their duties if the condition warrants.



10.2.3 When the Black Rainstorm Signal or typhoon signal No. 8 or higher is issued during working hours, staff working outdoors shall cease work and take shelter in a safe place. They shall not be required to resume work until the warning is cancelled and the weather condition permits.



10.2.4 When the Red or Black Rainstorm Signal or typhoon signal No. 8 or higher has been issued before commencement of outdoor work, it shall be postponed except those staff who are required to perform essential duties during rainstorms, such as the Direct Labour Force and staff engaged in emergency flood relief work.

10.2.5 When discharging duties during rainstorms, thunderstorm or typhoon, staff shall take due care of themselves and not to expose themselves unnecessarily to potential hazards such as: -

(a) entering manholes, watercourses, sewers and stormwater drains, channels and culverts, etc.;

(b) inspecting slope drainage;



- (c) getting near slopes with any sign of instability;
- (d) staying at high points when thunder warning signal is in effect;
- (e) getting near waterside;
- (f) staying under or near overhead power cables; and
- (g) staying at places where there is a risk of fall of person or objects, e.g. signboards, overhead temporary structures, etc.

10.2.6 Suitable protective clothing including a safety helmet, rubber boots and raincoat shall be worn.

10.2.7 Be alert for falling and flying objects especially during stormy weather. Take extreme care especially when working in rear lanes and temporary structures etc.

10.2.8 Be alert while staying close to slopes. Listen for any unusual sounds that may indicate moving debris, such as trees cracking or boulders knocking together. It shall be noted that a trickle of flowing or falling mud or debris normally precedes larger landslides.



10.2.9 Work in isolated locations shall be attended by at least two persons as far as possible. They shall also maintain communication with their supervisor regularly.

10.2.10 Monitor the change of weather condition continuously.

#### **Thermal Environment**

10.2.11 Heat stroke can occur in hot working environment. The following factors shall be considered in assessing the risk of heat stroke:-



- (a) High temperature,
- (b) High humidity that hinders sweat evaporation,
- (c) Poor ventilation,
- (d) High radiant heat load, such as exposure to direct sunlight,
- (e) Heavy manual activities, and
- (f) Wearing of clothing that hinders sweat evaporation and heat dissipation.

10.2.12 The following precautionary measures shall be taken when working in hot weather conditions or hot working environment: -

- (a) Avoid heat sources in workplace, e.g. isolate heat generating facilities, use heat insulating materials to minimize heat transmission, remove hot air by exhaust fans and ducts, etc.
- (b) Provide sufficient ventilation in workplace.
- (c) Avoid working under direct sunlight and set up temporary sunshade whenever possible.
- (d) Shorten the time of exposure, e.g. reschedule work to cooler periods in daytime, provide breaks, arrange job/workplace rotation or use mechanical aids to minimize physical demand.
- (e) Provide cool refuge.
- (f) Provide adequate supply of cool drinking water or other appropriate beverages to replenish the fluid and electrolytes lost through sweating.
- (g) Wear suitable clothing of reflective or light colour and breathing materials.
- (h) Wear broad brim naturally ventilated helmet where appropriate.
- (i) Train site staff concerned to recognize symptoms of heat stroke, observe their body responses and report any abnormalities.
- (j) Avoid assigning workers who may have difficulties to work in hot environment because of health condition or the effects of drugs.
- (k) Develop first aid and emergency procedures to deal with heat stroke.

10.2.13 It shall be noted that heat stroke can be fatal. The symptoms and signs of heat stroke are stopping of sweating; deep breathing followed by shallow breaths; a rapid, strong pulse followed by a rapid, weak pulse; dry, hot and often red skin. The following actions shall be taken immediately in the event of heat stroke: -



- (a) Call for emergency medical assistance.
- (b) Cool the victim quickly by moving him/her to shaded and cool area; wrap the victim in wet towels or sheets, and pour cold water on the victim's wrappings, fan the victim, place him/her in recovery position if he is unconscious, do not give him/her any food or drink no matter whether he/she is conscious or not.

10.2.14 Reference shall also be made to the "Guidelines on Site Safety Measures for Working in Hot Weather" issued by Construction Industry Council.

### **Lightning Protection**

10.2.15 Stay alert when working in an open field, at peaks or ridges of mountains and on surface of lakes, rivers, roof of buildings etc., where any person is likely to become the tallest object. It is because lightning typically strikes the tallest object in the area.



10.2.16 Check the latest weather forecast and keep watching out for the change of weather. Towering thunderheads, darkening skies, increasing wind and sudden drop in temperature often signal an impending lightning storm.

10.2.17 When thunderstorm signal is on, avoid working outdoors as far as practicable, particularly those work needs to be carried out in the high-risk areas as stated above, and stay away from such high risk areas.



10.2.18 When a thunderstorm threatens, get away immediately from such unsafe places as underneath a tall isolated tree, a telephone pole, a tent or shed without lightning protection facilities. Remain in a safe shelter or building with lightning protection. If safe shelters are not immediately available, remain in a closed all-metal automobile (not a convertible), van or truck with all windows closed. It shall however be borne in mind that one of the most dangerous places is just outside a car, van, or truck because electric current travels around the outside of vehicles.

10.2.19 Get out of lakes, rivers, watercourses, ponds, etc. because water is an excellent conductor of electricity. Get off from a boat or an open vessel when thunderstorm approaches. Anyone who cannot get off the water before the thunderstorm hits shall crouch low. Once on land, stay at least 100m away from shore.

10.2.20 Stay away from metal objects such as steel wire mesh fencing, metal pipes, rails and utilities poles, vehicles, construction equipment and plants especially those with a boom sticking high (e.g. cranes) because metal objects are preferred conductors of electricity.

10.2.21 Do not stay at positions that are higher than the surrounding landscape. If caught in an open field or prairie far from shelter, seek a low spot and crouch in a position with feet together.



- 10.2.22 Remember that lightning may strike some miles from the parent cloud. Precautions shall be taken even though the thunderstorm is not directly overhead. If you feel your hair on your head or body standing on end, or your skin tingling, lightning may be about to strike you. Drop to your knees with feet together and bend forward, putting your hands on your knees so that your head is low but no other part of your body touches the ground. Do not sit or lie flat on the ground because these positions provide much more contact with the ground, providing a wider path for lightning to follow.
- 10.2.23 Do not use mobile phone unless it is absolutely necessary.
- 10.2.24 If you are with a group and the threat of lightning is high, spread out at least 5m apart to minimize the chance of everybody getting hit.
- 10.2.25 Know the "flash-to-bang" system of measuring lightning distance. Because light travels much faster than sound, the time between a lightning bolt and thunderclap will tell you approximately how far away the lightning is. A simple rule is each 5-second count approximately equals a mile (speed of sound 340 m/sec x 5 sec = 1.7 km ~ 1 mile or 1.6km). You shall quickly get away from dangerous places and remain in a safe shelter before the count reaches 15 seconds or less (i.e. before you are within 3 miles or closer from the lightning).
- 10.2.26 Beware of danger at onset and end of a thunderstorm. Do not return to an open area or resume outdoor activity prematurely as people have been struck by lightning near the end of a storm, which is still a dangerous time.
- 10.2.27 The need for lightning protection for buildings (e.g. pumping stations or site offices) may be assessed by a risk factor which varies according to the size (particularly the height), the use and the location (whether isolated) of the building and the number of thunderstorm days per year. Methods of assessing the risk are provided in technical standards such as BS EN 62305:2011 and Australian Standard AS/NZS 1768-2007, which also advise on the design and construction of lightning protection systems.
- 10.2.28 Lightning protection is particularly important for certain types of building, e.g. very tall or isolated buildings, according to the Practice Note No. 156 "Lightning Protection for Buildings" issued by the Building Department.
- 10.2.29 Lightning protection installations should be installed to BS EN 62305-3:2011 or equivalent and inspected periodically according to the Code of Practice for Electricity (Wiring) Regulations issued by the Electrical and Mechanical Services Department.

## **Weather Information, Forecasts and Warnings**

10.2.30 The Hong Kong Observatory keeps a close watch on the changing weather situation. Staff concerned should take note of the following weather information, forecasts and warnings, which are issued by the Hong Kong Observatory from time to time to the public:-

- (a) Weather information and forecasts on Bulletins
- (b) Tropical Cyclone Warnings
- (c) Rainstorm Warning
- (d) Thunderstorm Warning
- (e) Special Announcement on Flooding in the Northern New Territories
- (f) Landslip Warning
- (g) Strong Monsoon Warning
- (h) Frost Warning
- (i) Fire Danger Warning
- (j) Cold Weather Warning
- (k) Very Hot Weather Warning
- (l) Rain Alert
- (m) Tsunami Warning

10.2.31 Besides the above services, which are provided free of charge to the public over the mass media, forecasts and warnings are also supplied at cost to special users through fax and direct communication links, e.g. private firms, public utilities and transport companies whose operations are weather sensitive.

10.2.32 Except those issued to special users, all warnings issued by the Hong Kong Observatory are passed to the Information Services Department for onward transmission to the relevant government departments for information and action.

10.2.33 The Hong Kong Observatory provides the "Dial-a-Weather" service through a telephone hotline 1878200. It also maintains a website at <http://www.weather.gov.hk> and <http://www.hko.gov.hk>. The website aims at providing information on meteorology, radiation monitoring and other geophysical sciences. Its contents also include weather information, forecasts and warnings for the public as well as the marine and aviation communities.

10.2.34 Staff concerned should take note of the weather information, forecasts and warnings issued by the Hong Kong Observatory from time to time and make good use of its service and website for better planning and preparation for outdoor work.

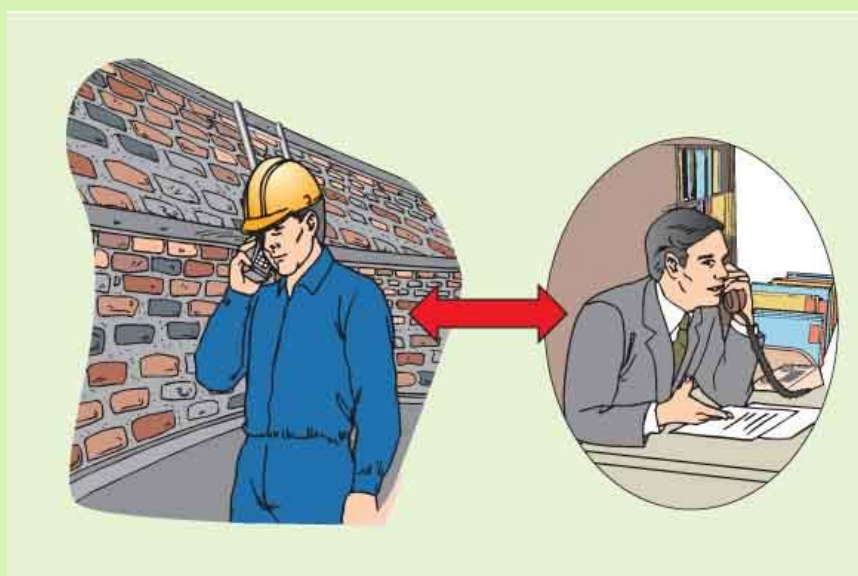
### 10.3 Working Alone

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10.3.1 Supervisors shall assess risks to their lone staff and take steps to avoid or control the risks where necessary. When the risk assessment shows that it is not possible for the work to be done safely by a lone staff, arrangement for providing help or backup shall be put in place. In general, staff shall not be assigned to work alone in the following situations: -

- (a) The workplace and work nature will present a special risk to the lone staff (e.g. work in confined space).
- (b) Means of access to or egress from a workplace may not be safe to use by one person. Temporary access equipment, such as portable ladders or trestles, which cannot be safely handled by one person, is used.
- (c) Plants, substances and goods involved in the work cannot be safely handled by one person.
- (d) There is a risk of violence.
- (e) Staff who have physical or health problems.

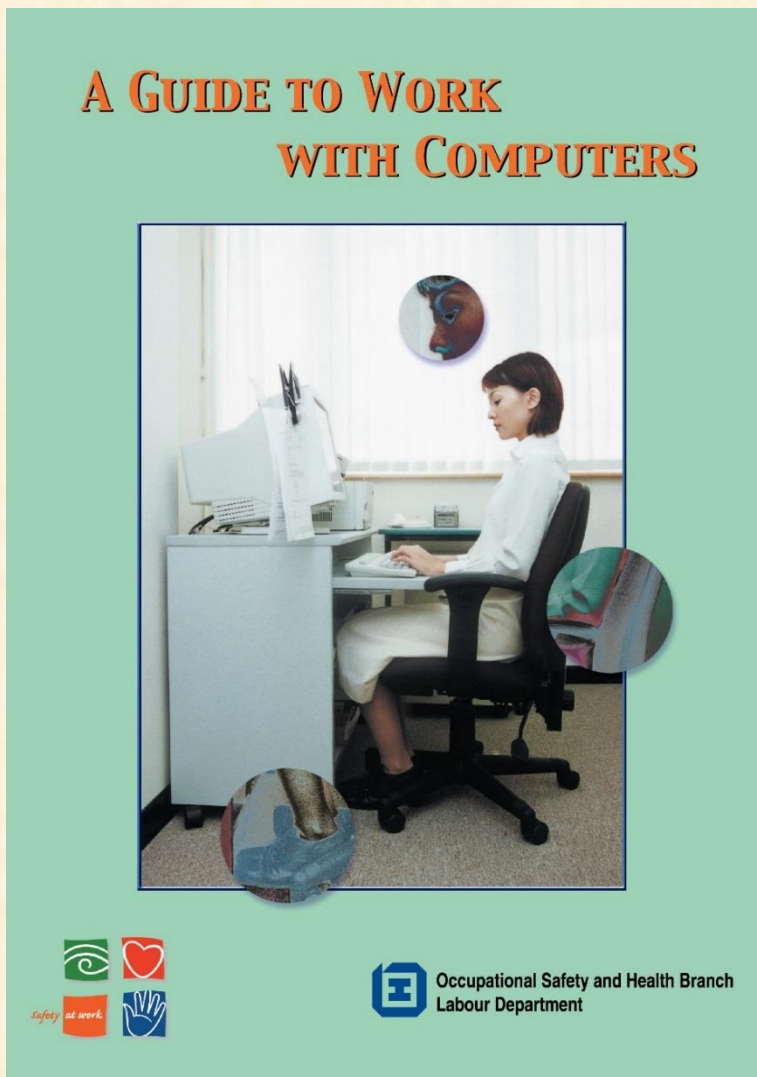
10.3.2 Training shall be given to lone staff to ensure that they understand the risks associated with their work and working environment, the corresponding precautions to be taken and emergency procedures.



- 10.3.3 Regular contact shall be maintained between the lone staff and his/her supervisor using suitable communication means.
- 10.3.4 The supervisor shall visit the workplace to see if the work can be safely performed by the lone staff if situation warrants.
- 10.3.5 The lone staff shall be able to call for help if there is any problem, but it is also essential to have a failsafe so that help arrives even if the lone staff cannot summon it himself/ herself.
- 10.3.6 The lone staff shall report any accidents, injuries, dangerous occurrences or near misses to their supervisor. The results of investigating these incidents should be fed back into the risk assessment process to improve future controls.
- 10.3.7 The lone staff shall report to his/her supervisor that he/she has returned to his/her base or home on completion of a task.
- 10.3.8 Lone staff working at a fixed location shall have access to adequate first-aid facilities and mobile staff shall carry a first-aid kit suitable for treating minor injuries.

# 11

## Occupational Safety and Health in Offices



# CHAPTER 11

## Occupational Safety and Health in Offices

### 11.1 General

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- 11.1.1 The safety at work in office is governed by the Occupational Safety and Health Ordinance (OSHO) and Occupational Safety and Health Regulation (OSHR), which aim at ensuring the safety and health of employees when they are at work and prescribe measures that will make the workplaces safer and healthier.
- 11.1.2 Sharp objects such as cutters, scissors and pins shall be properly kept and used.
- 11.1.3 Drawers, cabinet doors and panel doors shall be closed immediately after use.
- 11.1.3 Sufficient potable water shall be provided.
- 11.1.5 First aid box shall be provided in every workplace.
- 11.1.6 Maintain good housekeeping. Keep places tidy and clean.
- 11.1.7 Maintain all accesses especially the fire escapes clear of obstructions.
- 11.1.8 Maintain security of the office to exclude unauthorised entry. Visitors and other persons who are not working in the office shall be registered in order to ensure that nobody is left in the office in the event of a fire.

### 11.2 Working Environment

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#### 11.2.1 Artificial lighting

- (a) Ensure that adequate lighting is provided in the office. The following table lists the recommendation made by The Chartered Institution of Building Services Engineers (CIBSE) on the illumination level for various tasks to be carried out in office.





Minimum Illuminance (lux)	Optimum Illuminance (lux)	Location / Activities in Office
5	100	Corridors, bulk stores
50	200	Causal work, such as loading and unloading, photocopying
100	300	Causal reading of printed material, conference room
-	500	Visual tasks moderately difficult, i.e. moderate size and low contrast, colour judgement may be required.
200	750	Drawing offices
-	1000	Job comprising very difficult visual tasks, fine work.

- (b) Diffusers of artificial lighting shall be cleaned at regular intervals.
- (c) Defective lightings shall be repaired as soon as possible.

#### 11.2.2 Ventilation

- (a) Ensure that the room temperature in the office is comfortable and suitable for the work being carried out.
- (b) Ensure that the office is provided with sufficient amount of fresh air.
- (c) The fresh air intake points shall be away from pollutant sources.
- (d) Ensure that air outlets are not blocked.
- (e) Ensure that the thermostats are not obstructed by objects.
- (f) Ensure that the air-conditioning system is regularly inspected and maintained.




- (g) If renovation work is to be carried out in the office, the following points shall be noted: -
  - (i) The renovation site shall be separated by robust enclosed barriers or the work shall be carried out after office hours.
  - (ii) Fresh air supply shall be provided to the renovation site and negative pressure shall be maintained in the renovation area.
  - (iii) Only essential work shall be done on site, viz. painting of furniture shall preferably be done in somewhere other than the office.
  - (iv) Do not select any building material, furniture or fixture that may emit formaldehyde.
  - (v) Local exhaust ventilation (LEV) shall be installed for specific processes that generate large amount of volatile organic compounds (VOCs).
- (h) Smoking shall not be allowed in the office, especially the renovation areas.
- (i) All potential nourishing water sources for Legionnaire's disease shall be removed, e.g. stagnant water in drip pans of the cooling coils of air conditioning units.

#### 11.2.3 Housekeeping

- (a) Set up a programme of routine cleaning and waste disposal and ensure that the cleaning and waste disposal work is performed according to schedule.
- (b) Provide sufficient litter bins in the office and empty the litter bins daily.
- (c) Decayed food and materials shall be removed without delay.
- (d) Pesticides should only be used after the office has been evacuated.
- (e) Storerooms shall be cleaned at regular intervals.
- (f) Assign proper storage locations for documents, office supplies and goods.
- (g) Passageways and corridors shall be kept free from obstructions, tripping and slipping hazards.
- (h) Use shelves, racks, bins and cabinets to store materials tidily and orderly as far as possible.

- (i) Sharp objects and tools shall be separately stored. Avoid putting heavy objects and objects that roll on high shelves.
- (j) Unwanted items shall be disposed of as soon as possible.
- (k) The officer-in-charge shall appoint an officer responsible for housekeeping and storage.
- (l) Place drinking water away from electrical appliances.

#### 11.2.4 Fire Precaution

- (a) Appoint a Fire Safety Officer and establish a fire team for each office to undertake all matters regarding fire precautions, evacuation procedures, fire drills, etc. The Fire Safety Officer and his team members shall be provided with armbands, torches and suitable firefighting training. Replacement for any members who has been transferred out of the office shall be appointed immediately.
- (b) It is the responsibility of all staff to take every positive steps to maintain the office free from fire hazards, e.g. avoid smoking and properly use any electrical appliance that may cause electric fire. 
- (c) Officers-in-charge of overtime work (i.e. in general, work beyond 6:30 p.m. from Monday to Friday and at any time on Saturday, Sunday and public holidays) shall notify the respective Building Management Office of the following: -
  - (i) the number of staff doing overtime work;
  - (ii) location of staff doing overtime work; and
  - (iii) the name and contact telephone number of the officer-in-charge of the overtime work.
- (d) When the overtime work is completed and staff have left their office, the respective Building Management Office shall be informed by the officer-in-charge of the overtime work.
- (e) Every staff shall familiarise himself/herself with the fire fighting and evacuation procedures and participate in every fire drill organized by the Fire Safety Officer.
- (f) The fire escape routes and locations of firefighting equipment shall be clearly and accurately shown in a floor plan, which shall be displayed at prominent places in the office. All staff working in the office shall be made aware of the escape routes as well as the locations of firefighting equipment.

(g) The emergency exit doors shall be closed and must be able to be opened from the inside of the office without using a key at all times.



(h) All means of escape shall be accessible at all times. The route between the office and a safe assembly place shall be kept unobstructed at all times.

(i) The firefighting equipment including the sprinkler system, fire extinguishers, etc. shall always be maintained in good working condition.



(j) Bulk storage of photocopying papers and the like can constitute fire hazards. Excessive reams of papers shall be stored properly in cabinets and kept away from any power sockets and heat generating electrical appliances.

(k) All new recruits shall be required to peruse the updated firefighting and evacuation procedures set out in the departmental Integrated Management System (IMS) briefing kit.

## 11.3 Safe Use of Office Equipment

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### 11.3.1 Photocopiers

(a) Photocopiers shall be located in a well-ventilated printing room to minimize disturbance to others. If it is not practical, photocopiers shall be placed away from conditioned air outlets and any seats as far as practicable.

(b) Adequate clearance around photocopier shall be maintained to facilitate heat dissipation.

(c) The exhaust from the photocopier shall not be directed to any persons sitting in the vicinity.

(d) During photocopying, be sure that the cover has been placed in proper position to prevent eye irritation from the strong light.



- (e) The photocopying machine shall be properly maintained by competent technicians.
- (f) Replacement of carbon powder cartridges used in photocopiers shall be handled with care in accordance with manufacturer's instructions.

### 11.3.2 Guillotine

- (a) Never place any part of the body, e.g. fingers or hand, under the sharp edge of a guillotine.
- (b) The cutting edge of a guillotine must be tied at close position after use.
- (c) The guillotine shall be stored at lower shelves.
- (d) Never remove the guarding at the paper inlet of the machine if the guillotine is mechanically driven. Only paper is allowed to enter the cutting edges through the clearance of the guarding.
- (e) Loosely fitted clothes, ties, untied long hair etc. shall be tied up securely prior to using the machine for cutting paper.



## 11.4 Display Screen Equipment (DSE)

11.4.1 The Occupational Safety and Health (Display Screen Equipment) Regulation aims at protecting the safety and health of employees who use display screen equipment at work for prolonged periods of time.

### 11.4.2 Workstation

- (a) The table shall have sufficient space for documents; knee clearance; cable and wire conduits; and sufficient depth for screen and keyboard.
- (b) The keyboard top shall be set at approximately 0.7m above floor level.



Footrest

- (c) The footrest shall be adjusted to a suitable height with sufficient knee clearance.
- (d) The chair shall be of swivel type having good stability and preferably mounted on smooth castors, adjustable seat height between 0.34m to 0.52m and adjustable backrest to give lumbar support.
- (e) Document holder shall be properly positioned to avoid awkward neck posture and movement.

#### 11.4.3 Working Environment

- (a) The working environment shall be adequately and evenly illuminated without causing glare on the screen. The recommended illumination level ranges from 300 to 500 lux on the desk surface.
- (b) Avoid placing a computer screen directly under and in front of lightings or in front of a window.
- (c) Blinds or curtains shall be used to prevent glare and to control illumination level.
- (d) The direction of vision of the operator shall be approximately parallel to the DSE and document. The DSE shall be perpendicular to the light source to avoid reflection on the screen.
- (e) The temperature and humidity at workplace shall be kept at a suitable level to avoid discomfort to the operator.

#### 11.4.4 Posture

- (a) DSE operators shall adopt correct posture to reduce fatigue. The recommended posture is: -
  - (i) viewing distance ranges from 35 to 60 cm,
  - (ii) looking down slightly on the display screen at an angle of not more than 20 degrees,
  - (iii) upper arms and lower arms are approximately at right angle,
  - (iv) lower arms shall be approximately horizontal,
  - (v) wrist incline angle shall be not more than 10 degrees, and
  - (vi) thighs are at about horizontal position, and back is straight without twisting.



- (b) Periodic postural change, rest break, stretching and visual exercises are recommended.

## 11.5 Electrical Safety in Office

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- 11.5.1 Maintenance and repair of electrical installations and electrical appliances shall be carried out by a registered electrical worker (REW).
- 11.5.2 An effective circuit protection device shall be provided in each feeder circuit in order that electricity will be cut off in the event of overloading, short-circuiting or earth leakage.
- 11.5.3 Cables and wirings shall be tied up or bundled neatly and shall preferably be run along edges of the structure or partitions to avoid tripping hazards.
- 11.5.4 The electrical appliances used in office shall fulfil the requirements as stipulated in the Electrical Products (Safety) Regulations. If the appliances are also designed for household use, e.g. television set, video player, electric kettle etc., and they are purchased after the commencement date of these Regulations (i.e. 25.2.1999), the appliances complying with the safety requirements of this Regulations will be distinguished by a Certificate of Safety Compliance. Staff shall make reference to this Certificate of Safety Compliance when they are about to purchase an electrical product.
- 11.5.5 For easy reference, the requirements extracted from the Guidance Notes of the Regulations are listed hereunder: -
  - (a) Persons are adequately protected against danger or physical injury or other harm, which might be caused by electrical contact whether direct or indirect.
    - (i) All live terminals of electrical appliances should be adequately protected against direct contact by a person.
    - (ii) An electrical product, if intended to be connected to the supply by means of a plug, should be so designed that in normal use there is no risk of electric shock from charged capacitors when touching the pins of the plug.
    - (iii) Shafts of operating knobs, handles, levers and the like of an electrical product should not become live.
  - (b) Persons and property are adequately protected against non-electrical danger caused by the electrical product which are revealed by experience.

- (i) Moving parts of an electrical product should, as far as it is compatible with the use and working of the product, be so arranged or enclosed as to provide, in normal use, adequate protection against personal injury.
  - (ii) Protective enclosures, guards and the like should have adequate mechanical strength.
  - (iii) An electrical product and its accessories should have no sharp edges, burrs or the like other than those necessary for the function of the product.
  - (iv) Non-detachable parts of an electrical product should be fixed in a reliable manner and should withstand the mechanical stress occurring in normal use.
  - (v) Handles, knobs, grips, levers and similar parts should be fixed in a reliable manner so that they will not work loose in normal use if loosening might result in a hazard.
- (c) Proper insulation with adequate dielectric strength should be provided for the electrical product to cater for normal operating conditions.
- (d) The electrical product should be provided with appropriate overload protection device such that any overload current caused by external or internal influences would not cause a temperature rise detrimental to insulation or excessive temperature rise to the electrical product and its surroundings.



11.5.6 Avoid using electricity supply extension units. If it is unavoidable, the supply extension unit shall be fused and comply with the requirements of the Electrical Products (Safety) Regulations.

11.5.7 Avoid using adaptors for electrical appliances. If it is unavoidable, the adaptors shall be fused and comply with the requirements of the Electrical Products (Safety) Regulations.

11.5.8 The overall connected electrical load through adaptors or extension units to town mains shall be within the maximum rating of the socket outlet to which the adaptors or extension units are connected, e.g. if the rating of the socket outlet is 13A, the total load of the appliances being connected shall be less than 13A.

11.5.9 Never connect the adaptors or extension units in cascade, i.e. an adaptor is connected to another adaptor or an extension unit is connected to another extension unit.

11.5.10 All electrical installations and electrical appliances shall be properly protected against wetting. Never touch or operate them if the hands are wet.

## 11.6 Manual Handling in Office

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11.6.1 The tasks for manual handling shall be designed to minimize the weight, range of motion and frequency of the activity.

11.6.2 During planning for manual handling, staff shall carefully determine the route for transporting, platforms at about waist height for resting of objects and the means of transportation, e.g. carts, etc. shall be considered.

11.6.3 Bending the upper body and spine to reach into a bin or container, or over stretching of any part of the body, shall be avoided.

11.6.4 Never stand on a swivel chair with castors.

11.6.5 Occupational Safety and Health Council provides guidelines for safe manual handling operations, which are illustrated in the figure below.

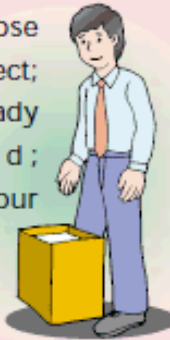


# Manual Handling Operations

The Occupational Safety and Health Regulation requires the responsible person to identify the risks associated with manual handling operations at the workplace and evaluate such risks. Any manual handling operations that may create high risks of safety and health should be avoided. If the operations cannot be avoided, further assessments must be made of the risks and adequate protection, preventive measures and training must be provided to employees.

The following are guidelines for safe manual handling operations:

- 1** Stand close to the object; take a steady foothold; spread your legs.



- 2** Keep your back straight; bend your knees.



- 3** Hold the object firmly and ensure that it does not slip.



- 4** Breathe in. Inflated lungs help support your spine.



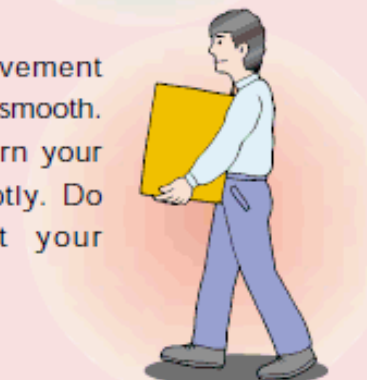
- 5** Stand up slowly until your legs are straight.



- 6** Hold the object firmly and keep it close to your body.



- 7** Your movement should be smooth. Do not turn your legs abruptly. Do not twist your back.



## 11.7 Work at Height

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11.7.1 To ensure compliance with the safety legislation regarding work-at-height and eliminate work-related hazards, the following rules should be observed:

- (a) Avoid work above ground where possible by, for example, designing and using specific hand tools to allow the work to be done on the ground.
- (b) If work above ground cannot be avoided, provide and ensure the use of a suitable mobile working platform.
- (c) For light duty work to be carried out in work environment where a suitable working platform cannot be erected (for example, with restrictive space), provide and ensure the use of suitable step platforms (梯台) or hop-up platforms (功夫橈) as appropriate.
- (d) Refrain from using ladders for work above ground unless all the above measures are found not feasible and a permit-to-work for use of ladder has been issued with a thorough risk assessment conducted and all necessary safety measures related to use of ladder taken.

## 11.8 Occupational Stresses

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11.8.1 DSE operators

- (a) DSE operators shall be arranged to perform DSE job and non-DSE job alternately, i.e. job rotation.
- (b) Short and frequent breaks are better than longer ones taken occasionally.
- (c) During break, DSE operators are recommended to look at distant objects.

11.8.2 Office Staff

Any work that requires sitting or standing partly bent over for a long period of time can cause extra stress on muscles. Seating and other work positions shall be so designed that the back is not bent for long periods. The best sitting position is with knees higher than hip and lower back flat against a firm back rest. Apart from that, the Occupational Safety and Health Council provides some useful relaxation

exercises for office staff as below, which will help prevent fatigue and strain.

## Office Relaxation Exercise

Office relaxation exercises can help relieve muscle tension and improve blood circulation after prolonged sedentary work.



- 1 Stretching Exercise**  
Lock the fingers of both hands together. Stretch your arms vertically upward with your palms up.



- 2 Toes Exercise**  
Spread out your legs to the width of your shoulder with your heels touching the floor. Curl your toes inward and then flex them outward.



- 3 Shoulder Relaxation Exercise**  
Raise your shoulders and rotate them backward. Relax, then repeat in the opposite direction.



- 4 Side Bend Exercise**  
Lower your left shoulder toward the floor. Try to touch the floor with your fingertips. Return to the original position. Repeat with your right shoulder.



- 5 Leg Lifting Exercise**  
Sit upright and keep your back away from the backrest. Rest your feet on the floor. Lift your left leg until it is several inches off the floor. Hold for a moment. Return it to the original position. Repeat with your right leg.



- 6 Curling Exercise**  
Hold your lower leg. Curl your body forward as much as possible. Try to touch your knee with your nose.



# 12



## PERSONAL PROTECTIVE EQUIPMENT



# CHAPTER 12

## Personal Protective Equipment

### 12.1 General

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- 12.1.1 The provision and use of personal protective equipment (PPE) shall be considered as the last resort only after all measures for removing or controlling the safety and health hazards have been proved to be reasonably impracticable.
- 12.1.2 Sufficient PPE shall be provided and that they shall be readily available for every person who may need to use them.
- 12.1.3 The PPE shall provide suitable level of protection and shall be comfortable for continuous use. The PPE shall conform to the respective British Standards or their equivalent.
- 12.1.4 The departmental Safety Advisory Unit shall be consulted if there is any doubt about the requirements and selection of any personal protective equipment.
- 12.1.5 It shall be the responsibility of both the management and the individual workers to ensure the full and proper use of the PPE provided.
- 12.1.6 Instruction and training shall be provided to all workers in the proper use and care of the PPE provided to them.
- 12.1.7 Proper storage shall be provided for the PPE issued.
- 12.1.8 A register of the PPE issued to each worker shall be maintained.
- 12.1.9 No one shall wilfully or without reasonable excuse refuse to use the PPE provided to him/her as it may endanger himself/herself or others.
- 12.1.10 No one shall wilfully misuse, interfere with or ill-treat any protective clothing and equipment provided.
- 12.1.11 All persons who have been issued PPE shall ensure that they are maintained in good condition and report any damage to the management as soon as possible.
- 12.1.12 All PPE shall be kept as clean as possible. It shall be noted that dirty PPE can impose risk of fire or dermatitis.

12.1.13 All PPE of which the service life has expired shall be replaced.

## 12.2 Head Protection

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12.2.1 Safety helmets shall conform to BS EN 397:2012 or its equivalent. Reference shall be made to the Guidance Notes on the Selection, Use and Maintenance of Safety Helmets (2018 Version) published by the Labour Department, which includes the requirements for wearing suitable safety helmets with chin straps.



**Safety helmet      Bump cap**

12.2.2 A safety helmet shall be worn: -

- (a) when there is a risk of being hit by falling or flying objects;
- (b) while on or near a construction site;
- (c) during adverse weather conditions; and
- (d) in any area designated as a 'hard hat' area.

12.2.3 Bump caps or safety helmets shall be worn when working in or passing any place where the headroom is limited and there is risk of bumping against hard objects leading to head injuries.

12.2.4 The head harness shall be correctly adjusted so that head protection will stay on while you are bending over and yet will not be so tight that the band makes a mark on your forehead.

12.2.5 All helmets shall be marked in a way to prevent random exchange among wearers, with one helmet exclusive to each person.

12.2.6 Helmets shall be inspected for cracks or signs of impact or rough treatment before each usage. All worn, aged, defective or damaged helmets shall be destroyed, removed and replaced.

12.2.7 Any helmet that has received a severe blow shall be destroyed as the blow may have substantially reduced the protection offered by the helmet without apparent defects.

12.2.8 Safety helmets shall be prevented from being dropped, thrown or used as supports.

12.2.9 There shall be at least 30mm clearance between the crown straps and the inside shell.

- 12.2.10 The shell and the suspensions shall be maintained in an excellent condition, and any defective part shall be replaced immediately.
- 12.2.11 Tars, paints, oils and other adherent dirt shall be removed with non-inflammable and non-toxic solvents. The helmet manufacturer shall be consulted before choosing a solvent as some can be harmful to dielectric helmets.
- 12.2.12 Caution shall be exercised when painting any helmet shell. The helmet manufacturer shall be consulted with regard to the choice of paint for any particular helmet.
- 12.2.13 Dust or moisture shall be wiped away from helmets before storing them.
- 12.2.14 Helmets shall not be placed on the rear window shelf of a car as sunlight may adversely affect their strength. Also, a helmet may become a hazardous missile in case of emergency stops or accidents.
- 12.2.15 Suitable storage racks shall be provided for helmets at work sites.
- 12.2.16 The officer-in-charge of PPE shall carry out periodic inspection of helmets. Safety helmets of which the service life has expired shall be replaced.
- 12.2.17 Chin strap shall always be used, especially if the falling of the helmet is liable to endanger others, e.g. workers working at the bottom of a deep shaft.

### 12.3 Eye and Face Protection

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- 12.3.1 It shall be noted that even a small particle getting into the eye can lead to disaster.
- 12.3.2 If any foreign body gets into the eye, ask for the assistance of a qualified person like first aider to remove it from the eye.
- 12.3.3 An adequate supply of safety spectacles, goggles and face shields shall be available.



**Safety spectacles**



**Safety goggles**



**Face shield**

- 12.3.4 Goggles or eye protectors shall be issued to the persons who are exposed

to a foreseeable hazard of eye injury.

- 12.3.5 Goggles shall be kept clean and fit to the person using it.
- 12.3.6 All safety spectacles, goggles and face shields shall conform to BS EN 166:2002 or its equivalent.
- 12.3.7 Welding shield and welding goggles shall conform to BS EN 169:2002.
- 12.3.8 Suitable eye or face protection shall be worn when engaged in: -
- (a) grinding and cutting with an abrasive wheel which is driven by mechanical power;
  - (b) dressing abrasive wheels;
  - (c) internal and external turning, other than precision turning, of non-ferrous metal and cast iron;
  - (d) welding and cutting;
  - (e) loading and unloading a live cartridge into a cartridge-operated tool, operating and doing repairs or examinations to a cartridge-operated tool when it is loaded;
  - (f) handling sewage, molten metal, acids, alkalis and other dangerous or corrosive substances, whether liquid or solid, which are injurious to the eyes;
  - (g) cleaning swarf, dust, etc. with compressed air;
  - (h) any process involving the use of laser beams;
  - (i) cutting or breaking, chipping or scaling of rock, metal, clayware, cast iron, concrete or glass product;
  - (j) cutting out or cutting off rivets or bolts from boilers, vessels or plant;
  - (k) chipping, scaling or scurfing of boilers or vessels;
  - (l) shotcreting;
  - (m) grit-blasting or sand blasting; and
  - (n) any operation where there is a risk of injury to the eyes from flying particles or splashed corrosive or harmful liquids.
- 12.3.9 Never watch welding operations without suitable eye protection against flash which can damage the eyes.

## 12.4 Hearing Protection

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### General

- 12.4.1 The attenuation of all ear protectors shall conform to BS EN 352:2002 or equivalent.
- 12.4.2 Only ear protectors approved by the Commissioner for Labour shall be used.
- 12.4.3 Some signs that noise level in a workplace is too high and ear protection is required to prevent damage to hearing are listed below: -
- (a) You have to shout to be heard.
  - (b) Your hearing is dull just after work.
  - (c) You get ringing in the ears after work.
  - (d) You have difficulty hearing people while others are talking.
- 12.4.4 It shall be noted that prolonged exposure to noise over 90 dB(A) can cause permanent hearing loss that cannot be cured. Excessive noise can cause a person irritable and tired. It also increases the chance of accidents as it distracts and makes it harder to hear audible alarms.
- 12.4.5 It shall be noted that the sound pressure level will drop by approximately 6 dB(A) for any doubling in distance.
- 12.4.6 Ordinary dry cotton wool shall not be used for hearing protection.

### Ear Plugs

- 12.4.7 Re-usable ear plugs or disposable ear plugs shall be used where the attenuation demand is not excessive. The attenuation of some soft plastic re-usable ear plugs ranges from 18 to 25 dB(A) and that some disposable ear plugs made of plastic foam or wax cotton wool ranges from 8 to 12 dB(A).
- 12.4.8 Disposable ear plugs shall be provided for infrequent visitors and shall never be re-used.
- 12.4.9 Re-usable ear plugs shall be provided to those who need to work continuously for a long-period in a high noise area.
- 12.4.10 Re-usable ear plugs shall be washed clean every time after use and shall be stored properly. The box holding the ear plugs shall also be cleaned regularly.



**Ear-plugs**

12.4.11 Ear plugs are available in different sizes to fit different ear canals. Universal fitting re-usable plugs are also available. Care shall be taken in selecting the correct size if the universal fitting type is not used. If they are too small for the ear canals, the attenuation effect will be reduced or even lost. If they are over-sized, they may deform the ear canals and cause severe nerve problems in the worst case.

12.4.12 It shall be noted that ear plugs of compressible foam rubber or wax cotton wool are all made for universal fitting.

12.4.13 All persons provided with ear plugs for the first time shall be trained on how to put them in and look after them after use. Before inserting an ear plug, one hand shall be put behind the head and the back of the ear shall be pulled back to open the ear canal. The ear plug shall be compressed to a smaller size and it shall be slid into the ear canal gently. The hand pulling the ear shall be released and the ear plug shall sit tightly and comfortably.



#### **Ear Muffs**

12.4.14 Ear muffs shall be used where a large attenuation of up to 40 dB(A) is demanded. The cushion shall be able to wrap around the whole ear and shall provide a good seal.



**Ear-muffs**

12.4.15 Ear muffs with replaceable ear cushions are preferred because the cushions will deteriorate with age or may be damaged in use.

12.4.16 Wearing of spectacles shall be avoided in order to get a good seal from ear cushions.

12.4.17 Only soap and water or other solvent recommended by the manufacturer of the ear muffs shall be used for cleaning.

12.4.18 Ear muffs shall be provided for those who may need to get in and out of a high noise area frequently.



## 12.5 Respiratory Protection

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12.5.1 Suitable respirators shall be worn for protection for the following work: -

- (a) sanding and rubbing down wood, filling materials and oil paint,
- (b) spray painting and painting,
- (c) steam cleaning,
- (d) cleaning cooling coils and filters with high pressure jets,
- (e) all processes that may give out silica dust or mercury vapour,
- (f) all works in a confined space,
- (g) the atmosphere contains a nuisance, harmful or toxic dusts or gases,
- (h) all works involving asbestos,
- (i) shotcreting, and
- (j) sand blasting or grit blasting.



**Mouth Piece**



**Half-face type respirator with cartridge filter**



**Full-face type respirator with cartridge filter**

12.5.2 Suitable respirators shall also be worn for rescue purposes, e.g. inside a confined space.

12.5.3 Suitable respirators will provide adequate protection. This is measured by the degree of inward leakage that occurs when used. The maximum allowable inward leakage for the various types of respirators are given in the appropriate British Standards or their equivalent.

12.5.4 The degree of inward leakage depends on: -

- (a) the quality of face seal (facial air, wearing spectacles, etc. can seriously affect the face seal);
- (b) the degree of efficacy of the filter or canister if any;
- (c) the degree of efficacy of the exhalation valve if used; and
- (d) the maintenance of the respirator and its accessories.

12.5.5 Instruction and training shall be provided to all persons using the respirators for their correct fitting, use, limitations and symptoms of exposure.

12.5.6 Reference shall be made to Table 12.5a and 12.5b for selecting suitable respirators for the protection against specific hazards.

**Table 12.5a - Specifications for Respirators**

Specification	Reference
The selection, use and maintenance of respiratory equipment	BS EN 529:2005
Gas filters and combined filters	BS EN 14387:2004
Mouthpiece assemblies	BS EN 142:2002
Powered particle filtering devices incorporating helmets or hoods	BS EN 12941:1998
Power assisted particle filtering devices incorporating full face masks, half masks or quarter masks	BS EN 12942:1998
Filtering half masks to protect against particles	BS EN 149:2009

**Table 12.5b - Types of Respirators to Use Against Specific Hazards**

Type	Purpose
Facemask	Nuisance dusts and non-toxic sprays
Cartridge Respirator	Low concentration of certain relatively non-toxic gases
Canister Respirator	High concentration of certain toxic gases
Positive Pressure	Against disease producing non-toxic dusts

12.5.7 The types of respirators for asbestos works shall be those approved by the Commissioner for Labour (Regulation 12 of the Factories and Industrial Undertaking (Asbestos) Special Regulations).

12.5.8 All respirators, with the exception of disposable types, shall be cleaned and inspected after use and before wearing by another person. Cartridges and filters have a limited life, which is very dependent on the environment in which they are used, and manufacturer's recommendations shall be closely followed.

12.5.9 Respirators shall be stored properly when not in use.

## 12.6 Breathing Apparatus

- 12.6.1 Breathing apparatus shall be used for protection against toxic gases and in an oxygen deficient environment.
- 12.6.2 Every person designated to wear breathing apparatus shall be certified fit by a doctor.
- 12.6.3 Every person designated to wear breathing apparatus shall be properly trained and given adequate practice in its use.
- 12.6.4 Table 12.6 shows the references for selecting suitable breathing apparatus.



**Self-contained breathing apparatus**

**Table 12.6 - Specifications for Breathing Apparatus**

Specification	Reference
Self-contained open-circuit compressed air breathing apparatus	BS EN 137:2006
Fresh air hose breathing apparatus for use with a full face mask, half mask or mouthpiece assembly	BS EN 138:1994
Compressed air line breathing apparatus for use with a full face mask, half mask or a mouthpiece assembly	BS EN 14593:2018
Self-contained closed-circuit breathing apparatus, compressed oxygen type	BS EN 145:1998
Self-contained closed-circuit compressed oxygen breathing apparatus for special use	BS EN 145-2:1998
Powered fresh air hose breathing apparatus incorporating a hood	BS EN 269:1995
Compressed air line breathing apparatus incorporating a hood	BS EN 14594:2018
Compressed air line or powered fresh air hose breathing apparatus incorporating a hood for use in abrasive blasting operations	BS EN 14594:2018

- 12.6.5 The pressure gauge readings shall be regularly checked when using breathing apparatus. Ensure that adequate gas is in the cylinder before use.

- 12.6.6 The breathing apparatus shall be regularly serviced. The gas hose shall be checked for any leakage and shall be replaced immediately if defect is found.
- 12.6.7 The breathing apparatus shall be stored properly when not in use and proper maintenance record shall be maintained.
- 12.6.8 The types of breathing apparatus for working in confined space shall be those approved by the Commissioner for Labour according to the Factories and Industrial Undertakings (Confined Spaces) Regulation.

## 12.7 Hand Protection

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12.7.1 Protective gloves shall be worn whenever you are handling: -

(a) equipment or work pieces that may cause abrasions, cuts, tears, punctures and other injuries to your hands;



**Spanner**

(b) toxic or hazardous chemicals;

(c) high or low temperature work pieces;



**Screwdriver**

(d) electrical installations; and

(e) sewage and foul matters.

12.7.2 The right gloves shall be used for the job and that they shall be of the right size. If the gloves are too tight, fatigue and discomfort will result. A glove too large or too thick will reduce dexterity.

12.7.3 Gloves shall be changed at suitable time as they are of limited life. It shall be noted that the harmful effects of toxic chemicals can substantially reduce the durability and performance of the glove material over time.

12.7.4 Gloves shall be regularly checked for any defects.

12.7.5 A register of the gloves issued to workers shall be kept so that a regular replacement programme of the gloves can be implemented.

12.7.6 All gloves shall be thoroughly cleaned after use and shall be stored properly.

12.7.7 Contaminated gloves shall be removed carefully and disposed properly in a bin for hazardous wastes to avoid others from accidentally contacting them.

- 12.7.8 Gloves shall not be shared among different workers.
- 12.7.9 Hands shall be washed before gloves are worn.
- 12.7.10 All cuts and abrasions on the hands shall be treated and covered before wearing gloves.
- 12.7.11 Any sign of a skin rash or irritation shall be attended to immediately.
- 12.7.12 Table 12.7 shows the references for selecting the suitable types of gloves against different types of hazards.

**Table 12.7 - Specifications for Hand Gloves**

Hazard	Specification
Mechanical : resistance to abrasion, blade cut, tear, and puncture	BS EN 388:2016
Chemical and Micro-organisms	BS EN 16523-1:2015
Thermal	BS EN 407:2004
Protection from Cold	BS EN 511:2006
Electricity	BS EN 60903:2014

## 12.8 Safety Footwear

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- 12.8.1 Suitable footwear conforming to BS EN ISO 20344:2011 and BS EN ISO 20345:2011 shall be worn during work in construction sites, workshops, plants and laboratories. In general, skid-resistant safety shoes with steel toe cap and reinforced sole shall be used.



**Wellingtons**

- 12.8.2 Suitable ankle boots shall be worn when there is high risk of foot injuries from slippery or uneven ground, sharp objects, falling objects, etc.

- 12.8.3 Shoelace knots shall be kept tight.



**Ankle boots complete with steel toe-cap and mid-sole**

- 12.8.4 Wellington boots with skid-resistant soles shall be worn when working in flooded or constantly wet areas.

- 12.8.5 No flip flops, high heel shoes and slippers shall be worn in the construction sites, workshops, plants and laboratories.

## 12.9 Protective Clothing

12.9.1 Impermeable overalls, gloves and dust caps shall be worn when working with or handling asbestos and asbestos-based products, lead and lead-based products including lead paint, and other harmful chemicals, which may be absorbed through intact skin.



12.9.2 Overalls that are worn or saturated with oil shall not be worn. They shall be cleaned and changed before returning home and washed every day after work.

12.9.3 Loose sleeves or belts shall be avoided and loose clothing shall be kept buttoned up.

**Gaiter, gloves and shoe-covers**

**Protective overalls**

12.9.4 Overalls shall not be soaked in sewage. No one shall enter a sewage manhole unless impermeable protective overalls are worn.

12.9.5 Gaiters manufactured to BS EN ISO 20349:2010 or equivalent shall be worn when engaged in handling molten metal and knocking out hot materials.

12.9.6 Suitable types of coveralls commensurate with the level of hazardous exposures in laboratories shall be worn. Laboratory clothes shall be regularly laundered and kept in good conditions.

12.9.7 All protective clothing shall be removed before leaving the workplace or entering rest rooms or eating.

12.9.8 Table 12.9 shows the references for the selection of protective clothing against different types of hazards.

**Table 12.9 - Specification for Protective Clothing**

Hazard	Specification
General Requirements	BS EN ISO 13688:2013
Mechanical : Hand-held chain saws	BS EN 381-11:2002
Chemical	BS EN 14605:2005
Welding	BS EN 14605:2005
Entanglement with moving parts	BS EN 510:1993
Heat and flame	BS EN ISO 14116:2015

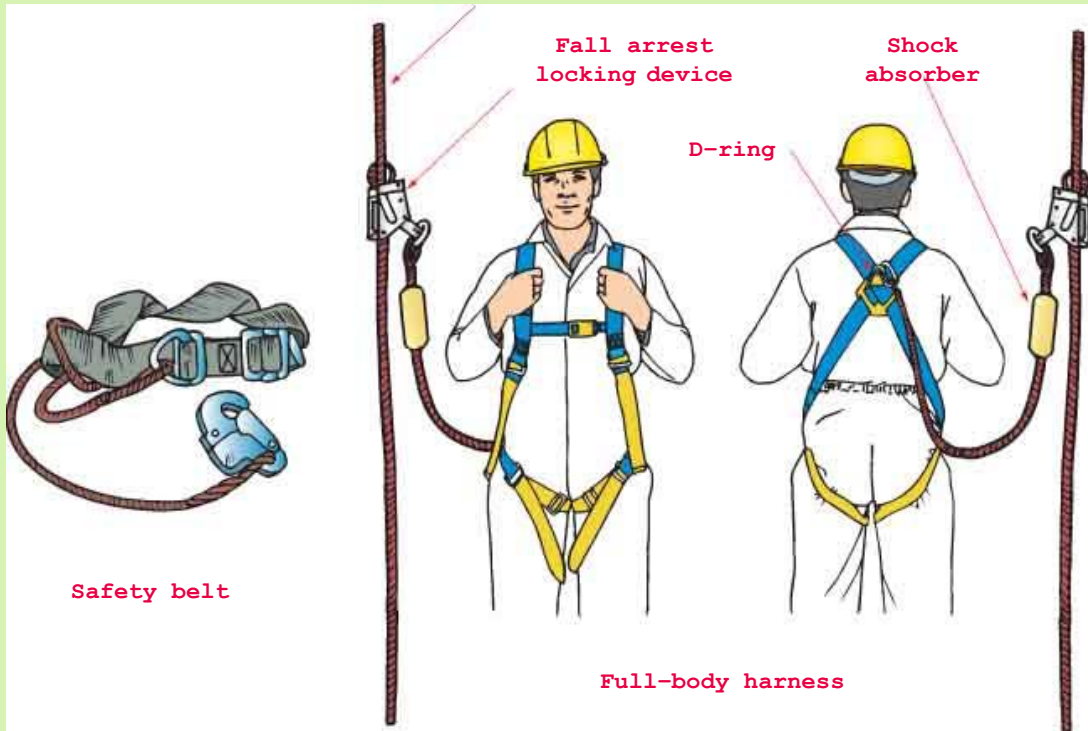
## 12.10 Fall Protection

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- 12.10.1 Reference shall be made to the "Guidance Notes on Classification and Use of Safety Belts and their Anchorage System" published by the labour Department.
- 12.10.2 Safety belts, harnesses and safety nets shall not be relied on to prevent falls, except where it is impractical to provide proper means of protection against fall of person, including suitable scaffolds or working platform, safe access and egress, safe place of work and fencing of dangerous place, for workers required to work at height.
- 12.10.3 Where proper means of protection against fall of person cannot be provided, all persons liable to fall for more than 2m or any distance less than 2m but the injuries so caused may be serious shall wear safety belts or safety harnesses as appropriate with a lanyard which shall be attached to secure anchor points.
- 12.10.4 The safety belts, harnesses, lanyards, anchorage and fittings shall be of such a design and so constructed as to prevent serious injury in the event of a fall to any person using them.
- 12.10.5 All safety belts and harnesses shall conform to BS EN 361:2002 or equivalent.
- 12.10.6 Safety harnesses are preferable to safety belts for reducing possible injuries to the waist caused by the shock from a drop. A shock-absorbing device shall be used as far as practicable.
- 12.10.7 Safety belts and harnesses of the smaller drop shall be used as far as the situation permits. They shall be made to two drop limits (i.e. lanyard lengths), one shall be 0.6m for close work and the other shall be 2.0m for providing greater freedom of movement.
- 12.10.8 Anchor points for safety belt or harness shall be directly above and the lanyard shall be left with the minimum free length. All anchor points shall conform to BS EN 795:2012.
- 12.10.9 All safety nets, safety belts and other equipment provided for prevention of falls of person shall be properly maintained.
- 12.10.10 All safety belts and harnesses shall be registered. A record of maintenance shall be kept.



Independent lifeline

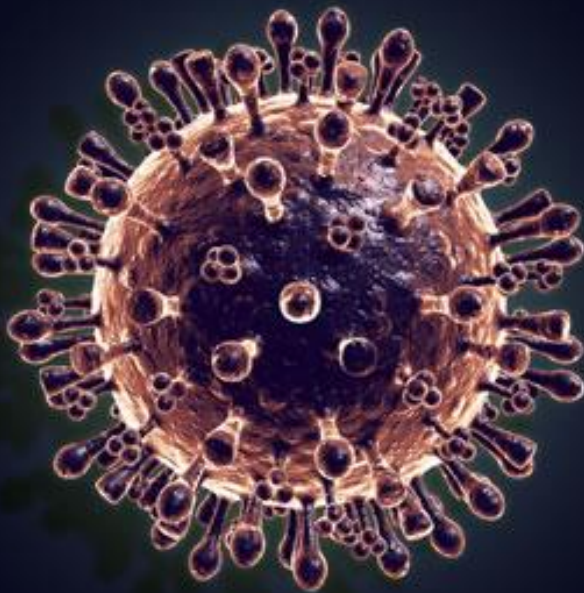


# 13

**BIRD  
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**Hygiene  
at Work**



# CHAPTER 13

## Hygiene at Work

### 13.1 Personal Hygiene and Workplace Hygiene

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- 13.1.1 Hygiene is the principle of health. Maintaining good hygiene at work can help prevent breeding of pests and avoid development and transmission of diseases like dengue fever, avian flu and pandemic influenza etc. On the other hand, poor hygiene at work can affect workers' health, morale, organization's image and even work progress.
- 13.1.2 Hygiene at work consists of the personal hygiene of individual staff and the hygiene of the workplace concerned, both of which require the joint effort of every single staff working therein. All levels of staff should therefore pay attention to maintaining their personal hygiene and the hygiene of the place they work.

#### **Personal Hygiene**

- 13.1.3 Every staff is responsible for the hygiene of their own and should develop good personal habits including but not limited to the following:
- (a) Keep hands clean and wash hands regularly and properly.
  - (b) Cover nose and mouth while sneezing or coughing. Dispose sputum or secretions wrapped in tissue paper into rubbish bins with lids. Wash hands afterwards.
  - (c) Avoid crowded places with poor ventilation if one is feeling unwell.
  - (d) Develop good body resistance and have a healthy lifestyle. This can be achieved through a balanced diet, regular exercise, adequate rest, reducing stress and no smoking.
  - (e) If you have flu symptoms, consult a doctor and wear a mask to prevent spread of disease. Tell your doctor your travel history if you have been to places with outbreak of avian influenza reported.

## Workplace Hygiene

13.1.4 Officers-in-charge of a workplace should make arrangements to upkeep the hygiene of the working environment to minimize the risk of development and transmission of diseases, including but not limited to the following:

- (a) Provide and maintain suitable sanitary conveniences like toilets, changing rooms and washing facilities, etc. at the workplace including offices and site offices, sewage treatment facilities and pumping stations. Mobile toilets should be provided wherever fixed toilets are not practicable. Ensure liquid soap, disposable towels or hand dryers are available in toilets.
- (b) Provide sufficient suitable waste receptacles and litter bins with lid at convenient locations. Remove and dispose of the waste and litter at least daily and clean the waste receptacles and litter bins regularly.
- (c) Maintain a clean and hygienic working environment. Good housekeeping, i.e. regular cleaning and tidying up of the workplace, proper storage and disposal of materials and wastes, etc., is essential to the upkeep of the hygiene of the working environment.
- (d) Clean and disinfect the furniture and equipment for public use, e.g. telephones, floor buttons in lift cars and lift lobby, etc., at least daily and when visibly soiled by using appropriate disinfectant, e.g. 1 part of 5.25% household bleach in 99 parts water for non-metallic surface, or 70% alcohol for metallic surface. Leave for 30 minutes and then rinse with water.
- (e) If a workplace is contaminated by respiratory secretions, vomits or excreta, use disposable towels to wipe them away. Then disinfect the surface and neighbouring area with appropriate disinfectant as described above. Leave for 30 minutes and then rinse with water.
- (f) Ensure good ventilation: -
  - (i) Maintain air-conditioners in good working order and wash down the dust-filters frequently.
  - (ii) Switch on wall fans and any circulating or exhaust fans to enhance air movement.
  - (iii) Windows of offices should be opened from time to time for better ventilation, but make sure that the windows and exhaust louvers are not located on the same wall.

- (g) Inspect wash-hand basins, bathtubs, shower trays, water closets, sinks, floor drains, etc. regularly. Qualified technicians should be hired for inspection and repair if necessary. Make sure: -
  - (i) Each of the above sanitary fitment is fitted with a trap;
  - (ii) The trap is fitted properly;
  - (iii) There is no crack or defect; and
  - (iv) No leakage.
- (h) Pour about half a litre of water into each floor drain inlet regularly in about once a week. Then, pour a teaspoon of 1:99 diluted household bleach solution into it. Finally, spray insecticide into the drain inlet.
- (i) Repair immediately if there is defect in the trap or smell of foul air coming out from drain inlets.
- (j) Promote non-smoking working environment and if necessary provide smoking room.
- (k) If a staff develops influenza-like symptoms such as fever, sore throat and cough, remind him/her to stay at home and consult a doctor immediately.

## **13.2 Mosquito Prevention in Workplaces**

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- 13.2.1 Mosquito breeding is not only a nuisance but also a risk of health to humans. Mosquitoes transmitted various diseases, notably the Dengue Fever, Japanese Encephalitis and Malaria. Fatality can be resulted after contracting these diseases if timely and suitable treatment is not available.
- 13.2.2 The hot and wet climate in Hong Kong is favourable to the breeding of mosquitoes, especially in summer. Mosquitoes can breed in very tiny unnoticed puddles as quickly as in a few days. Once the larvae and pupae are developed into adult form, they can fly away from their breeding place and are much more difficult to deal with.
- 13.2.3 It is therefore crucial to combat the problem before the mosquitoes develop into adults. In so doing, the most effective way is to get

rid of their breeding places by removing stagnant water, or, to prevent them from developing into adults by spraying mosquito oil on stagnant water, which cannot be practicably removed.

13.2.4 DEVB has promulgated guidelines on the basic mosquito prevention measures to be implemented by public works contractors, as well as the anti-mosquito actions to be taken for public works sites at different levels of risks as reflected by the mosquito indices announced by the Food, Environment and Hygiene Department (FEHD). Details are as below.

13.2.5 Basic Measures to be Implemented by Contractors

- (a) To assign a designated person to co-ordinate, supervise and monitor the mosquito prevention measures to be carried out by his workers or those of his subcontractors on site.
- (b) To maintain good housekeeping at all times. Keep construction site clean and tidy and free from litter especially empty lunch boxes, plastic bottles and cans that can hold water.
- (c) To conduct regular inspections of the works sites and surroundings. Identify and eliminate possible mosquito breeding grounds, e.g. ditches, pits, bamboo stumps, keyholes of manhole covers, etc.
- (d) To remove stagnant water found by all means or apply larvicide if impracticable.
- (e) To conduct toolbox talks regularly to upkeep the workers' awareness.
- (f) To instruct workers at risk to wear protective work wear and apply mosquito repellents.
- (g) To establish complaint hotline at prominent position.
- (h) To promote anti-mosquito work and review the performance of mosquito prevention and formulate necessary improvement actions as needed during the monthly Site Safety Management Committee (SSMC) meetings.

13.2.6 Different Actions to be Taken on Site at Different Levels of Risks

DEVB has set out the actions to be taken on site when different levels of Ovitrap Indices (OVI) were recorded by the FEHD as below.

Action Level	Actions to be taken
<p>Level 1 OVI&lt;5%</p>	<ul style="list-style-type: none"> <li>• Closely monitor the hygiene conditions to prevent breeding of mosquitoes.</li> <li>• Conduct regular inspections as per Section 13.2.7(a) to identify potential mosquito breeding places and eliminate such places as far as possible.</li> </ul>
<p>Level 2 5%&lt;OVI&lt;20%</p>	<ul style="list-style-type: none"> <li>• Conduct regular inspections as per Section 13.2.7(a) for the thorough site.</li> <li>• Check and eliminate possible mosquito breeding grounds.</li> <li>• Ensure all stagnant waters are removed.</li> <li>• Encourage workers to report mosquito breeding areas found.</li> </ul>
<p>Level 3 OVI&gt;20%</p>	<ul style="list-style-type: none"> <li>• Conduct regular inspections as per Section 13.2.7(a) for the thorough site.</li> <li>• Extend the inspection to cover surrounding areas.</li> <li>• Report mosquito breeding grounds found outside the site boundary to FEDH.</li> <li>• Provide mosquito-killing devices on site if situation warrants.</li> <li>• Include the mosquito prevention issue in weekly site meeting with contractor.</li> <li>• Where necessary, request FEDH to install ovitraps for monitoring.</li> </ul>
<p>Level 4 OVI&gt;40%</p>	<ul style="list-style-type: none"> <li>• Intensify the Level 3 actions as appropriate.</li> <li>• Arrange independent audit of the site as per Section 13.2.7(b) once a month.</li> <li>• Instruct workers to wear long sleeved work wear.</li> <li>• Provide mosquito-killing devices on site.</li> <li>• Apply larvicide at all possible breeding grounds.</li> </ul>



### 13.2.7 Inspections to be Conducted by the Engineer's Representative (ER)

Senior Engineer/Safety Adviser (SE/SA) would keep track of the ovitrap indices (OVI) promulgated in FEHD's website regularly and advise the ER through the Chief Engineers (CEs)/Divisional Safety Coordinators (DSCs). The ER and their site supervisory staff, or resident site staff as the case may be, concerned should conduct inspection to monitor the on-site anti-mosquito measures to be taken at different action levels. In particular,

- (a) To conduct regular inspection of the works site and its surroundings, using the appropriate checklists, to monitor the adequacy and effectiveness of anti-mosquito measures carried out by the contractors, which includes: -
  - (i) "daily inspection" by WS,
  - (ii) "weekly inspection" by IOW, and
  - (iii) "monthly inspection" by ER.
- (b) To arrange audits for sites falling within areas of OVI Level 4 once a month, which shall be conducted by an independent task force assigned by the CE concerned (e.g. officers not related to the works at SE or E level, say), using the audit checklist specified.
- (c) To review the contractor's mosquito prevention performance and instruct the contractor to improve the anti-mosquito work as necessary during the monthly SSMC Meeting.

### 13.2.8 Reporting

- (a) The ER shall submit the "Monthly Report of Mosquito Prevention on Construction Sites" to report the Nos. of inspections and anti-mosquito clearance actions of SIMAR slopes carried out by the contractor, and the regulating actions taken, if any. SE/SA shall consolidate the returns from different sites for submission to the DEVB.
- (b) SE/SA shall submit a "Monthly Situation Report" to AD/O&M for reporting and discussion in the "Pest Control Steering Committee Meeting" (formerly the Ad hoc IDWG Meeting on Mosquito Prevention at Works Sites) convened by the Food and Health Bureau (FHB). The report shall contain the Nos. of convictions and/or summons issued by FEHD due to mosquito breeding on works sites, as well as a specific report on districts where high Monthly Ovitrap Indices (MOI) are recorded.

- (c) The CE and ER concerned shall truly reflect the contractor's mosquito prevention performance in the Report on Contractor's Performance (re: item 6.1, 7.3 and 7.4) for consideration of the Contractors Performance Reporting Review Committee (CPRRC) in its regular meetings.

#### 13.2.9 Other Requirements

- (a) The Contractors shall strictly follow the contractual and legislative requirements regarding prevention of mosquito breeding and good housekeeping of the works sites.
- (b) DEVB has set a target of zero prosecution (and thus zero conviction) against mosquito breeding on public works sites.
- (c) The ER shall conduct an immediate and thorough audit on the contractor's anti-mosquito measures if a summons is issued.
- (d) Site supervisory staff, or resident site staff as the case may be, shall instruct the contractor to critically review his anti-mosquito measures and increase the frequency of inspection. It shall be aimed at no repeated prosecution of the same contract within the following 3 months.
- (e) Regulating actions, ranging from the issue of a warning letter to suspension from tendering, will be taken by the DEVB against contractors who are convicted of 4 or more mosquito breeding offences in separate incidents in any rolling 3-month period in accordance with ETWBTC(W) No. 22/2003.

13.2.10 The above procedures can be found in "DSD Consolidated Anti-mosquito Measures for DSD's Works Sites (June 2014)", which is available in the Departmental Portal.

13.2.11 Officers-in-charge of other DSD's workplaces such as sewage treatment works, pumping stations and maintenance depots etc. should make reference to the above document in combating mosquito problems.

### 13.3 Pest Control

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#### 13.3.1 General

- (a) Pest control refers to the regulation or management of pest, which is perceived to be detrimental to human's health, ecology or economy.

- (b) The common pest found on construction sites and sewage treatment facilities include pest harmful to trees, red imported fire ants (RIFA) and rodents etc.
- (c) In general, pest problems can be mitigated significantly by improving the cleanliness and tidiness of construction sites and sewage treatment facilities.

### 13.3.2 Preservation of Trees

- (a) Trees can be affected by: -
  - (i) disease due to bacterial or fungal action,
  - (ii) damage caused by insects,
  - (iii) damage caused by animals, including birds,
  - (iv) natural threats, e.g. fire, and
  - (v) human activities, e.g. construction work.
- (b) Common pests in crops of Hong Kong include Red Imported Fire Ants (RIFA), Flea Beetles, Melon Flies, Leaf Miner, Fall-armyworm Larvae etc. The common control methods against pests and diseases can be broadly divided into three categories, namely:
  - (i) physical method (e.g. bug-sucking method, simple bagging method, mineral oil),
  - (ii) chemical method (e.g. artificial insecticides and fungicides, natural derris root extract, matrine), and
  - (iii) biological method (e.g. Bacillus thuringiensis, Steinernema nematode).

Detailed information can be found in AFCD's website.

- (c) Control of Pest and Disease of Preserved Trees
  - (i) It is a good practice to plant trees that are most likely to remain healthy under the conditions of a planting site. Provide good care and maintenance by a qualified arborist and protect trees from construction and other damage.
  - (ii) Early detection of tree diseases is also important since timing is important both in limiting damage to infected trees and in treating the diseases.

- (iii) Take necessary control measures to protect the preserved trees from pest and disease attack in the execution of the Works.
- (iv) Before commencing the application of the pest and diseases control measures, a method statement shall be prepared, which shall cover amongst other aspects as required under the contract, the pesticide or fungicide to be used and any other necessary associated arboriculture work to the infected areas.
- (v) The pest and disease control measures shall comply with following requirements: -
  - environmentally friendly measures shall be adopted, and
  - the safety precautions as per manufacturer's instruction shall be strictly followed in using pesticide or fungicide so as to avoid causing danger or harm to the public and the environment.

### 13.3.3 Red Imported Fire Ants (RIFA)

- (a) Red Imported Fire Ant (RIFA), with scientific name *Solenopsis invicta* Buren, is a small ant species (about 3-6mm) which will emerge from the mounds and be very aggressive when disturbed. Given their large populations and aggressiveness, RIFA may have an impact on ecology and natural environment. RIFA may also give human a fiery sting. The sting can give a painful, itchy and burning sensation. On rare occasions, RIFA can cause severe acute allergic reactions, which may lead to death.
- (b) If any suspected RIFA mounds/nests are found, do not tamper with or touch them with bare hands. Avoid coming into contact with the RIFAs and being stung. If stung, one should:
  - (i) apply a cold compress to the skin to relieve the swelling and pain;
  - (ii) gently wash the affected areas with soap and water and leave the blister intact;
  - (iii) do not scratch the blister;
  - (iv) seek medical advice if necessary; and
  - (v) seek immediate medical advice if one has a history of allergy to insects or experience symptoms like rapid onset of flushing; general hives; swelling of the face, eyes or throat; chest pains; nausea; severe

sweating; breathing difficulties and faintness.

- (c) Regular inspections shall be conducted to work locations with particular attention to areas with potential risk of pests, e.g. vegetation, grass areas with imported planting and soil. Even when no RIFA is found, continue the careful inspections.
- (d) All staff should be vigilant to watch out for the presence of any RIFA in their daily inspection of DSD's construction sites and sewage treatment facilities.
- (e) The CEs should alert their consultants and contractors to ensure that the planting and soil used for landscaping works must come from proper sources and free from RIFA. The ER responsible for supervising landscaping works should oversee the contractors' work with a view to guarding against inadvertent import of RIFA.
- (f) Anyone who first discovers the mounds or nests shall report immediately to the officer-in-charge (or his delegate) of the construction sites or sewage treatment facilities. The officer-in-charge shall inspect the nests and report as below if the nests are suspected genuine: -
  - (i) notify the CE concerned;
  - (ii) report to AFCD through the hotline telephone No. 2150 7000;
  - (iii) complete the "Inspection Report on Suspected Presence of Red Imported Fire Ant" provided by AFCD and send it to AFCD by fax (No. 2736 9904) and copy to SE/SA and TS/2;
  - (iv) collect specimens of the suspected RIFA for examination of AFCD according to the guideline on sample collection and delivery set out in the technical note "Tackling Red Imported Fire Ants" produced by AFCD;
  - (v) SE/SA will coordinate the quarterly return to AFCD.
- (g) Apply insecticide, carry out surveillance and hire private pest control service to deal with RIFA found as and when necessary. In case of query, call AFCD hotline at 2150 7000.
- (h) Reference shall be made to the DSD Guideline on RIFA (March 2005) or its latest update on handling and reporting of RIFA, which has been uploaded to the Departmental Portal for easy reference of DSD staff.

#### 13.3.4 Rodents

- (a) Hazards caused by rodents include:
- (i) Transmission of infectious diseases directly or indirectly to humans such as plague, hantaviral infection, leptospirosis, scrub typhus, urban typhus and spotted fever.
  - (ii) Damage of properties by gnawing building fittings, biting data cables and electric cables posing fire hazards due to short-circuiting. Their excreta can spoil food and goods.
  - (iii) Biting people of low mobility or who are asleep or who attempt to attack them.
- (b) Rodent infestation can be prevented in the following ways:
- (i) Eliminate food sources - Store all food properly in covered containers. Dispose of food remnants and refuse properly in covered rubbish bins, which should be cleared daily. Do not leave dog food overnight.
  - (ii) Remove rodent harborages - Avoid accumulation of building material or junk for a long period of time. Prevent rodents from entering the voids beneath container offices by screening the footings with appropriate material (e.g. metal plates) so that the openings are less than 6mm. The threshold clearance beneath the doors of site offices and storerooms should be less than 6mm.
  - (iii) Exclude rodents from the sites - Reduce the gaps between or under the hoardings around a construction site, particularly those facing side lanes or rear lanes, to not more than 6mm. Inspect unloaded building material to ensure no rodents are brought into the site with the material.
  - (iv) Never tolerate any minor rodent infestation. Early detection of rodent infestation can help minimize the problem.
  - (v) Be aware of the presence of rodent signs such as droppings, burrows, gnawing marks, smear, etc.
  - (vi) Apply poisonous baiting and appoint pest control companies for regular inspections and control when necessary.

### 13.3.5 Use of Pesticide

- (a) The term pesticide refers not only to insecticides but also applies to herbicides, fungicides, rodenticides and other various substances used to control pests.
- (b) Pesticide can be in different forms including wood preservatives, anti-fouling paints, aerosol insect spray, cockroach and rat baits etc. Pesticides may cause serious harm to humans, animals and environment if they are not used properly. The manufacturer's instruction shall be strictly followed when using pesticide.
- (c) For control of pest like mosquito, general safety precautions on applying mosquito larvicide include: -
  - (i) Adjust the pressure of the vessel containing the larvicide to suitable level.
  - (ii) Attend to the wind direction and avoid larvicide spraying on the body.
  - (iii) Adjust the nozzle to control the area and amount of application.
  - (iv) Avoid direct contact with the larvicide and clean thoroughly the hands, face etc. after work.
  - (v) No smoking and eating when spraying larvicide.
  - (vi) Store the vessel of larvicide in an airtight bag or container before putting on vehicle to avoid the larvicide vaporizing in the vehicle.
  - (vii) Clean the hose and nozzle daily after work and check for possible leakage.
  - (viii) Ensure correct label of the larvicide is attached on the vessel, which should show the name, risks and safety precautions of the larvicide.
  - (ix) Use appropriate personal protective equipment including safety goggles, facemask, plastic gloves, overalls, etc.



## 13.4 Avian Flu and Influenza Pandemic

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13.4.1 Avian influenza (or avian flu) - Avian influenza in man causes wide range of flu-like symptoms, which may progress rapidly to respiratory failure, multi-organ failure and even death. When people are concurrently infected with human and avian influenza virus strains, they may serve as the "mixing vessel" for the emergence of a novel subtype of virus having sufficient human influenza genes to facilitate transmission from person to person. The event could mark the beginning of influenza pandemic.

### 13.4.2 Avoiding Avian Influenza

- (a) Avoid touching live poultry, birds or their droppings, because they may carry the avian influenza virus.
- (b) Wash your hands thoroughly with liquid soap and water immediately after contact with live poultry, birds or their droppings.
- (c) Cook poultry and eggs thoroughly before eating.

### 13.4.3 Reporting of Dead Birds found in Workplace

The following procedure shall be followed when dead birds are found in DSD workplace.

- (a) The carcass of a dead bird, including its body parts and internal organs, may carry pathogens that are hazardous to humans. Direct contact with the carcass, blood or body fluid of the dead wild bird should be avoided;
- (b) If a dead wild bird is found, the officer-in-charge (Oi/c) of a workplace should call the Agriculture, Fisheries and Conservation Department (AFCD) through the Government Hotline 1823 and initiate measures to prevent other persons from coming into contact with the carcass;
- (c) If it is unavoidable to handle the carcass, the safety guidelines set out in the website of the Centre for Health Protection (CHP) of the Department of Health (DH), which has also been uploaded to the Departmental Portal for easy reference, shall be followed to protect the workers;
- (d) Apart from reporting to the divisional chief concerned, the Oi/c should notify Technical Secretary 2 (TS2) and Senior Engineer/Safety Adviser (SE/SA) by e-mail the following information:
  - (i) Contract No. and Title (for construction sites)

- (ii) Date and time
  - (iii) Location (with a map or location plan)
  - (iv) Photos
  - (v) Brief description of findings (number and type, if known) and actions taken (e.g. referral to AFCD, etc.)
  - (vi) Name, post and contact phone no. of the officer for further contact
- (e) SE/SA will maintain a record of the dead birds found to monitor the situation.

#### 13.4.4 Preparedness Plans at Different Levels

- (a) The government has established an overall contingency mechanism to set a clear command and response coordination structure for making and implementing decisions. Central to this contingency mechanism is a three-tiered response system (i.e. "Alert", "Serious" and "Emergency Response Level") to ensure the government's swift formulation of strategies in handling major infectious disease outbreaks. Details of the system can be found in the website of the Centre for Health Protection (CHP) of the Department of Health (DH).
- (b) With reference to this three-tiered response system, government departments will draw up their contingency plans.
- (c) The then ETWB has issued a memo ref. ETWB(W) 505/91/01 dated 7.2.2004 on guidelines of prevention of avian flu.
- (d) Preparedness plans have been drawn up for the DSD Headquarters, Sewage Services Branch, Operations & Maintenance Branch, Projects & Development Branch and Electrical & Mechanical Branch. Details of the plans can be found in the Departmental Portal.
- (e) Officers-in-charge of individual workplaces should make reference to the above information and make up their own preparedness plan to suit operation needs where necessary.

#### 13.4.5 Outbreak of Pandemic

- (a) When a pandemic strike, it may not be possible to totally eliminate the risk of infection. However, one can reduce the risk considerably if one is prepared for the following measures and adhere to them: -

- (i) Step up hygiene practices like washing hands and keeping the environment clean and maintain good ventilation.
  - (ii) Avoid crowded or poorly ventilated places.
  - (iii) Wear a mask if you develop flu-like symptoms, when caring for the sick, and when visiting hospitals and/or clinics.
  - (iv) Watch out for the latest situation of the influenza pandemic and further announcements from the government.
  - (v) Pay attention to and comply with guidelines issued by the government with respect to travelling, port health control and suspension of public events as needs arise.
- (b) Visit the Centre for Health Protection (CHP) Website [www.chp.gov.hk](http://www.chp.gov.hk) or call the 24-Hour Health Education Hotline of the Department of Health (DH) at 2833 0111 to retrieve updated information about influenza.

13.4.6 Reference shall be made to the "DSD Consolidated Guide to Prevention of Pandemic Influenza" (Dec 2015) or its latest update on handling and reporting of Avian Influenza. The consolidated guide has been uploaded to the Departmental Portal for easy reference of DSD staff.

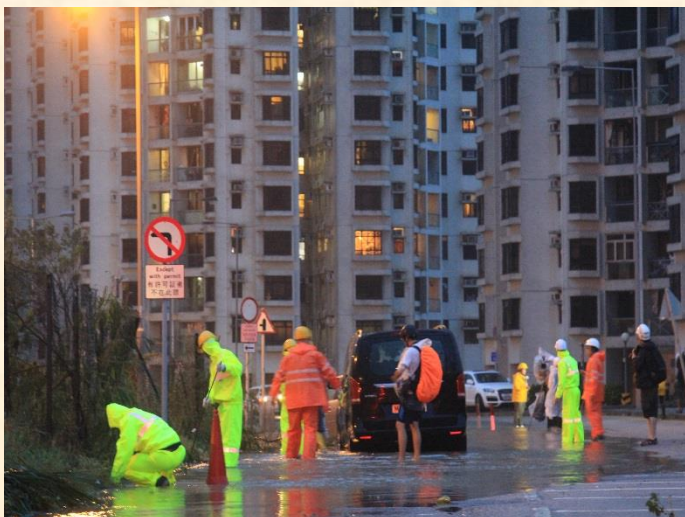
## **13.5 Control of Dogs on Construction Sites**

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- 13.5.1 No dog shall be kept by the Contractor or his employees, his agents or sub-contractors or their employees, on the Site unless the dog is acceptable for licensing by the Agriculture, Fisheries and Conservation Department (AFCD), and is licensed under the Rabies Ordinance (Cap 421), implanted with a microchip and vaccinated against rabies.
- 13.5.2 The licensee shall be a contractor's staff at a level not lower than deputy site agent, or a security firm hired by the contractor for site security purpose or one of its staff at a level not lower than assistant manager.
- 13.5.3 All licensed dogs kept on Site must be neutered. The contractor shall keep on Site a copy of the licence and certificate of neutering issued by a registered veterinary surgeon for all dogs for inspection by the ER.

- 13.5.4 All licensed dogs kept on Site shall be identified by suitable markings on their collars. The contractor shall remove all dogs from Site upon completion of the Works.
- 13.5.5 The contractor shall alert Agricultural, Fisheries and Conservation Department (AFCD) of any unlicensed dogs found on site and provide access to AFCD for removing such dogs.
- 13.5.6 The contractor and any persons in his employ shall observe the licensing requirement and control measures as set out in the "Code of Practice for the Keeping of Dogs on Construction Sites in Hong Kong" issued by AFCD. The major requirements are: -
- (a) All dogs over 5 months of age must be vaccinated against Rabies, micro-chipped and licensed, which can be done on Site upon request to AFCD.
  - (b) Dogs must be kept inside the Site at all times. At least one person should take responsibilities for the proper behaviour, welfare and legal responsibilities of any dogs kept on Site.
  - (c) No dogs shall be abandoned. Dogs must be re-homed upon closure of a site, or surrendered to the AFCD or Society for the Prevention of Cruelty to Animals (SPCA) if there is no alternative.
  - (d) Owners of the dogs shall take responsible manner to prevent occurrence of unwanted puppies, e.g. spaying or neutering by a registered veterinary surgeon.
  - (e) Abandoning dogs, keeping dogs without licence, allowing dogs to stray in public places or not exercising proper control on dogs in public places may contravene the Rabies Ordinance or other laws in Hong Kong.
- 13.5.7 The ER shall have the power to order the removal of any person who fails to comply with the requirements from the Site.

# 14



**Emergency  
Preparedness**

# CHAPTER 14

## Emergency Preparedness

### 14.1 General

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14.1.1 The guidelines provided below outline the principles and essential arrangements for dealing with emergency situations that may arise in a workplace. The officer-in-charge of each workplace shall draw up comprehensive emergency procedures to suit the specific circumstances of the workplace.

14.1.2 The officer-in-charge of a workplace shall ensure that all persons employed in the workplace are familiar with the emergency procedures.

14.1.3 Emergency situations shall mean those situations where there is a potential for severe consequence involving serious injuries, loss of lives and damage to properties. They are listed below and the respective emergency preparation work is described in Section 14.3: -

- (a) heavy rainstorms, tropical cyclone or adverse weather,
- (b) flooding,
- (c) fire and explosion,
- (d) detection of toxic, flammable and asphyxiant gases,
- (e) chemical spillage,
- (f) discovery of bombs or explosive,
- (g) damage to utility services, and
- (h) incidents causing death or injury to persons.

14.1.4 It shall be noted that the emergency situations described above are not exhaustive. The officer-in-charge of a workplace shall be responsible for identifying other potential risks associated with the specific nature of the work and working environment when drawing up the emergency procedures. Advice from the departmental Safety Advisory Unit should be sought, if necessary.





- 14.1.5 The emergency procedures and the emergency contact telephone list shall be regularly reviewed and updated.
- 14.1.6 The guidelines given in this Manual shall be read in conjunction with the following documents: -
- (a) Construction Site Safety Manual, Chapter 10 - "Emergency, Tropical Cyclone and Heavy Rainstorm Procedures",
  - (b) Handbook on "Emergency and Storm Damage Organization",
  - (c) DSD Administrative Circular No. 4/2015 - Guidelines on Work Arrangements in Times of Tropical Cyclones and Rainstorms,
  - (d) "Contingency Plan for Incidents Possibly Encountered in Sewage Treatment Facilities having a Potential of Generating an Environmental Nuisance" and "Typhoon and Rainstorm Emergency Operating Procedures" of the E&M Branch,
  - (e) DSD Administrative Circular No. 7/2006 - "Departmental Fire Security Instructions for DSD Staff accommodated in Revenue Tower",
  - (f) "Fire Security Instructions for DSD Staff at Western Magistracy" issued by AD/SS's memo ref. (009BSM) in DSD SS 1/125/2/23 dated 26.9.2018.
  - (g) Divisional Note No.68 - Fire Security Instruction for DSD Staff Accommodated in 1063 King's Road
  - (h) DSD Technical Circular No. 2/2014 - "Handling and Managing Serious and Emergency Incidents"
- 14.1.7 It shall be noted that for construction sites the contractors are responsible for formulating the emergency procedures and organizing the rescue teams to deal with emergency situations. The Contractor shall make reference to the provisions in this Chapter in drawing up the construction site emergency plan. He shall then provide details of the emergency procedures and rescue teams to the ER for consent and such details shall be incorporated in the Contractor's Safety Plan if available. The ER may seek comments from Police, Fire Services Department and Marine Departments on such submissions if necessary.

## **14.2 Emergency Preparedness for Workplaces in General**

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### 14.2.1 Emergency Team and Emergency Coordinator

- (a) An emergency team comprising an Emergency Coordinator and suitable number of Assistant Emergency Coordinators shall be established



for each workplace. They shall be appointed by the officer-in-charge of the workplace. Deputies for the Emergency Coordinator and Assistant Emergency Coordinators shall be appointed to act on their behalf in the event of their absence.

- (b) The emergency team shall consist of suitable number of qualified first aiders and all members must be familiar with the operation of the emergency facilities, supplies and equipment at the workplace.
- (c) Only the Emergency Coordinator on duty may declare an emergency situation to be in effect in a workplace.
- (d) The emergency team shall be responsible for: -
  - (i) calling up external emergency services such as Fire Services Department, Police, Labour Department or Marine Department as appropriate;
  - (ii) assisting rescue or carrying out immediate rescue if situation warrants;
  - (iii) organizing, monitoring and executing preventive measures for typhoon or heavy rainstorm; and
  - (iv) ensuring the execution of remedial work to prevent recurrence of accident.
- (e) The names of the members of the emergency teams, qualified first aiders and the officer-in-charge of the workplace, together with means of their emergency contact and the telephone numbers of the external emergency services shall be posted at conspicuous locations in the workplace.
- (f) In the event of an emergency situation, the Emergency Coordinator shall inform the officer-in-charge of the workplace, who shall in turn report the situation to the senior management.
- (g) The following information shall be provided to the external emergency services at the time they are called up for assistance: -
  - (i) the exact location of the incident and the time of occurrence,
  - (ii) details of the incident including the number of injured persons,
  - (iii) any restriction on access to the spot and the best entry point to the location of the incident,
  - (iv) brief description of how the incident occurred,
  - (v) the name of the reporting person and the telephone number for further contact, and

- (vi) the service required, e.g. police, fire brigade, ambulance, if known.
  
- (h) The contact telephone number given to the emergency services shall be continuously manned by an Assistant Emergency Coordinator until the event is over.
  
- (i) When request for emergency services is made, the Emergency Coordinator shall nominate one of the Assistant Emergency Coordinators to: -
  - (i) await the emergency services at the scene or designated meeting point,
  
  - (ii) brief the emergency services on the nature, location and updated situation of the incident and the actions that have been taken when they arrive, and
  
  - (iii) lead the emergency services directly to the location of the incident.

#### 14.2.2 Emergency Drills and Exercises

- (a) Emergency drills and exercises shall be conducted regularly to enable the staff concerned to familiarise themselves with the emergency procedures and enhance their awareness and preparedness. In general, the following drills and exercises shall be arranged: -
  - (i) Functional drill for emergency teams - This is to test the capability of emergency personnel in performing their specific duties (i.e. overall command, communication, first aid, rescue, use of emergency facilities, etc.).
  
  - (ii) Full-scale exercise for all staff of the workplace - This is to enable them to familiarise themselves with the emergency procedures, escape routes, assembly points, etc. and to test the effectiveness of the emergency procedures and evacuation plan.
  
- (b) Emergency drills and exercises shall be well planned and shall simulate the real situation as far as practicable. Where appropriate, the external emergency services (e.g. Fire Services Department, Police, Labour Department, Marine Department, Auxiliary Medical Service, etc.) shall be invited to jointly conduct emergency drills and exercises.
  
- (c) All full-scale emergency drills and exercises shall be conducted at least annually. For the functional drills, they shall be conducted more frequently particularly after changes in key personnel.

- (d) Observers should be deployed to record the happenings during the course of emergency drills and exercises. The results shall be reviewed by the Emergency Coordinator to identify deficiencies in the emergency procedures, personnel or equipment. The emergency procedures of a workplace shall be updated in the light of reviews undertaken after each drill and exercise.

#### 14.2.3 Facilities, Supplies and Equipment

- (a) Emergency facilities and equipment shall be inspected monthly and records of the inspection shall be properly kept. Emergency facilities and equipment shall include, but not limited to the following: -

- (i) communication equipment;
- (ii) workplace emergency plan complete with location maps showing the escape routes and assembly points;
- (iii) Material Safety Data Sheets (MSDS);
- (iv) telephone directories;
- (v) firefighting equipment such as fire extinguishers, fire hydrants, hoses, ropes, spill control equipment, absorbents and others used to control fire and hazardous materials spills;



- (vi) personal protective equipment;
  - (vii) first aid supplies;
  - (viii) torches, armbands or flags for the use of the emergency team; and
  - (ix) alarm systems.
- (b) Life-supporting equipment (e.g. self-contained breathing apparatus) shall be tested in accordance with manufacturer's instructions to ensure its reliability. Records of all tests shall be properly maintained.
  - (c) Items with a limited shelf-life such as sterile first aid supplies shall be replaced on a regular basis.

- (d) All items expended during an emergency or exercise, as well as damaged, defective or spoiled items, shall be reported to the officer-in-charge of the workplace, who shall arrange for their immediate replacement.

Type of Extinguishers to Tackle Different Sources of Fire						
Source of Fire	Paper, Textile, Wood, Plastic	Flammable liquids, Solvent, Oil, Grease	Electrical appliances, Motors, Electrical switches	Typical Size	Proper method of application	Remarks
Type of Extinguishers						
<b>Carbon Dioxide</b> 	✗	✓	✓	4.5 kg	Spray at bottom part of fire source as far as possible	Vapours will asphyxiate, withdraw to open air after use
<b>Water</b> 	✓	✗	✗	9 litre	Spray at lower part of fire source	<b>Never</b> on fires involving electrical, flammable liquids or metals
<b>Dry Powder</b> 	✓	✓	✓	5 kg	Spray at bottom of fire source direct	Discharged dry powder may reduce visibility and cause dis-orientation
<b>Clean Agent</b> 	✓	✓	✓	1 - 18 kg	Spray at bottom part of fire source as far as possible	Withdraw to open air after use
<b>Foam</b> 	✓	✓	✗	9 litre	Let foam shower from top to bottom to cover fire source	<b>Never</b> on electrical fires

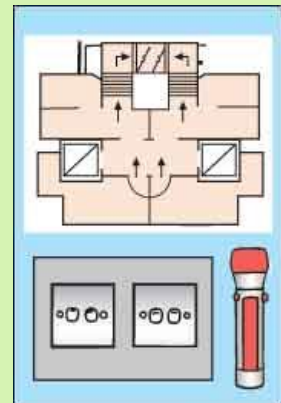
#### 14.2.4 Emergency Exit

- (a) All escape routes and emergency exits must be clearly delineated by appropriate signs and kept clear of any obstruction.
- (b) All escape routes and emergency exits shall be illuminated. Separate standby lighting shall be provided to keep the escape routes illuminated during power failure.
- (c) The doors and gates to all emergency exits shall be able to be manually opened from inside at all times. Never lock emergency exit doors and gates.
- (d) Location maps of the escape routes and emergency exits shall be posted at prominent positions of a workplace.



#### 14.2.5 Evacuation

- (a) Evacuation of a workplace or part of it shall be ordered if an emergency is likely to threaten the lives and safety of personnel inside.
- (b) The officer-in-charge of a workplace shall develop and make known to all staff the evacuation procedure of the workplace, the escape routes and the location of the assembly points.
- (c) The officer-in-charge of the workplace shall determine and order an evacuation if necessary. He/she, or the Emergency Coordinator, shall then trigger the alarm system to effect evacuation.
- (d) Once the evacuation alarm is heard, all staff and visitors (if any) shall leave the workplace and proceed to the nearest assembly point along a safe route under the direction of the emergency team.
- (e) The first Assistant Emergency Coordinator arriving at the assembly point shall take a roll call and report the result to the Emergency Coordinator who shall initiate a search for any missing staff or visitors or seek assistance from the external emergency services.



## 14.3 Emergency Situations

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### 14.3.1 Heavy Rainstorms, Tropical Cyclones or Adverse Weather

- (a) The weather condition shall be regularly checked with the Hong Kong Observatory for any impending typhoons, thunderstorms, heavy rain and floods.
- (b) Anyone required to work outdoors during heavy rainstorm, typhoon or adverse weather shall take due care and shall not expose himself/herself unnecessarily to potential hazards especially when: -
  - (i) entering manholes, major watercourses, sewers and stormwater drains, channels, culverts, trenches and excavations, etc.;
  - (ii) inspecting slope drainage; and
  - (iii) getting near slopes with any signs of potential danger.
- (c) When Rainstorm Red or Black Warning is issued, anyone working outdoors (except those engaged in emergency operation such as flood relieving work) shall temporarily suspend his/her work, and resume working only when weather conditions so permit.
- (d) If the Rainstorm Black Warning is issued during working hours, staff working indoors shall stay in the workplace as far as possible for their own safety.
- (e) When typhoon signal No. 1 is hoisted, anyone working in outdoor environment shall be informed of the hoisting of the signal. Preparation shall commence to ensure that all necessary personal protective equipment, tools and machinery are made available in case of emergency.
- (f) Upon hoisting of typhoon signal No. 3, the officer-in-charge of a workplace or his/her representatives shall inspect all areas to ensure that the following are properly done: -
  - (i) All loose materials shall be securely fastened and anchored or moved to a protected area.
  - (ii) All items of plants (e.g. cranes, overhead hoists) and equipment shall be adequately anchored, power cables disconnected, jibs lowered to ground level, and if necessary, equipment moved to a protected area.
  - (iii) All working platforms, scaffolds, and temporary structures shall be securely lashed.

- (iv) All electrical equipment shall be adequately protected against weather and moved away from any expected flood area.
  - (v) All temporary site offices and partly completed structures shall be securely braced, supported and lashed.
  - (vi) All existing and temporary drainage shall be checked to ensure that they are not obstructed. Diversion and/or temporary connection shall be carried out as necessary.
  - (vii) All windows shall be securely closed and the glazing shall be taped or protected against sudden breakage. Put up typhoon bars to protect windows, doors, etc. that are vulnerable to damage by strong wind.
- (g) When typhoon signal No. 8 is hoisted, all workers not engaged in emergency operation shall leave the workplace, or stay in a safe and secure place, if the workplace is unsafe.

#### 14.3.2 Flooding

- (a) The weather condition shall be regularly checked with the Hong Kong Observatory for any impending flood condition.
- (b) For workplaces that are prone to flooding, sufficient quantities of the following supplies and equipment shall be available: -
  - (i) sandbags,
  - (ii) pumping facilities,
  - (iii) lifebuoys and life jackets,
  - (iv) floating grab ropes, and
  - (v) dinghies.
- (c) When adverse weather warning signal is received and flooding is imminent, the officer-in-charge shall make arrangement to: -
  - (i) check and clear all temporary drainage at the workplace;
  - (ii) check and ensure that all electrical equipment and cables are properly protected and disconnected;
  - (iii) move all movable equipment and supplies to upper floor levels or to other elevated areas as appropriate;
  - (iv) check and secure all storage tanks and vessels that may be dislodged due to flotation; and
  - (v) ensure that lifebuoys and life jackets etc. are readily available.



### 14.3.3 Fire and Explosion

(a) In the event that a worker discovers a fire or explosion, he/she shall: -

(i) attempt to extinguish a small fire only if there is backup support and that he/she has been trained in the proper use of the firefighting equipment available;



(ii) notify the Fire Services Department, the Police and the emergency team of the following information if the attempt to immediately extinguish the fire fails: -

- exact location of fire;
- type of fire (i.e. electrical, flammable liquid or combustible material);
- whether or not the fire is near a critical system (i.e. major equipment, chlorine or other chemicals system, fuel gas lines, steam lines, etc); and
- whether or not medical assistance is needed.

(iii) distance himself/herself from the incident site to a safe place.

(b) Upon notification of a fire or explosion, the Emergency Coordinator or his/her assistant shall attend to the incident and be prepared to offer assistance to the Fire Services Department and Police immediately.

(c) Any emergency team personnel arriving on the incident site shall: -

(i) take no action that will subject the emergency team personnel to undue risk;

(ii) carry out rescue and first aid as the first priority over fire suppression; and

(iii) bear in mind that the possibility of explosion will always exist.

#### 14.3.4 Detection of Toxic, Flammable or Asphyxiant Gas

(N.B.: This section does not apply to workplace where presence of toxic, flammable or asphyxiant gas is expected and sufficient safety precautionary measures have been taken for the persons working therein.)

- (a) When alarm signals which indicate the presence of a high level of toxic, flammable or asphyxiant gas in the workplace are heard, the following procedures shall be followed by all persons at the workplace: -
  - (i) Put out all cigarettes, naked fire or other sources of ignition.
  - (ii) Do not switch on any electrical appliances as sparks can ignite.
  - (iii) Put on an escape respirator immediately.
  - (iv) Check for the source of gas leakage and eliminate it by closing valves, patching leaks, etc., if it is safe to do so.
  - (v) Evacuate from the workplace as soon as possible.
- (b) The workplace shall be purged to remove or dilute the gas to a safe level of concentration by suitable air blowers (N.B.: air blowers shall be of spark-proof type if flammable or explosive gas is detected) if natural ventilation is not practicable.
- (c) No one shall be allowed to enter the workplace again unless the atmosphere has been tested and it is certified safe to do so or unless the personnel who enters the workplace has taken all safety precautionary measures for such purpose.

#### 14.3.5 Chemical Spillage

- (a) Reference shall be made to the relevant material safety data sheets (MSDS) supplied by the manufacturers of the chemicals concerned regarding their physical properties, health hazards, safety precautions and first aid measures required for handling of spillage.
- (b) Anyone who first becomes aware of the chemical spillage shall alert other people to stay away from the scene.
- (c) For small spills which pose no safety and health danger and are unlikely to adversely affect the environment, they shall be handled by trained personnel with appropriate equipment and materials on hand. These personnel shall: -
  - (i) eliminate the source of the spill if it is easy to do so;

- (ii) prevent the spilt chemical from entering the drainage system; and
  - (iii) add neutralising agents and/or absorbents. A list of these materials shall be identified for each of the chemicals stored in the workplace and their locations shall be clearly shown in the workplace.
- (d) For large spills or spills that present a threat to safety or health due to toxic fumes, flammability or the possibility of release into the environment, the emergency team shall be notified immediately. The emergency team shall initiate the following spill control and containment procedures only if it is certain that they would not be exposed to unacceptably high risk to their safety or health for doing so: -
- (i) eliminate the source of the spill by closing valves, patching leaks, emptying faulty containers, etc.;
  - (ii) contain the extent of the spill through diking or other means;
  - (iii) implement other spill-control measures including neutralisation, dilution, containment, removal and disposal as appropriate; and
  - (iv) notify the Fire Services Department immediately as if a fire breaks out if the situation warrants.

#### 14.3.6 Discovery of Bombs, Ammunition or Explosives

- (a) When suspected bomb, ammunition or explosive is discovered at a workplace, any operation at the scene must be stopped and all personnel must be evacuated immediately.
- (b) The area at a distance of at least 30m from the bomb, ammunition or explosive shall be fenced off and no person shall be allowed to enter this area.
- (c) The incident shall be immediately reported to the Fire Services Department and the Explosive Ordnance Disposal Unit of the Police.
- (d) The incident must be handled by the Fire Services Department and the Police.
- (e) The emergency team shall be on standby to provide assistance and any necessary information to the Police to facilitate detonation or removal.

#### 14.3.7 Damage to Utility Services

- (a) All operations at the workplace must stop when any utility service is damaged. The case shall be reported to the utility undertakers

concerned immediately.

- (b) The emergency team shall be notified immediately of the exact nature and location of the incident.
- (c) The vicinity of the point of damage shall be fenced off to ensure that no one is allowed to enter the area without permission.
- (d) When a gas pipe is damaged or gas leak is suspected, the following additional action shall be taken: -
  - (i) notify the Fire Services Department and the Police immediately;
  - (ii) keep all ignition sources away from the scene;
  - (iii) stop work in the vicinity and any nearby excavations or manholes etc. as leaking gas may make its way through underground voids or ducts and accumulate there; and
  - (iv) evacuate all personnel and the general public from the scene.

#### 14.3.8 Incidents Causing Death or Injury to Persons

- (a) In the event that a staff discovers an incident involving death or injury of persons, he/she shall notify the emergency team and/or the officer-in-charge of the workplace immediately. He/She shall call the community emergency services by dialling 999 if the situation is urgent or serious and then inform the emergency team and/or the officer-in-charge subsequently.
- (b) No one shall conduct rescue operation unless he/she has been trained on how to carry out a proper rescue and that the situation is safe to do so. It shall be noted that reckless rescue operation not only endangers the rescuers themselves but also the others, for instance, when the victim is inside a room filled with toxic gas or fuel gas, or when the victim is still in contact with live electricity.
- (c) No one shall move an injured person, especially when there are signs of spinal injury or bone fracture, unless it is absolutely necessary to do so for safety reason.
- (d) The injured person shall be kept comfortable, warm and in a lying position.
- (e) First aid treatment shall be given preferably by trained persons. The immediate treatments for various situations are listed below: -

Circumstances	First Aid Treatment
Acid or alkali burns	Flush with running water
Heat or cold burns	Flush with cold water
Chemical in eyes	Flush eyes with emergency eyewash
Major bleeding	Apply pressure direct to the wound using a clean cloth
Toxic gas inhalation	Expose to fresh air

# 15



## Accident Reporting and Investigation



# CHAPTER 15

## Accident Reporting and Investigation

### 15.1 General

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- 15.1.1 This Chapter highlights the procedures for reporting and investigation of work-related accidents. In general, any accident that results in death, serious injury and damage to property, dangerous occurrence, near miss, or any incident that may arouse public interest or concern shall be reported. In case of doubt, the reporting officer shall seek advice from his/her immediate supervisor, Senior Engineer/Safety Adviser (SE/SA) or Technical Secretary 2 (TS2) as appropriate.
- 15.1.2 The Construction Site Safety Manual (CSSM), Chapter 9 - "Accident Investigation and Accident Statistics" sets out the accident reporting procedures for construction site accidents of PWP works contracts and the responsibilities of the Contractors and the Engineer's Site Staff respectively. The procedures shall be observed and followed by DSD's site supervisory staff and resident site staff (RSS) employed by DSD's consultants.
- 15.1.3 The procedures for reporting various accidents occurring on DSD's works sites, which include serious accidents, dangerous occurrences, near misses and non-serious accidents that required special attention are set out in DSD Technical Circular No. 1/2019 - "Reporting of Accidents Occurring on Drainage Services Department Works Sites". Details are given in Section 15.2.
- 15.1.4 Regarding accidents occurring in DSD's workplaces other than works sites (e.g. offices, sewage treatment works, maintenance depots etc.), which normally involved in-house staff, the procedures as promulgated in DSD Circular Memorandum No. 9/97 - "Accidents Resulting in Death and/or Injury of DSD Staff While on Duty" shall be followed.
- 15.1.5 The reporting procedures for other non work-related serious accidents or incidents that involve no personal injury or loss of life (e.g. environmental pollution, flooding, etc.) are outside the scope of this Manual. The reporting officer shall observe the relevant legal requirements, instructions and circulars and report to the concerned authorities accordingly. The relevant departmental instructions are listed hereunder for easy reference.



Instruction	Coverage
DSD Technical Circular No. 2/2014 – “Handling and Managing Serious and Emergency Incidents”	<p>All types of serious accidents/incidents to be reported to DSD Headquarters, including: –</p> <ul style="list-style-type: none"> <li>(a) serious accidents in DSD works sites (see Section 15.2.2),</li> <li>(b) accidents resulting in death and/or serious injury of DSD staff while on duty (see Section 15.2.6),</li> <li>(c) incidents encountered in DSD sewage treatment facilities with potential of generating a significant environmental nuisance,</li> <li>(d) major flooding incidents,</li> <li>(e) major complaints through media/referrals from others relating to policy, standard of service and management matters on drainage services, and</li> <li>(f) other serious incidents such as loss of important site records or labour disputes, etc.</li> </ul>
Handbook on Emergency & Storm Damage Organization (ESDO)	<p>Incidents involving: –</p> <ul style="list-style-type: none"> <li>(a) flooding, overflowing and sewage spillage as a result of heavy rain, chokage and damage of the public sewerage and drainage system,</li> <li>(b) Daya Bay Nuclear Power Plant,</li> <li>(c) aircraft crash,</li> <li>(d) explosive gas complaints,</li> <li>(e) system failure of the Flood Pumping Schemes,</li> <li>(f) tree failure, and</li> <li>(g) Chemical, Biological, Radiological and Nuclear (CBRN) Agent and Terrorist Attack.</li> </ul>
Contingency Plan for Incidents Commonly Encountered in Sewage Treatment Facilities having a Potential of Generating an Environmental Nuisance	<p>Incidents that have a potential of generating an environmental nuisance and polluting streamcourses, harbour or beach waters.</p>

Beach Pollution Response Plan	Incidents of beach being polluted.
A Guide on Reporting Sewage Bypass Incidents in Sewage Treatment Works	Incidents of sewage bypass in sewage treatment facilities
A Guide on Reporting Sewage Bypass Incidents in Sewage Pumping Stations and Sewers	Incidents of sewage bypass in sewage pumping stations and sewers
Direct Report of Tree Failing Incidents to Tree Management Office of the Development Bureau	Incidents of tree failure

- 15.1.6 The Head of Division and/or the officer-in-charge of a workplace or works site shall ensure that at least a copy of the relevant manual, circulars and handbooks mentioned above and a list of emergency contact telephone numbers are kept in the workplace or works site. The documents shall be kept at a place known to all staff and the emergency telephone numbers shall be displayed at prominent positions of the workplace or works site. The information contained therein shall be regularly updated.
- 15.1.7 The officer-in-charge of a workplace or works site shall draw the attention of new recruits to the accident reporting procedures.
- 15.1.8 Drills should be arranged to test the efficiency of reporting serious accidents or incidents of different levels of staff concerned.

## 15.2 Reporting of Accidents

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- 15.2.1 The procedures for reporting various site accidents are set out in DSD Technical Circular No. 1/2019 - "Reporting of Accidents Occurring on Drainage Services Department Works Sites", which shall be followed by the Engineer's Representative (ER) and DSD's site supervisory staff, or resident site staff (RSS) employed by DSD's consultants as the case may be. The salient points are recapitulated below for easy reference.

### 15.2.2 Serious Accidents

- (a) An accident is classified as a serious accident if: -
- (i) the accident has led to death, serious injury or damage, or
  - (ii) the victim is in critical condition, or
  - (iii) the media have arrived on site or have telephoned to ask for information concerning the accident, or
  - (iv) it will arouse public interest or concern in view of the damage or inconvenience that has been caused or its potential harm to the workers and/or the public, or
  - (v) it has created a drawn-out situation, which may lead to fatality or multiple injuries.
- (b) The responsibilities of the contractor in reporting serious accidents involving death or serious injury, dangerous occurrence, accidents occurring in Hong Kong waters, fire, etc. are detailed in Chapter 9 of the CSSM and not repeated here. The ER shall however ensure that the contractor has completed the accident reporting procedures accordingly.
- (c) As for the ER, he/she shall report the accidents as per DSDTC No. 1/2019. In brief, the ER or DSD site supervisory staff, or resident site staff (RSS) as the case may be, shall verbally report the serious accident within 30 minutes of the occurrence of the accident and send an initial report (and a brief note) by email or fax within 3 hours to the parties concerned, followed by a preliminary written report in a prescribed form within 24 hours, and if fatality is resulted additional information on the next of kin of the deceased person shall also be provided in another prescribed form as soon as possible.
- (d) After that, the ER shall submit a comprehensive report which contains details of the accident and investigation complete with photographs and sketches within 7 working days to the parties concerned. The comprehensive report shall contain findings and recommendations for prevention of recurrences.
- (e) The reporting flow chart for serious accidents on DSD's works sites, together with the prescribed forms for preliminary report and additional information for fatal cases as per DSDTC No. 1/2019 are reproduced in Appendix 4 for easy reference.
- (f) Serious accidents occurring on DSD's works site usually involve the death or injury of personnel employed by the contractor, who are directly exposed to the risks at work. If the casualty happens

to be DSD's staff, the procedure as in Section 15.2.6 shall also apply.

#### 15.2.3 Dangerous Occurrences

- (a) Dangerous Occurrences (DOs) are defined in the First Schedule of Factories and Industrial Undertakings Regulations and are detailed in Section 15.5.2(c).
- (b) The ER or DSD site supervisory staff or RSS shall notify the Division Head and SE/SA, and TS2 if appropriate, of any DOs occurring on DSD works sites as soon as possible irrespective of whether there are casualties or not, followed by submission of a comprehensive report. Copy of the comprehensive report prepared by the Contractor and the statutory "Dangerous Occurrence Report Form" shall be provided once available.

#### 15.2.4 Near Misses

- (a) Near misses are narrowly avoided accidents and shall be investigated as soon as possible because they reflect inadequacies in the safety provisions.
- (b) The ER or DSD site supervisory staff or RSS shall report to the respective Division Head and SE/SA, and TS2 if appropriate, as soon as practicable any near misses of which serious injuries or loss of life and/or damage of properties could have been resulted for consideration of necessary improvement actions.

#### 15.2.5 Non-serious Accidents Requiring Special Attention

- (a) Non-serious accidents are accidents that only result in minor injuries or damage or loss of property. Under normal condition upward reporting is necessary. However, the ER or DSD site supervisory staff or RSS shall report a non-serious accident to the Division Head and copy to SE/SA, and TS2 if appropriate, should the following conditions occur:
  - (i) ambulance service has been summoned;
  - (ii) the injured is admitted to hospital;
  - (iii) consultation and/or treatment by a doctor has been received; and
  - (iv) problematic cases including belated reporting and/or belated seeking of medical treatment, unwitnessed accidents, suspected under-reporting, excessively prolonged sick leave, etc.

- (b) The ER or DSD site supervisory staff or RSS should consult SE/SA if in double.

#### 15.2.6 Accidents Occurring in DSD's Workplaces Other Than Works Sites

- (a) Accidents occurring in DSD's workplaces other than DSD works sites normally involve DSD's in-house staff. The departmental procedure as set out in DSD Circular Memorandum No. 9/97 - "Accidents Resulting in Death and/or Injury of DSD Staff While on Duty" requires the supervisor or section head of the injured or deceased staff to: -
  - (i) report the accident in the prescribed DSD's "Accident Report Form" (ARF) without delay,
  - (ii) ensure that the ARF shall reach the Personnel Registry within 2 working days for death case and 4 working days for injury case respectively,
  - (iii) copy the ARF to the SE/SA for information and necessary action,
  - (iv) ensure that a statement of overtime work and shift duties undertaken by the concerned officer is prepared and submitted in the prescribed form to the Personnel Registry (PR) as soon as possible to facilitate calculation of the amount of employee's compensation payable.
- (b) For accidents involving DSD's in-house staff who are seconded from Electrical and Mechanical Services Department (EMSD), the completed ARF shall also be copied to the Director of Electrical and Mechanical Services (DEMS).
- (c) Copy of the ARF is contained in Appendix 5 for easy reference.
- (d) For accidents involving non-DSD's staff, the case shall be reported by the officer-in-charge of the workplace to the Head of Division/Section who shall decide the appropriate action to be taken case by case. The report shall also be copied to SE/SA, and TS2 if appropriate.
- (e) Regardless of the above procedures, in the event of a serious accident involving serious injury or death, the officer-in-charge of a workplace shall immediately report the case verbally to the Head of Division/Section who shall in turn inform the directors. The officer-in-charge shall also notify SE/SA and TS2 of the accident as soon as possible.

## 15.3 Accident Investigation

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### 15.3.1 General

- (a) Accident investigation shall normally be undertaken by the supervising officer of the injured person or the officer-in-charge of the workplace. Assistance from the departmental Safety Advisory Unit (SAU) shall be sought if necessary.
- (b) Near misses and minor accidents shall also be recorded and investigated as soon as possible because they may indicate inadequacies in existing safety management system and/or safety provisions.
- (c) Investigation shall be conducted in an open and positive atmosphere to encourage the witness(es) and personnel concerned to speak freely. The primary objective is to ascertain the facts with a view to preventing further and possibly more serious occurrences.



### 15.3.2 Serious Accidents Occurring on DSD's Works Sites

- (a) All serious accidents and incidents occurring on DSD's works sites shall be investigated by the contractor and the ER to determine the cause(s) of the accidents or incidents so that measures can be formulated to prevent recurrence.
- (b) The accident investigation report shall be completed by the contractor. The ER shall ensure that the investigation report completed by the contractor is thorough and accurate and the preventive measures recommended are effective and properly implemented. The SAU shall conduct separate investigation if necessary.
- (c) Details of the result of the accident investigation and the proposed safety measures for preventing recurrences shall be included in the comprehensive written report of the serious accidents or

incidents in accordance with DSDTC No. 1/2019. The report shall be submitted by the ER or his site supervisory staff or RSS, through the respective Head of Division, to the Director, Deputy Director and the concerned Assistant Director, and copied to SE/SA and TS2 within 7 working days of the accident. The contractor's accident investigation report shall also be enclosed.

### 15.3.3 Accidents and Incidents Occurring in DSD's Workplaces Other Than Works Sites

- (a) In case where the accident or incident has only caused minor bodily injury or minor damage to plant or property, the immediate supervising officer shall conduct an investigation and recommend measures for preventing recurrences.
- (b) The investigation report mentioned above shall be submitted to the Head of Division/Section and copied to SE/SA. SE/SA shall vet the report in order to ensure that the investigation conducted by the supervising officer is thorough and accurate and the preventive measures recommended are suitable and effective. The SAU shall conduct a separate investigation if necessary.
- (c) In case where the accident or incident has caused serious bodily injury, loss of life or serious damage to plant or property, the officer-in-charge of the workplace shall submit a detailed report with recommendations for preventing recurrence to the Head of Division/Section. Copies of the report shall be sent to the Director, Deputy Director and the concerned Assistant Director. If necessary, DSD Headquarters may direct the forming of an independent investigation team to investigate the accident and make recommendations. The team may comprise SE/SA and officers who are knowledgeable in the work being performed at the time of accident as appropriate.
- (d) If any DSD's staff is injured in the accident, the statements from the injured staff and witnesses of the accident shall be recorded in the "Accident Report Form" (ARF) at Appendix 5 and forwarded to the Personnel Registry (PR) within 2 working days for death case or 4 working days for injury case respectively.
- (e) If the serious accident and/or incident arouses public interest or concern, the investigation report shall also be copied to TS2 and the reporting officer shall always keep TS2 informed of the development of the matter.



## 15.4 Investigation Procedure

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### 15.4.1 Information Gathering

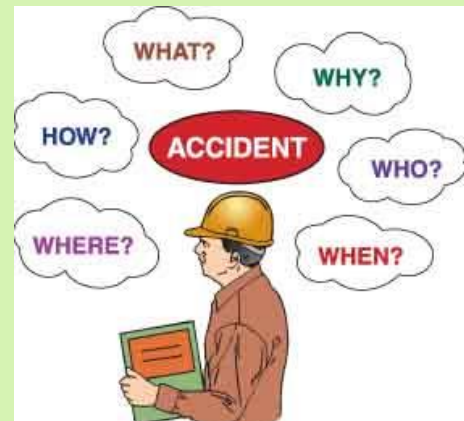
Information gathering is the first step and the most important step of the investigation process. Always investigate the scene and arrive on the scene as soon as possible to minimize the likelihood that the site condition may change and evidence may be disturbed. The following investigation procedures shall be followed: -

- (a) Be sure to check that dangerous situation is made safe before investigation is carried out;
- (b) Take photographs and make sketches;
- (c) Examine involved equipment, work pieces or materials and note the environmental conditions;
- (d) Interview the injured, if possible, witnesses and other parties involved;
- (e) Consult expert opinion where necessary; and
- (f) Identify the specific employer if the injured/deceased is not a DSD's staff.

### 15.4.2 Analysis

Analysis shall be carried out on the basis of information collected. Be methodical and never jump to the conclusion. The analysis shall comprise the following: -

- (a) Identify what is the task to be accomplished.
- (b) Find out at what stage did the unplanned event take place.
- (c) Link up the chain of events.
- (d) Establish a full picture of the circumstances.
- (e) Consider all possible causes and identify the most probable one. The cause of an accident shall never be classified expediently as "carelessness". The root cause of the specific act or omission that caused the accident or incident must be identified.



- (f) A thorough investigation shall be able to provide answers to the following questions: -
  - (i) WHAT caused the accident?
  - (ii) WHO was involved?
  - (iii) WHEN did it occur?
  - (iv) WHERE did it occur?
  - (v) WHY did it occur?
  - (vi) HOW could it have been prevented?
  - (vii) HOW can a recurrence be prevented?

#### 15.4.3 Follow-up Action

After investigation is completed, the following follow-up actions shall be taken to prevent similar accidents from recurring.

- (a) Report on the findings and the conclusion,
- (b) Formulate preventive measures to avoid recurrence,
- (c) Publicize the findings and the remedial actions taken, and
- (d) Monitor continuously to ensure that the preventive measures are implemented satisfactorily.

## 15.5 Accident Statistics

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### 15.5.1 General

- (a) Accident data, if properly collected and analysed, will indicate where and how problems arise and will also identify trends. Accident prevention efforts can then be focussed onto the problem areas.
- (b) The administrative procedures for the collection of construction site accident statistics of PWP works contracts set out in Chapter 9 of the CSSM shall be followed. The reporting forms to be used and timing of submission are summarized in Section 15.5.3 below for easy reference.
- (c) Collection of accident statistics on regularly basis is not required for accidents occurred in DSD's workplaces other than DSD's works sites, which normally involve DSD's staff.

### 15.5.2 Coverage

The accident statistics cover the following types of accident/incident: -

- (a) Fatal accidents;
- (b) Non-fatal reportable accidents each of which results in incapacity for more than 3 days; and
- (c) Dangerous occurrences as defined in the First Schedule of the Factories and Industrial Undertakings Regulations. They are reproduced below for easy reference.
  - (i) Bursting of a revolving vessel, wheel, grindstone or grinding wheel moved by mechanical power.
  - (ii) Collapse or failure of a crane, derrick, winch, hoist or other appliance (but not including a builders' lift or tower working platform to which the Builders' Lifts and Tower Working Platforms (Safety) Ordinance (Cap. 470) applies) used in raising or lowering persons or goods or any part thereof (except the breakage of chain or rope slings), or the overturning of a crane.
  - (iii) Explosion or fire causing damage to the structure of any room or place in which persons are employed, or to any machine or plant, resulting in the complete suspension of ordinary work.
  - (iv) Electrical short circuit or failure of electrical machinery, plant or apparatus, attended by explosion or fire, causing structural damage involving its stoppage or disuse.
  - (v) Explosion of a receiver or container used for the storage at a pressure greater than atmospheric pressure of any gas or gases (including air) or any liquid or solid resulting from the compression of gas.
  - (vi) Collapse in whole or part from any cause whatsoever of any roof, wall, floor, structure or foundation forming part of the premises of an industrial undertaking in which persons are employed.
  - (vii) Total or partial collapse of any overburden, face, tip or embankment in a quarry.
  - (viii) Overturning of, or collision with any object by any bulldozer, dumper, excavator, grader, lorry or shovel

loader, or any mobile machine used for the handling of any substance in a quarry.

- (d) Apart from the above, statistics of "severe incidents" is being collected quarterly from 2017Q2 to 2020Q2 tentatively to establish a three-year database for the calculation of the safety rating in future tender evaluation. Details can be seen in Section 9.3.5 of the Construction Site Safety Manual.

### 15.5.3 Collection of Construction Site Accident Statistics

- (a) For accidents that involve contractors' staff, divisional offices shall collect information and statistics on all construction site accidents, which result in death or incapacity for more than 3 days, and dangerous occurrences for contracts under their control and submit to the SAU in prescribed reporting forms who shall in turn consolidate the data of all divisions and submit to the Development Bureau. The required forms to be completed and the timing of submission are summarized in the table below. Copies of these forms are attached in Appendix 6.

Reporting form	Time of submission to the SAU
Summary of Details of Contract	Within 30 days after the award of a contract
Construction Accident Statistics Monthly Summary	On or before 15th of each month following the reporting month throughout the whole contract period
Injury Report Form (IRF)	Within 7 days from the date of an accident

- (b) Statutory forms for reporting accidents to be submitted to the Commissioner for Labour (C for L) by contractors (e.g. Form 2, Form 2A, Form 2B, etc. as required by the Employees' Compensation Ordinance) are not required for the purpose of collection of accident statistics under normal circumstances.
- (c) Site accidents not related to construction activities and those not involving contractors' staff (e.g. visitors or members of public, DSD's site staff or resident site staff employed by DSD's consultants etc.) shall be separately reported and shall not be included in the construction site accident statistics.
- (d) Site accidents that involve DSD in-house staff shall be reported to the Personnel Registry as per Section 15.2.6 who is responsible for maintaining such records. The report shall also be copied to SE/SA for record.

#### 15.5.4 Monitoring of Accident Statistics

(a) It is the responsibility of the Site Safety Management Committee and Site Safety Committee to study and analyse the accident statistics and trends for identifying persistently unsafe acts and unsafe conditions. The project office and the ER of the works contract shall also monitor the trends of accidents and take appropriate actions to ensure that the contractor under their control has taken appropriate actions to rectify the situation.

(b) SAU shall monitor the accident statistics and identify contracts of which the average accident frequency rate in any rolling 3-month period exceeds 0.5 Nos. of reportable accidents per 100,000 man-hours worked and incurs 2 or more reportable accidents in the same period in accordance with the guidelines set out in Construction Site Safety Manual published by the Development Bureau. SE/SA shall assess the situation holistically and recommend to the Division Heads concerned (copy to the Assistant Directors concerned) whether the Contractor is required to submit a written report. If the Division Head decides that a written report is required, he/she shall ensure that the following actions will be taken:



(i) The Division Head should interview the Contractor's site management to express concerns of the situation and ask the Contractor to submit a written report, copy to SE/SA, in 2 weeks covering the following:

- description of the causes and severity of each of the accidents that occurred during the 3-month period and actions taken to prevent recurrence;
- description of the problem areas and weaknesses identified in the site safety management system and actions taken to improve the situation; and
- proposal for monitoring and upkeeping site safety improvement measures to lower the accident rate.

(ii) The Contractor shall also submit monthly reports on implementation of the improvement measures. The ER or DSD site supervisory staff or RSS should advise the Division head and SE/SA on the effectiveness of the improvement measures.

- (iii) The ER or DSD site supervisory staff or RSS should step up their involvement in the Weekly Safety Walk and SSMC Meetings.
- (iv) The ER or DSD site supervisory staff or RSS should closely monitor the implementation of the improvement measures by the Contractor and reflect the Contractor's safety performance in the Report of Contractor's Performance. An ADVERSE report should be given if warranted.

The above action should continue until the ER is satisfied with the implementation of improvement measures by the Contractor.

- (c) If the average accident frequency rate in any rolling 3-month period of a contract exceeds DEVB's limit by 50% or more and incurs 2 or more reportable accidents in the same period, SE/SA shall initiate the same chain of actions as per paragraph (b) above, except that the interview as per para. (b) (i) should be conducted by the Assistant Director concerned, instead of the Division Head.
- (d) Notwithstanding the above, SE/SA shall recommend to a Divisional Head (copy to Assistant Director) for asking a contractor to submit a written report as per Section 15.5.4 (b) if persistently poor safety performance is observed during regular site safety inspections, even though the accident frequency rate of the contract concerned has not exceeded the thresholds set out in para. (b) or (c) above.

# **APPENDIX 1**

## **Safety Publications of Various Government Departments and Organizations**

- (a) Labour Department (LD)
- (b) Marine Department (MD)
- (c) Electrical and Mechanical Services Department (EMSD)
- (d) Environmental Protection Department (EPD)
- (e) Fire Services Department (FSD)
- (f) Highways Department (HyD)
- (g) Occupational Safety and Health Council (OSHC)
- (h) Construction Industry Council (CIC)



## **Safety Publications of Various Government Departments and Organizations**

(Note: Details of the safety publications can be viewed and downloaded from the respective websites)

### **(a) Labour Department**

**(Ref: <http://www.labour.gov.hk>)**

1. Guides to Safety and Health Legislation
2. Codes of Practice
3. Guidance Notes
4. Other Safety and Health Guidebooks
5. Posters / Notices
6. Audio Visual Materials

### **(b) Marine Department**

**(Ref: <http://www.mardep.gov.hk>)**

1. Marine Department Notices
2. Safety Newsletters
3. Safety Pamphlets and Leaflets

### **(c) Electrical and Mechanical Services Department**

**(Ref: <http://www.emsd.gov.hk>)**

1. Codes of Practice related to electricity and builders' lifts etc.
2. Code of Practice on Working near Electricity Supply Lines
3. Guidance Notes

### **(d) Environmental Protection Department**

**(Ref: <http://www.epd.gov.hk>)**

1. Codes of Practice on disposal of waste
2. Guides to control of waste

### **(e) Fire Services Department**

**(Ref: <http://www.hkfsd.gov.hk>)**

1. Fire Protection Notices
2. Codes of Practice
3. Fire Safety Guide

**(f) Highway Department**

**(Ref: <http://www.hyd.gov.hk>)**

1. Code of Practice of the Lighting, Signing and Guarding of Road Works

**(g) Occupational Safety and Health Council**

**(Ref: <http://www.oshc.org.hk>)**

1. Safety Guides/Handbooks/Hints
2. Health Brochures
3. CD-ROM - Occupational Safety and Health Bookshelf

**(h) Construction Industry Council**

**(Ref: <http://www.hkcic.org>)**

1. Safety Guidelines
2. Work Safety Alert

## **APPENDIX 2**

### **Safety Training Courses Offered by Various Training Institutes**

- (a) Labour Department (LD)
- (b) Auxiliary Medical Service (AMS)
- (c) Fire Services Department (FSD)
- (d) Construction Industry Council (CIC) – Hong Kong Institute of Construction (HKIC)
- (e) Occupational Safety and Health Council (OSHC)
- (f) Other Institutes

## **Safety Training Courses Offered by Various Training Institutes**

(Note: Details of the training courses can be viewed and downloaded from the respective websites)

### **(a) Labour Department**

(Ref: <http://www.labour.gov.hk>)

1. Legislation-related Safety and Health Courses for Trainers
2. Briefing Sessions on Safety and Health Legislation
3. Talks on Occupation Health

### **(b) Auxiliary Medical Service (AMS)**

(Ref: <http://www.ams.gov.hk>)

1. Basic First Aid and Refresher First Aid
2. Cardiopulmonary Resuscitation (CPR)
3. Care of Wounds
4. Automatic External Defibrillator (AED)

### **(c) Fire Services Department**

(Ref: <http://www.hkfsd.gov.hk>)

1. Fire Safety Talk
2. Evacuation Drill

### **(d) Construction Industry Council (CIC) - Hong Kong Institute of Construction (HKIC)**

(Ref: <http://www.hkcic.org>)

1. Construction Safety Officer Course, Construction Safety Supervisor Course and Safety Auditor Training Scheme
2. Safety Training Course for Competent Persons and Certified Workers in Confined Space Operation
3. Safety Training Course for Construction Workers of Specified Trade (Silver Card)
4. Mandatory Basic Safety Training (Construction Workers) (Green Card)

### **(e) Occupational Safety and Health Council (OSHC)**

(Ref: <http://www.oshc.org.hk>)

1. General Occupational Safety and Health Courses
2. Occupational Safety and Health Supervisors Courses
3. Certificate of Competence Courses (Workplace Noise Assessment, Laser Safety, etc.)
4. Professional Diploma Course

**(f) Other Institutes**

**Chinese University of Hong Kong (CUHK)**

1. Master of Science and Diploma in Occupational Hygiene
2. Diploma in Occupational Health Practice

**Open University of Hong Kong (OUHK)**

1. Bachelor of Science with Honours in Occupational Safety, Health and Environment
2. Professional Diploma and Diploma in Occupational Health and Safety

**City University of Hong Kong (CityUHK)**

1. Professional Certificate in Occupational Safety and Health
2. Professional Certificate in Safety Auditing

**Hong Kong Polytechnic University (HKPolyU)**

1. BSc(Honours) in Environmental, Occupational Safety & Health

**Hong Kong Baptist University (HKBU)**

1. Professional Diploma in Occupational Safety and Health

**Maritime Services Training Institute (MSTI) (formerly Seamen's Training Centre)**

1. Shipboard Cargo Handling Basic Safety Training (Blue Card)

# **APPENDIX 3**

## **Major Safety and Health Legislation**

- (a) Chapter 59 – Factories and Industrial Undertakings Ordinance
- (b) Chapter 509 – Occupational Safety and Health Ordinance

## Major Safety and Health Legislation

(Note: Details of the legislation can be viewed and downloaded from the website <http://www.legislation.gov.hk>)

### (a) CHAPTER 59 – FACTORIES AND INDUSTRIAL UNDERTAKINGS ORDINANCE

Ref.	Subsidiary Regulations
CAP 59A	Factories and Industrial Undertakings Regulations
CAP 59B	Factories and Industrial Undertakings (Confined Spaces) Regulations (Repealed by CAP 59AE)
CAP 59C	Factories and Industrial Undertakings (Blasting by Abrasives) Special Regulations
CAP 59D	Factories and Industrial Undertakings (First Aid in Notifiable Workplaces) Regulations
CAP 59E	Factories and Industrial Undertakings (Notification of Occupational Diseases) Regulations
CAP 59F	Quarries (Safety) Regulations
CAP 59G	Factories and Industrial Undertakings (Woodworking Machinery) Regulations
CAP 59H	Factories and Industrial Undertakings (Electrolytic Chromium Process) Regulations
CAP 59I	Construction Sites (Safety) Regulations
CAP 59J	Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations
CAP 59K	Factories and Industrial Undertakings (Cargo and Container Handling) Regulations
CAP 59L	Factories and Industrial Undertakings (Abrasive Wheels) Regulations
CAP 59M	Factories and Industrial Undertakings (Work in Compressed Air) Regulations
CAP 59N	Factories and Industrial Undertakings (Spraying of Flammable Liquids) Regulations
CAP 59O	Factories and Industrial Undertakings (Goods Lifts) Regulations



CAP 59P	Factories and Industrial Undertakings (Dry Batteries) Regulations
CAP 59Q	Factories and Industrial Undertakings (Guarding and Operation of Machinery) Regulations
CAP 59R	Factories and Industrial Undertakings (Cartridge-operated Fixing Tools) Regulations
CAP 59S	Factories and Industrial Undertakings (Protection of Eyes) Regulations
CAP 59T	Factories and Industrial Undertakings (Noise at Work) Regulation
CAP 59V	Factories and Industrial Undertakings (Fire Precautions in Notifiable Workplaces) Regulations
CAP 59W	Factories and Industrial Undertakings (Electricity) Regulations
CAP 59X	Factories and Industrial Undertakings (Asbestos) Special Regulations
CAP 59Z	Factories and Industrial Undertakings (Safety Officers and Safety Supervisors) Regulations
CAP 59AA	Factories and Industrial Undertakings (Carcinogenic Substances) Regulations
CAP 59AB	Factories and Industrial Undertakings (Dangerous Substances) Regulations
CAP 59AC	Factories and Industrial Undertakings (Suspended Working Platforms) Regulations
CAP 59AD	Factories and Industrial Undertakings (Asbestos) Regulation
CAP 59AE	Factories and Industrial Undertakings (Confined Spaces) Regulation
CAP 59AF	Factories and Industrial Undertakings (Safety Management) Regulation
CAP 59AG	Factories and Industrial Undertakings (Loadshifting Machinery) Regulation
CAP 59AH	Factories and Industrial Ordinance (CAP 59) (Appointed Day Under Section 6BA(17)) Notice
CAP 59AI	Factories and Industrial Undertakings (Gas Welding and Flame Cutting) Regulation

**(b) CHAPTER 509 - OCCUPATIONAL SAFETY AND HEALTH ORDINANCE**

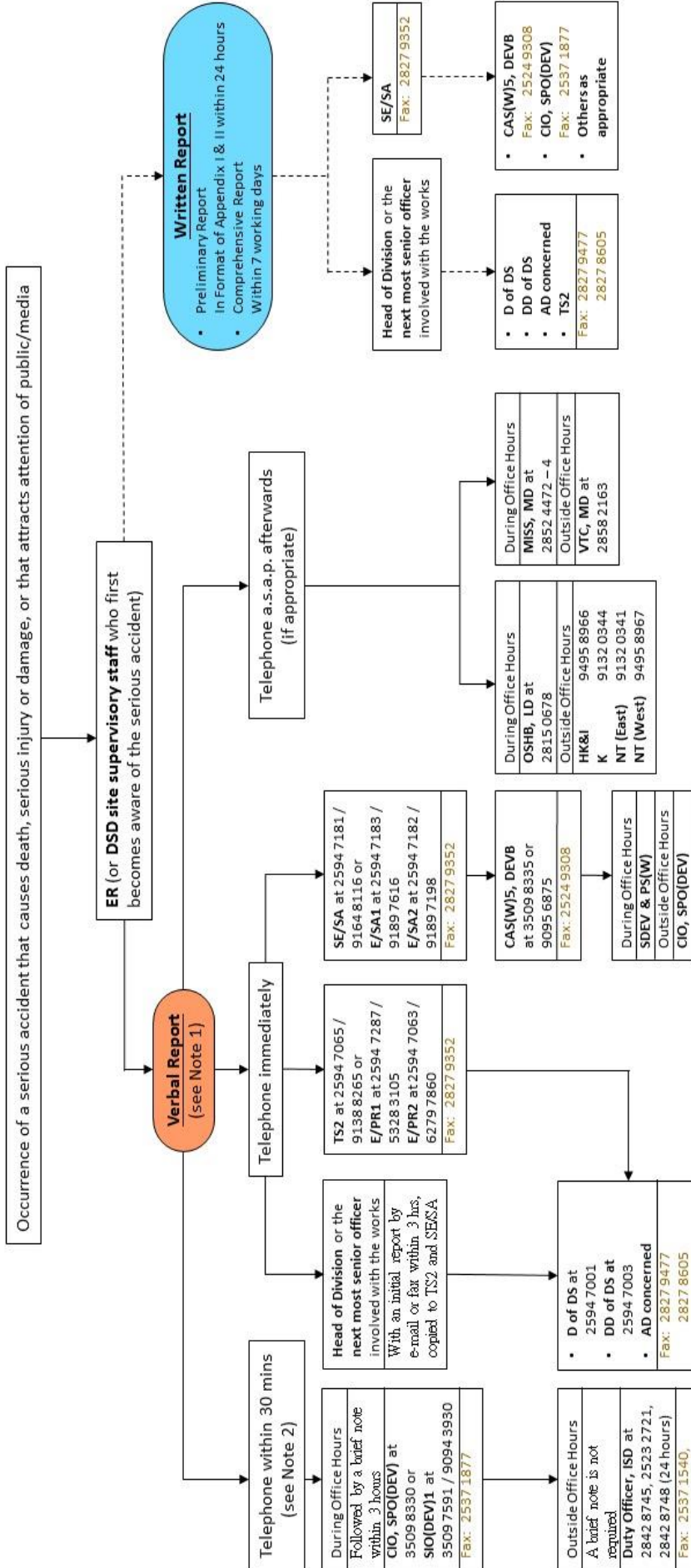
Ref.	Subsidiary Regulations
CAP 509A	Occupational Safety and Health Regulation
CAP 509B	Occupational Safety and Health (Display Screen Equipment) Regulation

## **APPENDIX 4**

### **Reporting of Serious Accidents on DSD's Works Sites – Flow Chart and Reporting Forms**

- (a) Flowchart for Reporting Serious Accidents on DSD's Works Site
- (b) Preliminary Report on Serious Accidents Occurred on DSD's Works site
- (c) Additional Information on Serious Accidents Leading to Fatality

**DRAINAGE SERVICES DEPARTMENT  
FLOWCHART FOR REPORTING SERIOUS ACCIDENTS ON DSD WORKS SITES**



**Legend**

SDEV	Secretary for Development	TS2	Technical Secretary 2
PS(W)	Permanent Secretary for Development (Works)	E/PR1	Engineer/Public Relations 1
CAS(W)5	Chief Assistant Secretary (Works)5	E/PR2	Engineer/Public Relations 1
CIO	Chief Information Officer	DEVB	Development Bureau
SIO	Senior Information Officer	SPO(DEV)	Secretariat Press Office (Development)
D of DS	Director of Drainage Services	DSD	Drainage Services Department
DD of DS	Deputy Director of Drainage Services	OSHB	Occupation Safety and Health Branch
AD	Assistant Director	LD	Labour Department
ER/PM/SM	Engineer's Representative / Project Manager / Service Manager	MISS	Marine Industrial Safety Section
SE/SA	Senior Engineer/Safety Adviser	VTC	Vessel Traffic Centre
E/SA1	Engineer/Safety Adviser 1	MD	Marine Department
E/SA2	Engineer/Safety Adviser 2		

**Note 1:**

- Contract no. and title, and name of contractor
- Time and location of accident
- A brief account of the accident with the no. of persons injured/trapped
- Seriousness of injury or extent of damage, if known
- Whether the media have arrived on site
- Name of officer and telephone no. for further contact

**Note 2:**

- Make it clear that the accident occurred on a Government site

**Annex I**

**Urgent By Fax**

**Preliminary Report on Accident**

To: (1) \_\_\_\_\_ (Head of Division) (Attn: \_\_\_\_\_)  
(Fax No.: \_\_\_\_\_ )  
(2) Senior Engineer / Safety Adviser (Attn: \_\_\_\_\_)  
(Fax No.: 2827 9352 )

Your Ref.: \_\_\_\_\_ Our Ref.: \_\_\_\_\_  
From: \_\_\_\_\_ (Name) \_\_\_\_\_ (Tel. No.)  
\_\_\_\_\_ (Post) \_\_\_\_\_ (Fax. No.)  
\_\_\_\_\_ (Division) \_\_\_\_\_ (Date)  
\_\_\_\_\_ (Signature) \_\_\_\_\_ (Time)

1. Contract No.:
2. Contract Title:
3. Name of Contractor:
4. Location of Accident:
5. Date and Time of Accident:
6. Nature and Brief Account of Accident (with a sketch attached, Yes/No):
  
7. Number of Person (s) injured/killed:
8. Name (s) and Age (s) of Person (s) injured/killed:
9. Seriousness of Injury, or extent of damages:
10. Probable cause of the accident, if established:
  
11. Measures introduced (or to be introduced) to prevent recurrence of similar accidents on site, if established:
  
12. Effect of accident on progress of works:
13. Contractor's report attached (Yes/No):
14. Any other information:

**Annex II**

**Urgent By Fax**

**Additional Information on Accident Leading to Fatality**

To: (1) \_\_\_\_\_ (Head of Division) (Attn: \_\_\_\_\_ )  
(Fax No.: \_\_\_\_\_ )  
(2) Senior Engineer / Safety Adviser (Attn: \_\_\_\_\_ )  
(Fax No.: 2827 9352 )

Your Ref.: \_\_\_\_\_ Our Ref.: \_\_\_\_\_

From: \_\_\_\_\_ (Name) \_\_\_\_\_ (Tel. No.)  
\_\_\_\_\_ (Post) \_\_\_\_\_ (Fax. No.)  
\_\_\_\_\_ (Division) \_\_\_\_\_ (Date)  
\_\_\_\_\_ (Signature) \_\_\_\_\_ (Time)

**Information on the Contract**

Contract No.: \_\_\_\_\_

Contract Title: \_\_\_\_\_

(in English)

\_\_\_\_\_  
(in Chinese)

**Information on the Accident and the Deceased**

Date of Accident: \_\_\_\_\_

Name of Deceased: \_\_\_\_\_ (in English)

\_\_\_\_\_  
(in Chinese)

Age: \_\_\_\_\_

**Information on the Next of Kin**

Name: \_\_\_\_\_ (in Chinese if the Deceased was of Chinese ethnic group)

Relationship with the Deceased: \_\_\_\_\_

Address: \_\_\_\_\_

(in Chinese if the Deceased was of Chinese ethnic group)

Contact Tel. No.: \_\_\_\_\_

**Number of Children**

Age below 18: \_\_\_\_\_ Age 18 or above: \_\_\_\_\_

## **APPENDIX 5**

### **Accidents Involving In-house Staff - Reporting Form**

Drainage Services Department - Accident Report Form (ARF)



**DRAINAGE SERVICES DEPARTMENT**  
**ACCIDENT REPORT FORM**  
**渠務署意外呈報表格**

To : ADS/P  
 致：助理主任秘書／人事

Reference No. : \_\_\_\_\_  
 檔號 : (to be allocated by ADS/P)

Thro' : \_\_\_\_\_ (Section Head) (由助理主任秘書／人事編配)  
 經由 : (單位主管呈交)

- Notes :**  
 註 :
- The "officer-in-charge" shall complete all parts except Part C (b), "Comments on the investigation results", which should be completed by Section Head (Part D should be completed only if the accident happens on construction site.)  
 除丙部(b)「對調查結果的意見」須由單位主管填寫及只有當意外在建築發生時才須填寫的丁部外，主管人員須填寫所有部分。
  - For accident involving more than one casualty, separate form shall be used for each individual.  
 涉及超過一名傷者的意外事件，每人須單獨使用一份表格。
  - Serious injury means the injured person is admitted to a hospital for observation or treatment immediately after the accident.  
 嚴重受傷是指在意外發生後傷者被立即送入醫院接受觀察或治療。
  - This report should be copied to Senior Engineer/Safety Adviser, DSD.  
 將本報告影印本交給渠務署高級工程師/安全顧問。

**Part A – Particulars of Injured Person** (\*Delete if not applicable)

**甲部 – 傷者的個人詳情**(\*請刪除不適用者)

**(a) Particulars**

個人詳情

Name in English: 英文姓名：	Name in Chinese: 中文姓名：	Sex: M/F* 性別：男／女*	Age: 年齡：
Position Held: 職位：	Date of Birth: 出生日期：	I.D./Passport* No.: 身分證／護照*號碼：	

Home Address: 居住住址：	Telephone No.: 電話號碼：	
Next-of-Kin: 最近親：	Relationship: 關係：	Contact Telephone: 聯絡電話：

Immediate Supervisor: 直屬主管：	Rank and Division: 職級及所屬部：	Contact Telephone: 聯絡電話：
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**(b) Initial Treatment**

初步治療

Name of hospital/clinic for initial medical treatment: 接受初步治療的醫院／診療所名稱：		Sick leave certificate attached: Yes/No* 是否已夾附病假紙： 是／否*
Sick leave granted at time of consultation : _____ days 醫生診斷時所給予的病假： 日	Expected to resume duty on (if known): 預計回任工作日期(若知道)：	Result of injury: Minor injury/Serious injury/Death* 受傷結果：輕傷／重傷／死亡*

Admitted to hospital: Yes/No* 是否入院： 是／否*	Name and Address of Hospital: 醫院名稱及地址：
---	---

**Part B – Details of Accident (Please tick the appropriate box)**

**乙部 – 意外詳情(請在適當空格內加上✓號)**

**(a) Date**

日期

Date: 日期：	Time: 時間：	Total number of injured: 受傷總人數：
--------------	--------------	------------------------------------

**(b) Place of Accident**

意外地點

The accident occurred in:  
該意外發生於：

<input type="checkbox"/> Civil works site 土木工程地盤	<input type="checkbox"/> Sewage Treatment Facilities 污水處理設施	<input type="checkbox"/> Flood water pumping station 洪氾抽水站
<input type="checkbox"/> Roads 路上	<input type="checkbox"/> Office/Depot 辦事處／廠房	<input type="checkbox"/> Sewer/Nullah/Tunnels 污水渠／明渠／隧道
<input type="checkbox"/> Others (please specify) 其他(請指明) _____		

Main activity carried out at the workplace at the time of accident:  
意外發生時工地進行的主要活動：

Address of the place of accident:  
發生意外的地址：

**(c) Nature of Injury**

損傷性質

<input type="checkbox"/> 01 Abrasion 擦傷	<input type="checkbox"/> 11 Electric shock 電擊
<input type="checkbox"/> 02 Amputation 截斷	<input type="checkbox"/> 12 Fracture 骨折
<input type="checkbox"/> 03 Asphyxia 窒息	<input type="checkbox"/> 13 Puncture wound 刺傷
<input type="checkbox"/> 04 Burn (heat) 燙傷(受熱)	<input type="checkbox"/> 14 Sprain & strain 扭傷
<input type="checkbox"/> 05 Burn 燒傷	<input type="checkbox"/> 15 Freezing 凍傷
<input type="checkbox"/> 06 Contusion & bruise 撞傷及瘀傷	<input type="checkbox"/> 16 Poisoning 中毒
<input type="checkbox"/> 07 Concussion 腦震盪	<input type="checkbox"/> 17 Irritation 受刺激
<input type="checkbox"/> 08 Laceration and cut 割傷	<input type="checkbox"/> 18 Nausea 惡心
<input type="checkbox"/> 09 Dislocation 脫臼	<input type="checkbox"/> 19 Multiple injuries 多處受傷
<input type="checkbox"/> 10 Crushing 壓傷	<input type="checkbox"/> 20 Other (please specify)其他(請指明) _____

**(d) Part of Body Injured**

損傷部位

Head 頭部	Neck & Trunk 頸部及軀幹	Upper Limbs 上肢	Lower Limbs 下肢
<input type="checkbox"/> 21 Skull/scalp 頭顱／頭皮	<input type="checkbox"/> 31 Neck 頸	<input type="checkbox"/> 41 Finger 手指	<input type="checkbox"/> 51 Hip 臀
<input type="checkbox"/> 22 Eye 眼	<input type="checkbox"/> 32 Back 背	<input type="checkbox"/> 42 Hand/palm 手／手掌	<input type="checkbox"/> 52 Thigh 大腿
<input type="checkbox"/> 23 Ear 耳	<input type="checkbox"/> 33 Chest 胸	<input type="checkbox"/> 43 Forearm 前臂	<input type="checkbox"/> 53 Knee 膝
<input type="checkbox"/> 24 Mouth/teeth 口／牙齒	<input type="checkbox"/> 34 Abdomen 腹	<input type="checkbox"/> 44 Elbow 手肘	<input type="checkbox"/> 54 Leg 小腿
<input type="checkbox"/> 25 Nose 鼻	<input type="checkbox"/> 35 Trunk 軀幹	<input type="checkbox"/> 45 Upper arm 上臂	<input type="checkbox"/> 55 Ankle 足踝
<input type="checkbox"/> 26 Face 面	<input type="checkbox"/> 36 Pelvis/groin 盤骨／腹股溝	<input type="checkbox"/> 46 Shoulder 肩膀	<input type="checkbox"/> 56 Foot 腳
<input type="checkbox"/> 61 Multiple locations, (please specify)多處部位(請指明) _____			

**(e) Type of Accident**  
意外類別

<input type="checkbox"/> 01 Trapped in or between objects 受困於物件之內或物件之間	<input type="checkbox"/> 05 Striking against fixed or stationary object 與固定或不動的物件碰撞	<input type="checkbox"/> 10 Trapped by collapsing or overturning object 受困於倒塌或翻側的物件	<input type="checkbox"/> 15 Exposure to fire 火警燒傷
<input type="checkbox"/> 02 Injured whilst lifting or carrying 提舉或搬運物件時受傷	<input type="checkbox"/> 06 Striking against moving object 與移動的物件碰撞	<input type="checkbox"/> 11 Struck by moving or falling objects 遭移動或墮下的物件撞擊	<input type="checkbox"/> 16 Exposure to explosion 爆炸受傷
<input type="checkbox"/> 03 Slip, trip or fall on same level 滑倒、絆倒或在同一高度跌倒	<input type="checkbox"/> 07 Stepping on object 踏在物件上	<input type="checkbox"/> 12 Struck by moving vehicle 遭開動的車輛撞倒	<input type="checkbox"/> 17 Other (please specify) 其他(請指明) _____
<input type="checkbox"/> 04 Fall of person from a height of _____ metres (distance through which person fell) 人體從高處墮下_____米(人墮下的距離)	<input type="checkbox"/> 08 Exposure to contact with harmful substance 暴露於有害物質中或接觸有害物質	<input type="checkbox"/> 13 Contact with moving machinery or object being machined 觸及開動的機器或觸及正以機器製造的物件	
	<input type="checkbox"/> 09 Contact with electricity or electric discharge 觸電或接觸放出的電流	<input type="checkbox"/> 14 Drowning 遇溺	

**(f) Agent Involved in Accident (if any)**  
引致受傷的媒介(如有者)

<input type="checkbox"/> 01 Equipment for lifting/conveying 吊重／運輸設備	<input type="checkbox"/> 04 Material/product being handled or stored 處理中或貯存中的物料／產品	<input type="checkbox"/> 07 Movable container or package of any kind 可移動的容器或任何類別的包裝物	<input type="checkbox"/> 10 Electricity supply, wiring apparatus or equipment 供電系統、設有線路裝置的器具或設備
<input type="checkbox"/> 02 Portable power or hand tools 手提動力工具或手動工具	<input type="checkbox"/> 05 Ladder or working at height 在梯上或高空工作	<input type="checkbox"/> 08 Floor, ground, stairs or any working surface 樓面、地面、樓梯或任何工作面	<input type="checkbox"/> 11 Vehicle or associated equipment or machinery 車輛或相聯的設備或機器
<input type="checkbox"/> 03 Other machinery, please specify: Type : _____ 其他機器， 請指明： 機器類別： Part causing injury: 令僱員受傷的機器部分：_____	<input type="checkbox"/> 06 Sewer, manhole or other confined space 坑渠、沙井或其他密閉空間	<input type="checkbox"/> 09 Gas, vapour, dust or fume 氣體、蒸氣、塵埃或煙霧	<input type="checkbox"/> 12 Others (please specify) 其他(請指明) _____
<p><input type="checkbox"/> a)Prime mover 原動部分</p> <p><input type="checkbox"/> b)Transmission part 傳動部分</p> <p><input type="checkbox"/> c)Working part 運作部分</p>			
<p>Describe briefly the agents you have indicated 簡述你所指的媒介</p>			

**(g) Unsafe Action Relevant to the Accident**

與該意外有關的不安全行為

<input type="checkbox"/> 01	Operating without authority 未獲授權操作	<input type="checkbox"/> 09	Failure to use helmet 未有使用頭盔
<input type="checkbox"/> 02	Failure to secure objects 未能將物件牢固	<input type="checkbox"/> 10	Failure to use proper footwear 未有使用適當的鞋履
<input type="checkbox"/> 03	Making safety devices inoperative 令安全裝置不能操作	<input type="checkbox"/> 11	Failure to use eye protector 未有佩戴護眼罩
<input type="checkbox"/> 04	Working on moving or dangerous equipment 在移動或危險設備上工作	<input type="checkbox"/> 12	Failure to use respirator 未有使用呼吸器
<input type="checkbox"/> 05	Using unsafe equipment or using equipment unsafely 使用不安全設備或不安全地使用設備	<input type="checkbox"/> 13	Failure to use proper clothing 未有使用適當的衣服
<input type="checkbox"/> 06	Adopting unsafe position or posture 採用不安全位置或姿勢	<input type="checkbox"/> 14	Failure to warn others or give proper signals 未能向其他人發出警告或適當的訊號
<input type="checkbox"/> 07	Operating or working at unsafe speed 以不安全速度工作或操作	<input type="checkbox"/> 15	Horseplay 喧鬧
<input type="checkbox"/> 08	Unsafe loading, placing, mixing etc 不安全地安放、放置物件、混合物品等	<input type="checkbox"/> 16	No unsafe action 並無不安全行動
		<input type="checkbox"/> 17	Others (please specify) 其他(請指明)_____

**(h) Unsafe Condition Relevant to the Accident**

與該意外有關的不安全情況

<input type="checkbox"/> 01	No protective gear 沒有防護裝置	<input type="checkbox"/> 08	Unsafe layout of job, traffic etc. 工作和交通等的不安全安排
<input type="checkbox"/> 02	Defective protective gear 防護用具有毛病	<input type="checkbox"/> 09	Unsafe process or job methods 不安全的程序或工作方法
<input type="checkbox"/> 03	Improper dress/footwear 穿著不合宜衣服/鞋履	<input type="checkbox"/> 10	Poor housekeeping 管理不善
<input type="checkbox"/> 04	Improper guarding 不適當的防護	<input type="checkbox"/> 11	Lack of warning system 缺乏警告系統
<input type="checkbox"/> 05	Improper ventilation 不適當的通風	<input type="checkbox"/> 12	Defective tool, machinery or material 工具、機器或物料的損壞
<input type="checkbox"/> 06	Improper illumination 不適當的照明	<input type="checkbox"/> 13	No unsafe condition 並無不安全情況
<input type="checkbox"/> 07	Improper procedure 不適當的程序	<input type="checkbox"/> 14	Others (please specify) 其他(請指明)_____

**(i) Personal Factor Relevant to the Accident**

與該意外有關的人為因素

<input type="checkbox"/> 01	Incorrect attitude/motive 態度／動機不正確	<input type="checkbox"/> 04	Unsafe act by another person 他人的不安全行動
<input type="checkbox"/> 02	Lack of knowledge or skill 知識或技術的缺乏	<input type="checkbox"/> 05	No unsafe personal factor 並無不安全的人為因素
<input type="checkbox"/> 03	Physical defects 身體上的缺陷	<input type="checkbox"/> 06	Others (please specify) 其他(請指明)_____

**Part C – Investigation (\*Delete if not applicable)**
**丙部 – 調查 (\*請刪去不適用者)**
**(a) Investigation Result**

## 調查結果

Police notified: 是否已報警：	Yes/No* 是／否*	Date: 日期：
Police Station informed: 通知的警署名稱：		Report No.: 報案編號：
Name of witness(es): 證人姓名：		Statement attached : 是否夾附供詞：  Yes/No*有／沒有*

**Describe in detail how the accident occurred**

詳細說明意外怎樣發生

**Findings after investigation:**

調查後得到的結果：

**Recommendations/Actions taken to avoid similar occurrence:**

避免發生同樣意外的建議／所採取的行動：

**(b) Comments (To be completed by Section Head)**

意見(由單位主管填寫)

**Comments on the investigation results:**

對調查結果的意見：

After investigation, I confirm that:

經調查後本人證實：

- (a) the injury \*was/was not attributable to the officer's own serious and wilful misconduct;  
該損傷\*是／不是由於人員本身的嚴重或蓄意失當行為所引起；
- (b) the injury \*was/was not deliberately aggravated by the officer;  
該人員\*是／不是故意令損傷更嚴重；
- (c) the injury \*was/was not attributable to drug addiction or the influence of alcohol; and  
該損傷\*是／不是由吸食毒品或受酒精影響所造成；以及
- (d) I am satisfied that the injury "is/is not caused by the accident arising out of and in the course of his employment."  
本人確信損傷\*是／不是由其工作及在工作進行時所引致。

Name \_\_\_\_\_ Signature \_\_\_\_\_ Rank \_\_\_\_\_ Date \_\_\_\_\_  
姓名 \_\_\_\_\_ 簽署 \_\_\_\_\_ 職級 \_\_\_\_\_ 日期 \_\_\_\_\_

**Part D – To be Completed if the Accident Occurred on a Construction Site** (please tick the appropriate box)

丁部 – 如意外發生在建築地盤內則須填寫此部 (請在適當空格內加上✓號)

**(a) Type of work performed by the employee at the time of accident**  
在意外發生時僱員所進行的工作類別

<input type="checkbox"/> 01	Concreting 混凝土傾注	<input type="checkbox"/> 07	Painting 油漆	<input type="checkbox"/> 13	Trench work 坑道工程	<input type="checkbox"/> 19	Slope work 斜坡工程
<input type="checkbox"/> 02	Woodworking 木器工程	<input type="checkbox"/> 08	Plastering 批盪	<input type="checkbox"/> 14	Gas pipe fitting 安裝氣體輸送管	<input type="checkbox"/> 20	Others (Please specify) 其他(請指明)
<input type="checkbox"/> 03	Glazier work 玻璃工程	<input type="checkbox"/> 09	Arc/gas welding 電焊/氣焊	<input type="checkbox"/> 15	Water pipe fitting 安裝水管		
<input type="checkbox"/> 04	Reinforcement bar 拗鋼筋	<input type="checkbox"/> 10	Formwork erection 搭建板模	<input type="checkbox"/> 16	Electrical wiring 安裝電線		
<input type="checkbox"/> 05	Bamboo scaffolding 竹棚工程	<input type="checkbox"/> 11	Brick laying 鋪砌磚塊	<input type="checkbox"/> 17	Material handling 處理物料		
<input type="checkbox"/> 06	Tubular scaffolding 通架棚工程	<input type="checkbox"/> 12	Caisson work 沉箱工程	<input type="checkbox"/> 18	Lift installation 安裝升降機		

Whereabouts on the site such work was performed

上述工作在建築地盤內何處進行

**(b) Machinery involved, if any**  
涉及的機器(如有的話)

<input type="checkbox"/> 01	Skip/material hoist 吊斗起重機/物料起重機	<input type="checkbox"/> 06	Hydraulic crane 液壓起重機	<input type="checkbox"/> 11	Bar bender 拗鋼筋機
<input type="checkbox"/> 02	Passenger hoist/builders' lift 載人起重機/建築工地升降機	<input type="checkbox"/> 07	Suspended working platform 吊船	<input type="checkbox"/> 12	Concrete mixer 混凝土攪拌機
<input type="checkbox"/> 03	Tower crane 塔式起重機(天秤)	<input type="checkbox"/> 08	Boatswain's chair 工作吊板	<input type="checkbox"/> 13	Air compressor/receiver 風泵/風鼓
<input type="checkbox"/> 04	Mobile crane 流動起重機	<input type="checkbox"/> 09	Pile driver 打樁機	<input type="checkbox"/> 14	Others (please specify) 其他(請指明)
<input type="checkbox"/> 05	Lorry-mounted crane 安裝在貨車上的起重機	<input type="checkbox"/> 10	Boring jig 鑽探機		_____

**(c) Transporting or construction machinery involved, if any**  
涉及的運輸機器或建築機器(如有的話)

<input type="checkbox"/> 01	Dump truck 倒泥卡車	<input type="checkbox"/> 04	Bulldozer 推土機	<input type="checkbox"/> 7	Others (please specify) 其他(請指明)
<input type="checkbox"/> 02	Loader 搬土機	<input type="checkbox"/> 05	Grader 平土機		_____
<input type="checkbox"/> 03	Excavator 挖土機	<input type="checkbox"/> 06	Compacting roller 壓土機		

Reported by :  
呈報人 :

Name of Officer-in-charge 主管人員姓名	Signature 簽署	Rank 職級	Telephone 電話	Date 日期
-------------------------------------	-----------------	------------	-----------------	------------



To: Personnel Registry  
致：人事組

**Statement of Injured Officer/Witnesses**

受傷人員／證人聲明書

Signature	:	
簽署	:	_____
Name	:	
姓名	:	_____
Rank and Post	:	
職級及職位	:	_____
Date	:	
日期	:	_____

Note 1 : The information collected will be used for the purpose of determination of eligibility for employees' compensation. It may also be used in ensuing civil actions or in matters directly related to the purposes for which this statement was initially taken. Failure to provide such information will delay or render it impossible to process claims for employees' compensation.

註 1 : 收集的資料將用作決定是否合資格領取僱員賠償，這些資料亦可能用於由此引致的民事訴訟或與最初錄取此陳述書時的目的直接有關的事件。未能提供此等資料將會延遲或導致不能辦理領取僱員賠償的申請。

Note 2 : The information may be disclosed to other departments/agencies for the purpose mentioned in Note 1.

註 2 : 可因上述註 1 的原因將此資料向其他部門／機構披露。

Note 3 : For access to or correction of the information above under the Personal Data (Privacy) Ordinance, please contact the access clerk at 2594 7056.

註 3 : 凡根據個人資料(私隱)條例查閱或改正上述資料，請致電 25947056 向負責查閱文員查詢。

## **APPENDIX 6**

### **Construction Site Accident Statistics - Reporting Forms**

- (a) Summary of Details of Contract
- (b) Construction Accident Statistics Monthly Summary
- (c) Injury Report Form

### Summary of Details of Contract

(To be submitted within 30 days after award of contract)

**Part A** (Data that can be obtained from Construction Management Information System)

1. Contract No.: \* \_\_\_\_\_  
Contract Title: \* \_\_\_\_\_
2. Department: \*  ArchSD  CEDD  DSD  EMSD  HyD  WSD  
Office: \* \_\_\_\_\_ Division: \_\_\_\_\_
3. Contractor Name: \* \_\_\_\_\_
4. Contract Sum: \* \_\_\_\_\_

**Part B** (Additional information to be input into the PCSES system)

5. (a) Contract Commencement Date: \* \_\_\_\_\_  
(b) Contractual Completion Date: \* \_\_\_\_\_
6. Management Party: \*  In House  
 Consultant Management Contract Consultant Name \_\_\_\_\_
7. Category for Tender Assessment: \*  Building  Non-building
8. Type of Works: \*  New Works  Maintenance  
(Including RMAA & Demolition)
9. Nature of Works: \* (Tick not more than two boxes)
 

<input type="checkbox"/> Building	<input type="checkbox"/> Port Works
<input type="checkbox"/> Roads and Drainage	<input type="checkbox"/> Site Formation
<input type="checkbox"/> Water Works	<input type="checkbox"/> Landscape
<input type="checkbox"/> Geotechnical Works	<input type="checkbox"/> Investigation (Ground / Marine)
<input type="checkbox"/> Electrical and Mechanical Works	<input type="checkbox"/> Tunneling
<input type="checkbox"/> Slope Works	<input type="checkbox"/> Other Specialist Works
10. Form of Contract: \* (Tick one box only)
 

<input type="checkbox"/> Works Order Type / Term Contract	<input type="checkbox"/> Design & Build
<input type="checkbox"/> BQ Re-measurement	<input type="checkbox"/> Lump Sum Contract
NEC Approach Project <input type="radio"/> A <input type="radio"/> B <input type="radio"/> C <input type="radio"/> D <input type="radio"/> E <input type="radio"/> F <input type="radio"/> Others	
<input type="checkbox"/> Others _____	
11. Others:
  - under Pay for Safety Scheme (PFSS)
  - under Pay for Safety Performance Merit Scheme (PFSPMS)
  - under Pay for Safety and Environment Scheme (PFSES)

\* is a mandatory field.

## Construction Accident Statistics Monthly Summary

[for the month ending \*   /     (mm/yyyy)]  
 (To be submitted on or before the 15<sup>th</sup> day of each month)

Please tick your DEPARTMENT \*

- |                                    |                                  |                                 |
|------------------------------------|----------------------------------|---------------------------------|
| 1. <input type="checkbox"/> ArchSD | 2. <input type="checkbox"/> CEDD | 3. <input type="checkbox"/> DSD |
| 4. <input type="checkbox"/> EMSD   | 5. <input type="checkbox"/> HyD  | 6. <input type="checkbox"/> WSD |

Office \_\_\_\_\_ Division \_\_\_\_\_

Contract No. : \* \_\_\_\_\_

Works Order No. : \_\_\_\_\_

### Part A: Summary

	<u>This Month</u>
1. Number of fatal accidents	_____
2. Number of dangerous occurrences	_____
3. Number of non-fatal accidents (with incapacity for more than 3 days)	_____
4. No. of man-day lost (i) due to accident(s) occurred in this month (ii) due to accident(s) of previous months	_____ (To be input in Part C)
5. No. of Form 2B submitted to LD (with incapacity of 3 days or less)	_____
6. Number of LD inspection conducted	_____
7. Number of Improvement Notice(s) issued by LD	_____
8. Number of Suspension Notice(s) issued by LD	_____
9. Number of "Part 1" issued by LD	_____
10. Sum certified (in HK\$) (including retention money)	_____

Note Key points to note when calculation man-days lost:  
 (a) Public holidays within the sick leave period should be counted; and  
 (b) The day of the reportable accident should be excluded in calculating man-days lost.

**Part B: Number of man-days and man-hours worked by Trades  
(based on the return of GF 527 to the Census and Statistics Department)**

	<u>Man-days</u>	<u>Man-hours</u>
1. Bar Bender & Fixer [or Steelbender]	1	
2. Concretor	2	
3. Drainlayer	3	
4. Plumber	4	
5. Leveller	5	
6. Bamboo Scaffolder	6	
7. Carpenter & Joiner	7	
8. Carpenter (Formwork)	8	
9. Joiner	9	
10. Plant & Equipment Operator (Load Shifting) [or Plant Operator (exc. driver, bulldozer driver, etc.)]	10	
11. Truck Driver	11	
12. Rock-Breaking Driller [or Pneumatic Driller]	12	
13. Blacksmith	13	
14. General Welder	14	
15. Metal Worker	15	
16. Glazier	16	
17. Excavator (male)	17	
18. Excavator (female)	18	
19. Labourer (male)	19	
20. Labourer (female)	20	
21. Concretor's Labourer (male)	21	
22. Concretor's Labourer (female)	22	
23. Heavy Load Labourer [or Heavy Load Coolie]	23	
24. Diver's Linesman	24	
25. Painter & Decorator	25	
26. Plasterer	26	
27. Terrazzo & Granolithic Worker	27	
28. Plasterer's Labourer (male)	28	
29. Plasterer's Labourer (female)	29	
30. Bricklayer	30	
31. Bricklayer's Labourer (male)	31	
32. Bricklayer's Labourer (female)	32	
33. Marble Worker	33	
34. Mason (incl. rubble mason, splitting mason and ashlar mason)	34	
35. Structural Steel Welder	35	
36. Structural Steel Erector	36	
37. Rigger/Metal Formwork Erector	37	
38. Asphalter (Road Construction)	38	
39. Construction Plant Mechanic [or Fitter]	39	
40. Diver	40	
41. Electrical Fitter (incl. Electrician)	41	
42. Mechanical Fitter	42	
43. Refrigeration/AC/Ventilation Mechanic	43	
44. Fire Service Mechanic	44	
45. Lift and Escalator Mechanic	45	
46. Building Services Maintenance Mechanic	46	
47. Cable Jinter (Power)	47	
48. Others not included in the above	48	
<b>Total of this month :</b>		





**Part D: Monthly Return for Construction Worker with/without Specified Trade Safety Training Certificate (Silver Card)**

Specified Trade	Worker with Silver Card		Worker without Silver Card		
	No. of Worker	Total No. of Man-days worked	No. of Worker	Total No. of Man-days worked	No. of Worker who have been arranged to attend Silver Card Course
Painter and Decorator					
Carpenter					
Demolition Worker (Building)					
Plumber					
Bar Bender and Fixer					
Plasterer and Tiler					
Bamboo Scaffold and Metal Scaffold					
Curtain Wall Installer					
Lift Mechanic (Installation and Maintenance)					
Tower Crane Worker (Erecting, Dismantling, Telescoping & Climbing)					
Construction Materials Rigger					
Tunnel Worker					
Others					
Total					



## Injury Report Form

**The Form should be completed by Safety Officer or Site Agent of Principal Contractor within seven days on occurrence of accident resulting in death, hospitalization for more than two nights or injury with incapacity for more than three days.**

Contract number \* \_\_\_\_\_ Ref. No. of injury \* \_\_\_\_\_  
 Works Order number \_\_\_\_\_

**A. Please fill in or tick the PERSONAL INFORMATION OF THE INJURED WORKER**

1. Name ( surname first ) \* \_\_\_\_\_  Not Specified
2. CWRB No. \* \_\_\_\_\_
3. Age \* \_\_\_\_\_  Not Specified
4. Sex \*  Male  Female  Not Specified
5. Imported labourer \*  Yes  No  Not Specified
6. Years of construction site experience \_\_\_\_\_ years
7. No. of months worked at this site \_\_\_\_\_ months
8. First Language  Cantonese  English  Mandarin  Japanese  Korean  French  German  Thai  
 Tagalog  Malay/Indonesian  Javanese  Urdu  Pashto  Punjabi  Sindhi  
 Balochi  Nepali  Arabic  Vietnam  Others
9. Race  Chinese  Filipino  Indian  Nepali  Pakistanian  Japanese  Korean  Thai  
 Vietnamese  Burmese  Russian  European  Others (specify) \_\_\_\_\_

**B. Please fill in the PARTICULARS OF EMPLOYER of injured worker**

Name of company / employer ( If not principal contractor ) \_\_\_\_\_

**C. Please fill in or tick the DESCRIPTION OF ACCIDENT**

1. Date of accident (in dd/mm/yyyy) : \_\_\_\_\_ Time of accident (in hh:mm) : \_\_\_\_\_
2. Date of Notification to Labour Department (in dd/mm/yyyy) : \* \_\_\_\_\_
3. Reason of Late Submission to Labour Department

**4. Preliminary View on Severity of Injury \***

- Minor (with no hospitalization or hospitalization less than 24 hours)
- Serious (with hospitalization more than 24 hours)
- Severe (as defined in paragraph 9.3.5(a) of the Manual but excluding fatal accidents)

No. of Nights in Hospital \* \_\_\_\_\_  
 Stayed in ICU \*  Yes  No

(\*Please attach medical certificate, or Contractor's report with declaration, as described in paragraph 9.3.5(b) of the Manual)

- Fatal

5. Air Quality Health Index  1  2  3  4  5  6  
 7  8  9  10  10+

6. Rain / Rainstorm Signal

- i.  N/A  
 ii.  Rainy  
 iii.  Amber Rainstorm Warning Signal  
 iv.  Red Rainstorm Warning Signal  
 v.  Black Rainstorm Warning Signal

7. Temperature Condition  N/A  Cold Weather Warning  Very Hot Weather Warning

8. Tropical Cyclone  N/A  No. 1  No. 3  No. 8 or Above

9. Flooding in the Northern New Territories  Yes  No  Not Specified

10. Period of Incapacity:

Start date of sick leave (in dd/mm/yyyy) : \* \_\_\_\_\_ (if different from the date of accident)

End date of sick leave (in dd/mm/yyyy) : \_\_\_\_\_ (to be provided when known)

**D. Please tick the appropriate TRADE of the injured worker ( tick one box only ) \***

Semi-skilled worker / General worker

1.  Chainman  
 2.  Concreting labourer  
 3.  Drilling assistant  
 4.  Excavator  
 5.  Labourer

Management / Foreman

11.  Manager / Site Engineer / General Foreman  
 12.  Ganger

Tradesman

21.  Bamboo scaffolder  
 22.  Bar bender and fixer  
 23.  Bricklayer  
 24.  Building services / E&M worker  
 25.  Carpenter (fender)  
 26.  Carpenter (formworker)  
 27.  Concretor  
 28.  Construction / Mechanical plant mechanic or fitter  
 29.  Diver  
 30.  Drainlayer / Mainlayer  
 31.  Demolition worker  
 32.  General welder  
 33.  Joiner  
 34.  Leveller  
 35.  Marine construction plant operator  
 36.  Mason

37.  Metal worker  
 38.  Metal scaffolder  
 39.  Painter and decorator  
 40.  Piling operative  
 41.  Plant & equipment operator (builders lift & other machinery)  
 42.  Plant & equipment operator (earthmoving machinery)  
 43.  Plant & equipment operator (hoist and crane)  
 44.  Plant & equipment operator (piling)  
 45.  Plant & equipment operator (tunnelling)  
 46.  Plasterer  
 47.  Plumber  
 48.  Pneumatic driller  
 49.  Rigger / Metal formwork erector  
 50.  Structural steel erector  
 51.  Truck and other vehicle driver  
 52.  Tunnel worker

60.  Others please specify, e.g. security staff / watchman \_\_\_\_\_

**E. Please tick the PLACE OF ACCIDENT ( tick one box only ) \***

- |   |   |
|---|---|
| 1. <input type="checkbox"/> Roof / Top of building              | 7. <input type="checkbox"/> External work / Scaffolding / Gondola |
| 2. <input type="checkbox"/> Lift shaft / Internal work surface  | 8. <input type="checkbox"/> Steel bending yard                    |
| 3. <input type="checkbox"/> Stair / Passage                     | 9. <input type="checkbox"/> Pre-casting / Prestressing yard       |
| 4. <input type="checkbox"/> Excavation / Underground / Basement | 10. <input type="checkbox"/> Floor / Floor opening                |
| 5. <input type="checkbox"/> Tunnel / Sewer / Drain / Nullah     | 11. <input type="checkbox"/> Falsework and formwork               |
| 6. <input type="checkbox"/> Ladder                              | 12. <input type="checkbox"/> Others (specify) _____               |



**F.** Please refer to the list below and write down the code of the **NATURE OF INJURY AND PART OF BODY INJURED** respectively. The information to be collected is similar to **Section J of Labour Department Form 2**. (If the victim has more than one injury in the accident, please specify separately. For example, in the case of burn in face and dislocation in elbow, please write down “5, 26” in first injury and “9, 44” in second injury. )

	1 <sup>st</sup> injury *	2 <sup>nd</sup> injury	3 <sup>rd</sup> injury
Nature of injury incurred ( 1-20 )			
Part of body injured ( 21-57 )			

**Nature of injury**

- |   |   |
|---|---|
| <ul style="list-style-type: none"> <li>1. Abrasion</li> <li>2. Amputation</li> <li>3. Asphyxia</li> <li>4. Burn (heat)</li> <li>5. Burn / Scald</li> <li>6. Contusion &amp; bruise</li> <li>7. Concussion &amp; other internal injury</li> <li>8. Laceration and cut</li> <li>9. Dislocation</li> <li>10. Crushing</li> </ul> | <ul style="list-style-type: none"> <li>11. Electric shock / Effects of electric current</li> <li>12. Fracture</li> <li>13. Puncture</li> <li>14. Sprain / Strain / Twist</li> <li>15. Freezing</li> <li>16. Poisoning and gassing</li> <li>17. Irritation</li> <li>18. Nausea</li> <li>19. Multiple Injuries</li> <li>20. Others (specify) _____</li> </ul> |
|---|---|

**Part of body injured**

- | <u>HEAD</u>           | <u>NECK &amp; TRUNK</u> | <u>UPPERLIMBS</u> | <u>LOWERLIMBS</u>          |
|-----------------------|-------------------------|-------------------|----------------------------|
| 21. Skull / Scalp     | 31. Neck                | 41. Finger        | 51. Hip                    |
| 22. Eye               | 32. Back                | 42. Hand / Palm   | 52. Thigh                  |
| 23. Ear               | 33. Chest               | 43. Forearm       | 53. Knee                   |
| 24. Mouth/ Tooth/ Lip | 34. Abdomen             | 44. Elbow         | 54. Leg                    |
| 25. Nose              | 35. Trunk               | 45. Upper arm     | 55. Ankle                  |
| 26. Face/ Cheek/ Chin | 36. Pelvis / Groin      | 46. Shoulder      | 56. Foot / Toe             |
|                       | 37. Waist               | 47. Wrist         | 57. Others (specify) _____ |

**G.** Please tick the appropriate **TYPE OF ACCIDENT**. (Tick one box only) \*  
 The information to be collected is similar to **Section K of Labour Department Form 2** with additional items.

- |  |   |
|--|---|
| <ul style="list-style-type: none"> <li>1. <input type="checkbox"/> Trapped in or between objects Injured whilst lifting or carrying / manual</li> <li>2. <input type="checkbox"/> lifting / manual handling / Handling without machinery</li> <li>3. <input type="checkbox"/> Slip, trip or fall on same level</li> <li>4. <input type="checkbox"/> Fall of person from height _____ metres</li> <li>5. <input type="checkbox"/> Striking against fixed or stationary object</li> <li>6. <input type="checkbox"/> Striking against moving object</li> <li>7. <input type="checkbox"/> Stepping on object / nail</li> <li>8. <input type="checkbox"/> Exposure to or contact with harmful substance (e.g. poison gas, toxic, corrosive substance)</li> <li>9. <input type="checkbox"/> Contact with electricity or electric discharge</li> <li>10. <input type="checkbox"/> Trapped by collapsing or overturning object</li> <li>21. <input type="checkbox"/> Others (specify) _____</li> </ul> | <ul style="list-style-type: none"> <li>11. <input type="checkbox"/> Struck by moving or falling object</li> <li>12. <input type="checkbox"/> Struck by moving vehicle / Traffic accident</li> <li>13. <input type="checkbox"/> Contact with moving machinery or object being machined</li> <li>14. <input type="checkbox"/> Drowning or asphyxiation</li> <li>15. <input type="checkbox"/> Exposure to fire / burning</li> <li>16. <input type="checkbox"/> Exposure to explosion</li> <li>17. <input type="checkbox"/> Dust / foreign particle in eye</li> <li>18. <input type="checkbox"/> Hand tool accident</li> <li>19. <input type="checkbox"/> Crushing / Burial</li> <li>20. <input type="checkbox"/> Machinery operation accident</li> </ul> |
|--|---|

**H. Please tick the appropriate AGENT INVOLVED. (Can tick more than one box)**

The information to be collected is similar to **Section L of Labour Department Form 2** with additional items.

- |  |  |
|--|--|
| 1. <input type="checkbox"/> Equipment for lifting / conveying                  | 11. <input type="checkbox"/> vehicle or associated equipment or machinery  |
| 2. <input type="checkbox"/> Portable power or hand tools                       | 12. <input type="checkbox"/> Construction formwork, shuttering & falsework |
| 3. <input type="checkbox"/> Other machinery (specify) _____                    | 13. <input type="checkbox"/> Nail, splinter or chipping                    |
| 4. <input type="checkbox"/> Material / Product being handled or stored         | 14. <input type="checkbox"/> Scaffolding / Gondola                         |
| 5. <input type="checkbox"/> Ladder or working at height                        | 15. <input type="checkbox"/> Excavation / Underground work                 |
| 6. <input type="checkbox"/> Sewerage, manhole or other confined space          | 16. <input type="checkbox"/> Slope   |
| 7. <input type="checkbox"/> Movable container or package of any kind           | 17. <input type="checkbox"/> Steel bar / rod                               |
| 8. <input type="checkbox"/> Floor, ground, stairs or any working surface       | 18. <input type="checkbox"/> Pipe  |
| 9. <input type="checkbox"/> Gas, vapour, dust or fume                          | 19. <input type="checkbox"/> Others (specify) _____                        |
| 10. <input type="checkbox"/> Electricity supply, wiring apparatus or equipment |  |

**I. Please tick the TYPE OF WORK PERFORMED by the injured worker at the time of accident. (Tick one box only) \***

The information to be collected is similar to **Section N of Labour Department Form 2** with additional items.

- |   |  |
|---|--|
| 1. <input type="checkbox"/> Concreting                | 16. <input type="checkbox"/> Electrical Wiring               |
| 2. <input type="checkbox"/> Woodworking               | 17. <input type="checkbox"/> Material handling               |
| 3. <input type="checkbox"/> Glazier work              | 18. <input type="checkbox"/> Lift installation               |
| 4. <input type="checkbox"/> Reinforcement bar bending | 19. <input type="checkbox"/> Slope work                      |
| 5. <input type="checkbox"/> Bamboo scaffolding        | 20. <input type="checkbox"/> Mixing                          |
| 6. <input type="checkbox"/> Metal scaffolding         | 21. <input type="checkbox"/> Demolition                      |
| 7. <input type="checkbox"/> Painting                  | 22. <input type="checkbox"/> Road work                       |
| 8. <input type="checkbox"/> Plastering                | 23. <input type="checkbox"/> Erection of structural elements |
| 9. <input type="checkbox"/> Arc / Gas welding         | 24. <input type="checkbox"/> Falsework                       |
| 10. <input type="checkbox"/> Formwork erection        | 25. <input type="checkbox"/> Surface treatment               |
| 11. <input type="checkbox"/> Brick laying             | 26. <input type="checkbox"/> Cutting                         |
| 12. <input type="checkbox"/> Caisson work             | 27. <input type="checkbox"/> Piling                          |
| 13. <input type="checkbox"/> Trench work              | 28. <input type="checkbox"/> Finishing work                  |
| 14. <input type="checkbox"/> Gas Pipe fitting         | 29. <input type="checkbox"/> Others (specify) _____          |
| 15. <input type="checkbox"/> Water pipe fitting       |  |

**J. Please tick the appropriate UNSAFE ACTION. (Can tick more than one box)**

- |   |  |
|---|--|
| 1. <input type="checkbox"/> Operating without authority                   | 11. <input type="checkbox"/> Failure to use eye protector                  |
| 2. <input type="checkbox"/> Failure to secure objects                     | 12. <input type="checkbox"/> Failure to use respirator                     |
| 3. <input type="checkbox"/> Making safety devices inoperative             | 13. <input type="checkbox"/> Failure to use proper clothing                |
| 4. <input type="checkbox"/> Working on moving or dangerous equipment      | 14. <input type="checkbox"/> Failure to warn others or give proper signals |
| 5. <input type="checkbox"/> Use unsafe equipment / Use equipment unsafely | 15. <input type="checkbox"/> Horseplay                                     |
| 6. <input type="checkbox"/> Adopting unsafe position or posture           | 16. <input type="checkbox"/> Smoking / Burning                             |
| 7. <input type="checkbox"/> Operating or working at unsafe speed          | 17. <input type="checkbox"/> Failure to use safety belt / harness          |
| 8. <input type="checkbox"/> Unsafe loading, placing, mixing etc           | 18. <input type="checkbox"/> Failure to use gloves                         |
| 9. <input type="checkbox"/> Failure to use helmet                         | 19. <input type="checkbox"/> Use unsuitable access / Failure to use access |
| 10. <input type="checkbox"/> Failure to use proper footwear               | 20. <input type="checkbox"/> Lapse of attention                            |
|   | 21. <input type="checkbox"/> Others (specify) _____                        |

**K. Please tick the appropriate UNSAFE CONDITION. (Can tick more than one box)**

- |   |  |
|---|--|
| 1. <input type="checkbox"/> No protective gear                | 11. <input type="checkbox"/> Lack of warning system                    |
| 2. <input type="checkbox"/> Defective protective gear         | 12. <input type="checkbox"/> Defective tool, machinery or material     |
| 3. <input type="checkbox"/> Improper dress / footwear         | 13. <input type="checkbox"/> Improper stacking / storage               |
| 4. <input type="checkbox"/> Improper guarding / No guarding   | 14. <input type="checkbox"/> Adverse weather                           |
| 5. <input type="checkbox"/> Improper ventilation              | 15. <input type="checkbox"/> Inadequate working space / platform       |
| 6. <input type="checkbox"/> Improper illumination             | 16. <input type="checkbox"/> Slippery area                             |
| 7. <input type="checkbox"/> Improper procedure                | 17. <input type="checkbox"/> Inadequate tools and protective equipment |
| 8. <input type="checkbox"/> Unsafe layout of job, traffic etc | 18. <input type="checkbox"/> Others (specify) _____                    |
| 9. <input type="checkbox"/> Unsafe process or job methods     |  |
| 10. <input type="checkbox"/> Poor housekeeping                |  |

**L. Please tick the appropriate PERSONAL FACTOR which cause the accident. (Can tick more than one box)**

- |  |  |
|--|--|
| 1. <input type="checkbox"/> Incorrect attitude / motive  | 5. <input type="checkbox"/> Fatigue / Exhaustion   |
| 2. <input type="checkbox"/> Lack of knowledge or skill   | 6. <input type="checkbox"/> Carelessness           |
| 3. <input type="checkbox"/> Physical defects             | 7. <input type="checkbox"/> Others (specify) _____ |
| 4. <input type="checkbox"/> Unsafe act by another person |  |



**M. Please tick the MACHINERY INVOLVED in the accident. (Tick one box only) \***

The information to be collected is similar to **Section O of Labour Department Form 2.**

- |  |  |
|--|--|
| 1. <input type="checkbox"/> No Machinery Involved                  | 9. <input type="checkbox"/> Boatswain's chair          |
| 2. <input type="checkbox"/> Skip / Material hoist / builders' lift | 10. <input type="checkbox"/> Pile driver               |
| 3. <input type="checkbox"/> Mobile platform                        | 11. <input type="checkbox"/> Boring rig                |
| 4. <input type="checkbox"/> Tower crane                            | 12. <input type="checkbox"/> Bar bender                |
| 5. <input type="checkbox"/> Mobile crane                           | 13. <input type="checkbox"/> Concrete mixer            |
| 6. <input type="checkbox"/> Lorry-mounted crane                    | 14. <input type="checkbox"/> Air compressor / receiver |
| 7. <input type="checkbox"/> Hydraulic crane                        | 15. <input type="checkbox"/> Others (specify) _____    |
| 8. <input type="checkbox"/> Suspended working platform             |  |

**N. Please tick the CONSTRUCTION MACHINERY INVOLVED in the accident if appropriate. (Tick one box only) \***

The information to be collected is similar to **Section P of Labour Department Form 2.**

- |  |  |
|--|--|
| 1. <input type="checkbox"/> Dump truck | 5. <input type="checkbox"/> Grader                 |
| 2. <input type="checkbox"/> Loader     | 6. <input type="checkbox"/> Compacting roller      |
| 3. <input type="checkbox"/> Excavator  | 7. <input type="checkbox"/> Others (specify) _____ |
| 4. <input type="checkbox"/> Bulldozer  |  |

**O. Brief account of the accident (Sections O & P need not be completed if a separate report has been / will be submitted.)**

**P. What action(s) / measure(s) should be taken / have been taken to avoid recurrence of similar accidents?**

**Q. Injury Report Form completed by:**

Name of Person \* \_\_\_\_\_  Signed Signature \_\_\_\_\_ Date<sup>1</sup> \_\_\_\_\_

Post Title \* \_\_\_\_\_

**Acknowledged by:**

Name of A/E's Representative \* \_\_\_\_\_  Signed Signature \_\_\_\_\_ Date<sup>1</sup> \_\_\_\_\_

(Note: <sup>1</sup> in format dd/mm/yyyy)

**STATEMENT OF PURPOSE FOR THE COLLECTION OF PERSONAL DATA**  
**BY DEVELOPMENT BUREAU (WORKS BRANCH)**

(Reporting Accident or Dangerous Occurrence and Giving Declaration to PCSES)

**Purpose of Collection**

1. The personal data provided by the data owner or data provider by means of this form, which is on voluntary basis, will be used by Development Bureau and Works Departments (Architectural Services Department, Civil Engineering and Development Department, Drainage Services Department, Electrical and Mechanical Services Department, Highways Department, and Water Supplies Department) for the following purposes:
  - (a) activities relating to the administration of the Public Works Programme Construction Site Safety and Environmental Statistics System (PCSES) by Development Bureau; and
  - (b) analysis of the safety and related matters.

**Classes of Transferees**

2. The personal data provided by the data owner or data provider will not be disclosed to others parties or authorities.

**Access to Personal Data**

3. The data owner or data provider has a right of access and correction with respect to personal data as provided for in Section 18 & 22 and Principle 6 of Schedule 1 of the Personal Data (Privacy) Ordinance. The right of access includes the right to obtain a copy of his/her personal data provided to this bureau.

**Enquiries**

4. Enquiries concerning the personal data collected, including the making of access and corrections, should be addressed to:

Works Branch  
Development Bureau  
15/F, West Wing, Central Government Offices,  
2 Tim Mei Avenue, Tamar, Hong Kong  
Email: pcses\_admin@devb.gov.hk

# REFERENCES

## 1. Safety-related Circulars in Force

- (a) Development Bureau Technical Circulars (Works) (DEVB TC(W))
- (b) Drainage Services Department Technical Circulars (DSDTC)
- (c) Drainage Services Department Circular Memorandum (DSDCM)
- (d) Drainage Services Department Practice Notes (DSDPN)
- (e) Civil Service Bureau Circular Memorandum (CSBCM)
- (f) Electrical and Mechanical Services Department Technical Circular (EMSRTC)

## 2. Hazardous Substances Commonly Found in DSD Workplaces

- (a) Dust
- (b) Fumes and gases
- (c) Inflammables
- (d) Infectious agents potentially present in raw domestic wastewater
- (e) Chemicals

## 3. Useful Telephone Numbers and Websites

- (a) DSD In-house Safety Advisory Service
- (b) Reporting of Serious Accidents
- (c) Enquiry Service Regarding Occupational Safety and Health Information
- (d) Useful Websites



## Safety-related Circulars in Force

### (a) Development Bureau Technical Circulars (Works) (DEVB TC(W))

Ref. No.	Title
8/2010	Enhanced Specification for Site Cleanliness and Tidiness
3/2009	Regulating Action against Contractors for Occurrence of a Serious Incident or Conviction for Site Safety or Environmental Offences
20/2005	Upward Reporting of Major Emergency Incidents from Works Departments
19/2005	Environmental Management on Construction Sites
5/2005	Protection of natural streams/rivers from adverse impacts arising from construction works
22/2003A	Additional Measures to Improve Site Cleanliness and Control Mosquito Breeding on Construction Sites
14/2003	Role of Departmental Safety and Environmental Advisor on Health, Safety and Environmental Protection on Construction Sites
30/2002	Implementation of Site Safety Cycle and Provision of Welfare Facilities for Workers at Construction Sites
12/2001	Safety Training for Departmental Staff and Resident Site Staff
30/2000	Construction Site Safety Manual - Second Updating of Chapters 3 and 12
26/2000	Score Card for Assessment of Site Safety Performance
32/1999	Second Stage of the Independent Safety Audit Scheme
18/1999	Particular Specification Clause for Vehicles Carrying Dusty Materials
11/1995	Construction Site Safety Manual

**(b) Drainage Services Department Technical Circulars (DSDTC)**

Ref. No.	Title
1/2019	Reporting of Accidents Occurring on Drainage Services Department Works Sites
3/2019	Departmental Safety Manual
2/2018	Safety Training for DSD Staff
2/2014	Handling and Managing Serious and Emergency Incidents
3/2012	Confined Space Safety Training for Competent Persons and Certified Workers Engaged in DSD's Works
2/2012	Proactive Approach to Site Safety Management
3/2006	Liaison with Labour Department and Marine Department on Site Safety Matters

**(c) Drainage Services Department Circular Memorandum (DSDCM)**

Ref. No.	Title
9/97	Accidents Resulting in Death and/or Injury of DSD Staff While on Duty

**(d) Drainage Services Department Practice Notes (DSDPN)**

Ref. No.	Title
3/2012	Safety Supervision of Work in Confined Space

**(e) Civil Service Bureau Circular Memorandum (CSBCM)**

Ref. No.	Title
15/2008	Work Arrangement in Times of Tropical Cyclones and Rainstorms
6/2014	Occupational Safety and Health in Civil Service - Personal Safety at Work

**(f) Electrical and Mechanical Services Department Technical Circular (EMSDTC)**

Ref. No.	Title
6/2013	Reporting of Accidents and Safety-related Incidents

## Hazardous Substances Commonly Found in DSD Workplaces

### (a) Dust

Substance	Probable Activities
Cement	Masonry and plaster work
Man-made mineral fibre (MMMF)	Insulation work
Gypsum	Masonry and plaster work
Silica	Grit blasting of masonry, concrete scabbling, granite polishing, tunnelling in silicate rock, power cutting of furnace brickwork/liners.
Wood-dust	Carpentry

### (b) Fumes and gases

Substance	Probable Activities
Welding fumes	Welding, brazing, cutting
Sludge gas	Sewers, culverts, digesters
Hydrogen sulphide	Work at sewers, drains, excavations, digester tanks
Carbon dioxide	Bore-holes in chalk and limestone, welding in confined spaces
Carbon monoxide	Operation of LPG equipment, petrol or diesel plant in or close to confined spaces
Methane	Work at sewers, drains, excavations, digester tanks
Chlorine	Effluent disinfection

**(c) Inflammables**

Substance	Probable Activities
Correction fluid	General office work
Solvents, e.g. toluene, xylene in paints, lacquers, glues, strippers, thinners, etc.	Decorative applications
Mineral oil	Machinery lubricant agents, high voltage transformer insulation
Fossil fuel, e.g. diesel, petrol, LP gas etc.	Emergency generator
Epoxy Resin	Work using high strength adhesives for joining structure units, floor, tube and pipe coatings.

**(d) Infectious agents potentially present in raw domestic wastewater**

Organism	Probable Activities
Bacteria: Escherichia coli Legionella pneumophila Leptospira Salmonella typhi Shigella Vibrio cholerae Yersinia enterocolitica	Direct contact with raw wastewater
Viruses: Adenovirus Enteroviruses Hepatitis A Norovirus Reovirus Rotavirus	Direct contact with raw wastewater
Protozoa: Balantidium coli Cryptosporidium Entamoeba histolytica Giardia lamblia	Direct contact with raw wastewater

Helminths: Ascaris lumbricoides Enterobius vermicularis Fasciola hepatica Hymenolepis nana Taenia saginata T. solium Trichuris trichiura	Direct contact with raw wastewater
---	------------------------------------

### (e) Chemicals

All chemicals used in sewage treatment works and laboratory, if unknown, should be considered dangerous. The most common hazardous chemicals used in the sewage treatment works and laboratory are: -

Type of Chemical	Name of Chemical
Acid	Hydrochloric acid, Sulphuric acid, Nitric acid, Chromic acid, Phosphoric acid
Base	Sodium hydroxide, Potassium hydroxide, Ammonium hydroxide, Sodium carbonate, Sodium bicarbonate, Calcium hydroxide, Calcium oxide
Oxidizers	Potassium dichromate, Sodium thiosulphate, Calcium hypochlorite, Chlorine, Sodium persulfate
Others	Ferric chloride, sludge conditioning polymers, Sodium hypochlorite, sewage flocculation polymer, alkali impregnated activated carbon

## Useful Telephone Numbers and Websites

### (a) DSD In-house Safety Advisory Service

Org.	Officer Concerned	Tel. No.	Mobile Phone	Fax
SAU	Senior Engineer/Safety Adviser	2594 7181	9164 8116	2827 9352 3103 0008
	Engineer/Safety Adviser 1	2594 7183	9189 7616	2827 9352
	Engineer/Safety Adviser 2	2594 7182	9189 7198	2827 9352
	Senior Mechanical Inspector/Safety	2594 7186	9189 7617	2827 9352
	Inspector of Works/Safety	2594 7185	9189 7618	2827 9352

Email address of SAU: [SAU@dsd.gov.hk](mailto:SAU@dsd.gov.hk) (Internet)  
SAU/DSD/HKSARG (Lotus Notes)

### (b) Reporting of Serious Accidents (Ref: DSDTC No. 1/2019 and DSDCM No. 9/97)

Org.	Officer Concerned	Telephone No.	Mobile Phone	Fax
DEVB	Chief Information Officer, Secretarial Press Office (DEV)	3509 8330		2537 1877
	Senior Information Officer, Secretarial Press Office (DEV)	3509 7591	9049 3930	2537 1877
	Chief Assistant Secretary (Works) 5	3509 8335	9095 6875	2524 9308
ISD	Duty Officer (for reporting outside office hours)	2842 8745 2824 8748 2523 2721 (24 Hours)		2537 1540 2845 9078 2810 1721
LD	Occupational Safety and Health Branch (during office hours)	2815 0678		
	Hong Kong and Islands (outside office hours)		9495 8966	
	Kowloon Region (outside office hours)		9132 0344	
	New Territories (East) (outside office hours)		9132 0341	
	New Territories (West) (outside office hours)		9495 8967	
MD	Marine Industrial Safety Section (during office hours)	2852 4472 2852 4473 2852 4474		
	Vessel Traffic Centre (outside office hours)	2858 2163 (24 hours)		



DSD	Director of Drainage Services	2594 7001		2827 9477
	Deputy Director of Drainage Services	2594 7003		2827 9477
	Assistant Director/Electrical and Mechanical	2594 7009		2802 8194
	Assistant Director/Operations and Maintenance	2594 7005		2802 9006
	Assistant Director/Projects & Development	2594 7007		2802 8194
	Assistant Director/Sewage Services	2594 7068		2802 8194
	Technical Secretary/2	2594 7065	6279 7860	2827 8605
	Senior Engineer/Safety Adviser	2594 7181	9164 8116	3103 0008
	Engineer/Safety Adviser 1	2594 7183	9189 7616	2827 9352
	Engineer/Safety Adviser 2	2594 7182	9189 7198	2827 9352
	Assistant Departmental Secretary/Personnel (for accidents involving DSD Staff)	2594 7041		3103 0026

**(c) Enquiry Service Regarding Occupational Safety and Health Information**

Org.	Officer Concerned	Telephone No.	Mobile Phone	Fax
LD	Occupational Safety and Health Training Centre	2940 7064		2940 6251
	Safety and Health Advisory Telephone Service	2559 2297		2544 3497
	General Enquiries of Occupational Health Service	2852 4041		2544 3497
EMSD	Electrical Legislation Division (on matters relating to the Electricity Ordinance)	2882 8011		2895 4929
	General Legislation Division (on matters relating to Builder's Lifts and Tower Working Platforms)	2808 3867		2577 4901
MD	Marine Industrial Safety Section	2852 4472		2577 4901
FSD	Fire Protection Bureau	2733 7619		2723 2197
AMS	Operations and Training Division	2762 2020		2319 2149
OSHC	Occupational Safety and Health Information Centre	2739 9377		2739 9779
	Occupational Safety and Health Training Centre (North Point)	2311 3322		2368 9626
	Occupational Safety and Health Training Centre (Kwun Tong)	3106 2000		3106 0022

**(d) Useful Websites**

Org.	Website	Remarks
DEVB	<a href="http://www.devb.gov.hk">http://www.devb.gov.hk</a>	Access to the Development Bureau's (DEVB) Construction Site Safety Manual, technical circulars and other publications
LD	<a href="http://www.labour.gov.hk">http://www.labour.gov.hk</a>	Access to the Labour Department's (LD) guides to safety legislation, code of practice and safety guidelines, etc.
MD	<a href="http://www.mardep.gov.hk">http://www.mardep.gov.hk</a>	Access to Marine Department Notices, safety newsletters, etc.
EMSD	<a href="http://www.emsd.gov.hk">http://www.emsd.gov.hk</a>	Access to Code of Practice on Working near Electricity Supplies Lines, safety guidelines on electrical products and electrical installations
EPD	<a href="http://www.epd.gov.hk">http://www.epd.gov.hk</a>	Access to environmental legislations, standards and compliance guides
FSD	<a href="http://www.hkfsd.gov.hk">http://www.hkfsd.gov.hk</a>	Access to Fire Protection Notices, codes of practice, fire safety guidelines
HyD	<a href="http://www.hyd.gov.hk">http://www.hyd.gov.hk</a>	Access to Code of Practice of the Lighting, Signing and Guarding of Road Works, Guide to Trench Excavation, etc.
OSHC	<a href="http://www.oshc.org.hk">http://www.oshc.org.hk</a>	Access to the OSHC's safety information, safety promotional materials (e.g. leaflets, VCD) and safety training courses
CIC	<a href="http://www.hkcic.org">http://www.hkcic.org</a>	Access to CIC's safety guidelines on tower cranes, site vehicles and mobile plants, working in hot weather, lift shaft works, etc.
HKIC (CIC)	<a href="http://hkic.edu.hk">http://hkic.edu.hk</a> , or <a href="http://hkcic.org">http://hkcic.org</a>	Access to HKIC's safety training courses provided for the construction industry
DSD	<a href="http://www.dsd.gov.hk">http://www.dsd.gov.hk</a>	Access to the DSD's safety-related technical circulars, practice notes, etc.
	Departmental Portal (for DSD staff only)	Access to safety information including DSD Safety Manual, safety-related technical circulars, practice notes, accident statistics, etc.