

Health and Safety Manual For CEM Contractors

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CONTENTS

Part A Overview of the Safety Management System

- I. Introduction
- II. Highlights of the Safety Management Program
- III. Role and Responsibilities

Part B Project Safety Plan

- I. Project Details
- II. Construction Safety Management Program
- III. Safety Audit

Part C Safe Work Practice

Part A

Overview of the Safety Management System

Chapter	Title
I	Introduction
1	Structure of Health and Safety Manual
2	References
3	Purpose of the Manual
4	Scope of the Manual
5	Responsibility for the Manual
6	Definitions
II	Overview of the Safety Management program
1	Safety and Health policy
2	Planning
3	Implementation
4	Measuring and reviewing
5	Elements of a safety Plan
6	Selection of Labor
7	Site safety Inspection
8	Monthly Site Safety Meetings
9	Contractor's Monthly Reporting
10	Risk Assessment
11	Safety Auditing
12	Documents, Records and Control
III	Roles and Responsibilities
1	Safety Obligations of Contractors and Employees
2	Contractors Responsibilities
3	Supplier's personnel Responsibility
4	Owners Responsibility
5	Breach of Safety Obligations

I Introduction

CEM (The Owner) leads and organizes Contractors on all matters associated with the project including safety and health on site. Contractors shall comply with and ensure their Subcontractors follow the safety requirements of the Project and the Owners instruction on site safety.

The Owner considers that safety and a safe working environment are crucial for the success of the Project. Securing safety and health at work on a construction site requires full commitment and co-operation of everybody concerned.

This 'Health and Safety Manual' defines the duties and responsibilities on site safety of all Contractors employed by the Owner. Contractors shall ensure their employees and Sub-contractors comply with this Health and Safety Manual. This Manual recommends the ways and means to carry out work safely and effectively in order to achieve the objective of ensuring the safety and health on site. It outlines items such as safety organization, communication, monitoring, equipment, facilities, accident reporting and safety audit.

Site safety is a shared responsibility of the Owner, the Contractors, the Sub-Contractors and their employees. Every person is required to co-operate with other workers to take reasonable care for the safety and health of not only himself, but also of other persons who may be affected by his acts or omissions at work.

To encourage workers to take responsibility for their personal safety, the Owner or the Contractor or the Subcontractors should take disciplinary actions against workers who violate the safety requirements under this Health and Safety Manual or the statutory safety requirements. Such disciplinary actions include stop work order and immediate removal from site of non-compliant workers.

Any worker with poor site safety performance such as repeated breaches of the safety requirements or serious breaches leading to serious site accidents shall be removed from site immediately. Such worker shall under no circumstances be employed again on the Project.

1. Structure of the Safety Manual

Part A of the Manual provides an outline of the site health and safety management system. Major processes that the Contractors should perform are identified and an overview of CEM's Safety Management System as applied is given.

Part B of this Manual details each element of the management system. A description is given of the roles and responsibilities, required actions and the documentation required for the related processes.

Part C of this Manual describes the preferred methodology or safe working practice to be adopted when carrying out tasks for the contract.

2. References

2.1 This Safety Manual should be read in conjunction with:

- a) Macau laws and regulations on Safety and Health at work;
- b) Codes of Practice on construction safety and health issued by Labor Department of the Macau Special Administrative Region;
- c) *The road work traffic control and safety measures Handbook issued from DSAT*
- d) The safety requirements specified in the Contract.

2.2 The Owner and his representative are empowered under this Health and Safety Manual to give directions, either verbally or written on safety and health on site. The Contractors, the Sub contractor and their workers shall comply with all such reasonably practicable safety and health directions.

3. Purpose of the Manual

The Health and Safety Manual is prepared to provide guidance for The Owner and Contractors on the safety and health standards and preferred work practices to be used on site.

4. Scope of the Manual

This Health and Safety Manual provides relevant information and policies to assist the Contractor to ensure that his staff works within a safety-conscious and safety-regulated environment.

The Contractor is fully responsible for the safety and health of the Works, his personnel, subcontractors' personnel, the general public and all persons directly or indirectly associated with the Works or in the vicinity of the Site.

The Contractor shall comply with the requirements of the Safety Manual where the standards set out shall be regarded as the minimum to be achieved. Compliance with the set out in this manual shall not relieve the Contractor of any of his duties or his responsibilities under the Contract.

5. Responsibility for the Manual

This Safety Manual reflects the minimum safety requirements of the Project.

All Contractors are reminded of their obligations to observe the latest statutory regulations, best industry standards and guidance on construction safety and health. They should not solely rely on the information provided in the Manual.

6. Definitions

In this Health and Safety Manual, unless the context otherwise requires:-

“Contract” means the contract entered into between the Owner and the Contractors for the Project.

“Contractors” means Main Contractors and Sub- Contractors entered into contract with the Owner for the Project.

“The Owner” means Companhia de Electricidade de Macau - CEM, S.A

“Works” means the work or services to be constructed, completed, maintained and/or supplied in accordance with the Contract.

Words importing the singular only also include the plural and vice versa where the context requires.

II. Overview of the Safety Management Program

1. Safety and Health Policy

It is the policy of the Owner to make safety and health a top priority over all others in any circumstances. The Owner is committed to implementing and maintaining a high standard safety and health system to maintain a safe working environment by eliminating or controlling all hazards posing an unacceptable or undesirable risk.

Safety goals and targets have been set for Contractors as follows:

- 1.1 To ensure that the Project is constructed and commissioned in accordance with good safety practice.
- 1.2 To encourage an awareness of safety and health on site, and to create a positive safety culture amongst the Contractors.
- 1.3 To reduce risks on site, everybody should aim at:
 - a) Zero accidents;
 - b) Zero dangerous occurrences
 - c) Incident free environment.

2. Planning

Planning is the process of determining in advance what should be accomplished. The Contractor is required to define, document and endorse the safety and health objectives identified. At this stage, the Contractor shall prepare Contractor's Safety Plan, Method Statements, Risk Assessments and Emergency Plans for the Owner's endorsement.

3. Implementation

With a view to achieving the objectives set out above, the Owner shall:

- 3.1 Secure commitments to safe working practices by all Contractors involved in the project.
- 3.2 Develop contract provisions that require Contractors to prepare, implement and monitor safety plans, and ensure that all Sub-contractors are also obliged to comply with the same.

- 3.3 Ensure that various outputs from the planning stage are properly implemented and maintained, regular safety meetings between relevant parties from the Owner and Contractors should be held. The main objective of these meetings is to monitor site safety performance.
- 3.4 Promote and maintain safety awareness on site.
- 3.5 Oversee the safety performance of the Contractors to ensure their compliance with safety and health requirements under the Contract, this Manual and the safety legislation.

4. Measuring and Reviewing

Maintaining the safety system in an efficient and effective state is vital for the site safety performance. The Owner is required to measure and review whether the safety system is working well or needs improvement.

This process covers checking activities such as:

- a) Monitoring and checking the safety performance of Contractors and subcontractors via monthly reporting;
- b) Conducting regular site safety inspections to verify site safety conditions; achieving the objectives of the safety policy;
- c) Checking whether the safety and health arrangements in place are effective in obtaining the objectives of the safety policy;
- d) Accident reporting in the form of accident and incident investigation, determining the immediate causes of sub-standard performance or accident and identifying the underlying causes;
- e) Supervising rectification of non-compliance or sub-standard performance.

5. Elements of A Safety Plan

It is possible to eliminate or minimize work hazards by proper planning and design of the methods of construction, sequences of activities, coordination, etc. A safety plan must be submitted by all Contractors, *within seven (7) days after the confirmation of the Contract or one month before the commencement of work but depending on which circumstance occur first*, to the Owner for review and endorsement. Likewise, selected Sub-contractors shall submit to the Contractors a safety plan. The safety plan should state the ways and means to carry out work safely and effectively in order to achieve the objective of ensuring the safety and health on site.

The plan shall include the following elements:

- 5.1 A safety policy which states the commitment of the Contractors to safety and health at work.
- 5.2 A Structure to assure the implementation of the commitment to safety performance.
- 5.3 A program on training to equip site personnel with the knowledge to work safely and without risk to health.
- 5.4 In-house safety rules to provide instruction for achieving safety management objectives.
- 5.5 A program of inspections to identify hazardous conditions and for the rectification of any such conditions at regular intervals or as appropriate.
- 5.6 A program to identify hazardous exposure or the risk of such exposure to the workers and to provide suitable personal protective equipment as a last resort where engineering control methods are not feasible. Contractors are also responsible for developing a strategy for accident control and elimination of the hazards before exposing the workers to the potentially adverse working environment.
- 5.7 Risk assessment to identify potential safety hazards and health hazards for the Contract. The Contractor should include details of the risk assessment methodology in the safety plan for review.
- 5.8 Investigation of accidents or incidents to find out the cause of any accident or incident and to develop prompt arrangement to prevent recurrence.
- 5.9 Emergency preparedness to develop, communicate and execute plans prescribing the effective management of emergency situations.
- 5.10 Safety Committee.
- 5.11 Evaluation of job related hazards or potential hazards and development of safety procedures.

- 5.12 Promotion, development and maintenance of safety and health awareness in a workplace.
- 5.13 A program for accident control and elimination of hazards before exposing workers to any adverse work environment.
- 5.14 A program to protect workers from occupational health hazards.
- 5.15 Measures for governing the Subcontractors, compliance with the Contractor's safety plan.
- 5.16 The Contractor's disciplinary procedures with respect to safety and health related matters.
- 5.17 A checking program to secure conformity of safety performance and compliance of the Contractor's Safety Plan.

6. Selection of Labor

- 6.1 The Contractors in control of their premises shall take all reasonable and necessary measures in the selection of workers directly or indirectly employed for the Works.
- 6.2 The Owner requires the Contractors to complete a copy of "Certificate of Competency" attached in the Appendix for each newly employed worker where it indicates his/her competency of undertaking the task and the Safety Induction Training has been given by the Contractor before commencement of his/her task. *Compliance of this practice shall not relieve the Contractors from any statutory duties or responsibilities under the Contract.*
- 6.3 The Contractors shall forward the completed "Certificate of Competency" bearing the Contractors' company chop to the Owner for the worker's entry registration. The Owner will not proceed with the entry registration for workers without the "Certificate of Competency".

7. Site Safety Inspection

The Owner or his representative shall conduct formal weekly site inspections or as appropriate. For large projects and contracts considered to have a high hazard potential, or to be high profile, the Owner may formally inspect more often (e.g. twice per week or

even daily).

The following types of contract are considered to be high risk or high profile:

- Any contract where there has been an injury or dangerous occurrence or fatality;
- Any contract involving frequent work at height;
- Any contract involving frequent hot work;
- Any contract involving work in close proximity to the public.

The Owner will notify the Contractors of the schedule of the regular workplace inspections and this will enable the Contractors to arrange for appropriate representatives to attend the planned site safety inspections and to take all necessary follow-up action immediately. Additional to the regular workplace inspections, the Owner or his representative may carry out ad hoc safety inspections.

8. Monthly Site Safety Meetings

All Contractors shall attend the monthly site safety meetings or otherwise arranged. The objectives of the meetings are to:

- Monitor the adequacy of the Contractors' Safety Plans.
- Review the Contractors' training programs relating to the construction activities.
- Discuss the forthcoming construction activities and safety precautions.
- Review accident statistics and trends so as to identify unsafe practices and conditions, and to ensure the implementation of appropriate corrective actions.
- Promote safety and health activities on site.
- Oversee the conduct of safety audits and inspections, and subsequent correction actions.
- Present and discuss topical safety and health issues.

The Contractors should prepare the above safety information and submit the Contractors' Monthly Safety Reports (sample as shown in Appendix) to the Owner prior to the meeting.

9. Contractor's Monthly Reporting

Contractors are required to produce and submit the following information to the Owner not later than 5 days after the end of the month covered. The information required includes:

- Summary of major tasks to be carried out in the current month and coming two months.
- Summary of accident, accident trend and statistics, investigation report and preventive measures taken.
- Safety and Health related offence / notice (if any)
- Summary of safety training and safety program for next month

- Summary of safety officers/ supervisors/ first aiders/ safety representatives etc.
- Safety audit (if any)
- Risk assessment / method statement

Safety Promotion

- Summary of construction plant and lifting gear
- Summary of deficiencies in Weekly Safety Inspections
- Review Safety Plan and Emergency Procedures
- Site safety complaints (if any)

10. Risk Assessment

Potentially hazardous or unfavorable site conditions which will likely affect the safety of the workplace should be considered in the planning and design of the Project. After the identification of the hazardous exposure or the risk of such exposure to the workers, the Contractors should find out whether planned or existing safety precautions are sufficient to keep the risk under control and meet legal requirements. If the findings are negative, the Contractors should adopt engineering methods and safe systems of work to control the risk. Personal protective equipment should be regarded as the last resort.

Prior to the commencement of any work that is considered by the Owner to be high risk and/or high profile, Contractors shall produce risk assessments and the relevant method statement.

As a guideline, the following works are considered to be high risk or high profile and therefore risk assessment is required:

- Working at height
- Entry into confined space
- Use of hazardous substances
- Use of flammable substances
- Lifting operation
- Excavation
- Hot work
- Electrical installation and alterations
- Mechanical machinery erection, alterations and dismantling
- Erection, loading, unloading and dismantling of temporary works
- Exposure to excessive noise levels
- Demolition

Additional to the above-said list, the Owner may require risk assessment and method statement for other activities that are considered to be high risk or high profile.

11. Safety Auditing

An audit is a systematic examination to determine whether activities and related results conform to planned arrangements, and whether these arrangements are implemented effectively and are suitable for achieving the Owner's safety objectives.

11.1 Contractors shall conduct internal safety audits at an interval of not less than once during the contractual period. The scope of the audit covers the adequacy and effectiveness of the safety plan against statutory regulations and safety requirements under the Contract from the Owner.

A copy of the audit report will be forwarded to the Owner. The result of the audit will be discussed in the site safety meeting for reviewing the adequacy and effectiveness of the Contractor's safety management system.

11.2 The Owner will as appropriate perform safety audits on the effectiveness, efficiency and reliability of the Contractor's safety management system and the result of the audit will be discussed in the site safety meeting for continual improvement. The Owner may also conduct a joint safety audits with the contractor

12. Documents, Records and Control

All safety records related to the contract activities should be properly maintained and kept on site for inspection.

Safety records should cover the following information, but not limited to:

- Safety plan
- Competent persons
- All examination reports and test certificates for plant and equipment
- Records of safety training
- Records of safety inspection and audits
- Monthly safety meeting minutes
- Method statement and risk assessment
- Emergency plan and drills
- Accident / incident investigation report and statistics
- Permits-to-work
- PPE records
- Safe working procedures

- Safety improvement notices
- Health assessment checklist and preventive measures
- Fire prevention checklist and precaution actions
- Photographs
- Others

III Roles and Responsibilities

1. Safety Obligations of Contractors and Employees

1.1 General Duties of Contractors to their Direct or Indirect Employees

Contractors have a duty, as far as is reasonably practicable, to ensure the safety, health and welfare at work of their employees, particularly by:

- a) Providing and maintaining machinery, equipment etc. and systems of work that are safe and without risks to health;
- b) Arranging safe and healthy systems of use, handling, storage and transport of machinery, equipment or appliances and solid, liquid or gaseous natural or artificial substances;
- c) Providing necessary and adequate information, instruction, training and supervision on safety and health at work to strengthen the employees' safety knowledge;
- d) Maintaining any workplace under their control in a safe and healthy condition and; providing and maintaining safe means of access to and from the workplace;
- e) Providing and maintaining a safe and healthy working environment and have adequate facilities and arrangement for the welfare of employees whilst at work.

1.2 General Duties of Employees at Work

Employees' duties are:

- a) To take reasonable care for the safety and health of himself and others who may be affected by his actions or omissions at work;
- b) To co-operate with his employer or anyone else where it is necessary to enable them to comply with their statutory and contractual duties.
- c) To report any area that is not safe or not healthy to his immediate supervisor or Safety Officer.

2. Contractors Responsibilities

- (a) The Contractors are responsible for complying with all statutory regulations, contractual requirements and general duties on construction safety and health.
- (b) The Contractors are responsible for providing comprehensive safety plans for the review of the Owner and for subsequent implementation of measures detailed in the safety plans.
- (c) The Contractors are responsible for ensuring his employees and Subcontractors to comply with the safety plan.
- (d) The Contractors shall provide competent and sufficient number of first aiders and full-time safety officers/supervisors to carry out their safety and health duties on site throughout the Contract.
- (e) The Contractors should examine the safety plan and the risk assessments of construction activities to evaluate and control risk so as to avoid harm.
- (f) The Contractors are responsible for tackling the causes of risks at source, or if this is not possible, reducing and controlling the effects of risks by means aimed at protecting anyone at work who might be affected by the risks.
- (g) The Contractors must comply with the directions of the Owner or his representatives in relation to safety and health matters on site.
- (h) The Contractors are responsible for the provision of adequate safety personnel to carry out regular safety inspections, safety promotion, and safety checks, and to keep records of all such activities for inspection.
- (i) The Contractors are responsible for providing safety induction training to their new comers and appropriate safety training to all workers and supervisors on site and for keeping records of all such activities for inspection.
- (j) The Contractors are responsible for appointing competent workers and persons of all trades to carry out his Works.
 - i. Contractors are required to ensure their workers or persons directly or indirectly employed for his Works are competent to carry out their duties and to ensure the safety operation on the Site. Such as:
 - Competent worker and person to carry out operation and/or inspection of lifting appliances, gears and hoists;
 - Competent worker and person to carry out erection, alteration, dismantling and inspection of plant and machinery;

- Competent worker and person to carry out erection, alteration, dismantling and inspection of scaffolds;
 - Competent worker and person to carry out operation and inspection of excavations;
 - Competent worker and person to carry out hot work;
 - Competent person to regularly inspect and maintain electrical appliance.
 - Competent person to take up the duty of first aider and regularly inspect the content of first aid box;
 - Competent person to inspect air compressor;
 - Competent person to carry out risk assessment for confined space operations and competent worker to carry out such operations;
 - Competent worker and person to carry out installation, alteration, dismantling and inspection of electrical power supply;
 - Competent person to carry out banks man duties by giving signals to lifting operator, vehicle driver, excavation operator etc.;
 - Others subject to the Owners request.
- ii. The Contractors shall appoint a proven competent person to provide specific safety training to workers who fail to submit recognized certificates for such specific tasks.
- iii. The Contractors shall appoint competent worker or person with substantial training on safety at work and practical experience.
- iv. The Contractors shall complete for each newly employed person or competent worker / person a 'Certificate of Competency' form shown in Appendix. The Contractor should send a copy of the 'Certificate of Competency' form to the Owner for processing the worker's site entry registration.
- (k) The Contractors are responsible for organizing site safety committees.
- (l) The Contractors are responsible for reporting dangerous occurrences and accidents.
- (m) In case the Contractor's Safety Plan is not available for submission to the Owner within the specified period or has not fulfilled the Owner's requirements, the Contractor shall enforce all the safety and health rules and requirements stipulated on the Health and Safety Management Plan of the Owner.

3. Supplier's Personnel Responsibility

If the supplier's personnel have to enter into or stay on the Site (or both) to perform the supplier's obligations, the supplier shall ensure that all of his personnel:

- (a) Conform and comply with all the safety regulations and requirements imposed on the Site;
- (b) Leave that the Site in safe, clean and tidy state;
- (c) Complete the safety induction training held by the respective Contractors before commencing work at the Site.
- (d) Equip with any tools and equipment in good and safe working conditions in compliance with the relevant statutory regulations, or manufacturer's standards and any Owner standards relating to safety and health.
- (e) Ensure that any dangerous substances and/or hazardous materials brought onto the site are stored safely in compliance with the relevant statutory regulations, or manufacturer's standards and any Owner standards relating to safety and health.

4. The Owner's Responsibility

It is the duty of the Owner, so far as is reasonably practicable, to ensure the safety and health at work of the site personnel and others affected by the construction operations.

- (a) Instruct Contractors to comply with their contractual obligations.
- (b) Develop and maintain reasonable arrangements for monitoring Contractors' compliance with safety and health requirements.
- (c) Promote interest in and enthusiasm for safety and health matters throughout the Project.
- (d) Co-ordinate with the contractors to minimize conflicts and problems. Where an interaction problem exists, the Owner should take a positive role in ensuring that the general principles of prevention and protection are applied.
- (e) Communicate and share information with Contractors to secure their understanding and compliance with the safety and health requirements.
- (f) Report on a regular basis the safety performance of the Project and Contractors.

5. Breach of Safety Obligations

5.1 Contractors

The Contractors in control of the premises have the primary responsibility to provide and maintain a safe working condition and environment to the workers whilst at work. The Contractors who fail to comply with the general duties or safety requirements willfully and without reasonable excuse commit safety non-compliance and are liable to administrative charges in accordance with the list of applicable safety non-compliance. The Contractors will be instructed to immediately suspend the unsafe practice by the Owner.

5.2 Persons Employed

A person directly or indirectly associated with the Project who seriously or repeatedly fails to comply with the general duties or safety requirements commits safety non-compliance and will be subject to disciplinary actions such as to be removed from site without re-employment opportunity on the Project.

Part B

Project Safety Plan

Chapter	Title
I	Project Details
II	Health and Safety Management Plan
1.	Safety Organization
2.	Safety Training
3.	In-house Arrangements and Rules
4.	Safety Inspections
5.	Personal Protective Equipment (PPE)
6.	Accident / Incident Investigation
7.	Emergency Preparedness
8.	Evaluation and Control of Contractors
9.	Safety Committees
10.	Job Hazard Analysis
11.	Safety Promotion
12.	Health Assurance Program
13	Process Control Program
III	Safety Audit
1.	Purpose
2.	Intervals

I. Project Details

Project Title:

Description and Scope of Works:

II Health and Safety Management Plan

1. Safety Organization

Managing safety and health is an integral function of management. It is therefore important that this is reflected in the individual duties and responsibilities of every level of management within the organization. Likewise, it is important to ensure that the avoidance of accidents and the provision and maintenance of safe and healthy workplaces is a common objective throughout the organization, from directors to operatives. To this end, it should be made clear that the safety and health duties and responsibilities delegated to individuals are no less than important than the duties they may have in performing any other function.

2. Roles and Responsibilities

Project Manager

- 1) Is responsible for the management of safety and health matters relating to the works contracts managed by The Owner.
- 2) Delegates specific responsibilities to the project management staff for the day-to-day management of safety and health affairs.
- 3) Establishes and maintains a communication channel between himself/herself and the Safety officer.
- 4) Is responsible for the provision of support and resources required to maintain safe and healthy conditions for site activities.
- 5) Co-ordinates activities between contractors sub contractors and any other individual contractors who may be working on the site.
- 6) Ensures that non-compliance with the Safety and Health Policy and procedures is a disciplinary matter.
- 7) Reprimands staff members failing to do their safety duties to his satisfaction.
- 8) Is responsible for the effective implementation of the Safety Management System and the achievement of its objectives.
- 9) Ensures that Contractors allocate adequate resources to comply with their Safety Plans, The Owner's contractual provisions and statutory regulations regarding safety and health.

- 10) Checks over working methods and precautions with site management before work starts.
- 11) Ensures that work, once starts, is carried out as planned and that relevant safety requirements are observed on site.
- 12) Advises senior management levels on matters regarding safety and health that require their attention or resolution.
- 13) Participates in Site Safety Meetings.
- 14) Supervises and monitors the performance of safety personnel.
- 15) Is accountable for implementation and monitoring the Safety Management System.

Safety Officer

- 1) Assists in the implementation of the Safety Management System.
- 2) Identification of hazards and evaluation of risk at work on site.
- 3) Checks over working methods and precautions with site management and Contractors before work starts.
- 4) Advises on the development of the Safety Plan, the laying down of safety rules and appropriate measures for ensuring co-operation between Contractors.
- 5) Conducts site inspections to check safety performance and follow up corrective actions.
- 6) Investigates occupational accidents and incidents, and assess remedial measures to prevent recurrence.
- 7) Reports to the Project Manager on the implementation and progress of the Safety Plan.
- 9) Supervises his sub-ordinates to carry out day-to-day activities in safety and health respect.
- 10) Attends safety meetings as scheduled.
- 11) Ensures that work, once starts, is carried out as planned and that relevant safety requirements are observed on site.
- 12) Assists to resolve and follow-up with Contractor's on safety and health matters by observing local legislation (M44/91/M Construction Health and Safety Regulation).
- 13) Monitors the Contractor's safety performance and report the safety position to his seniors.

3. Safety Training

Training needs are likely to be greatest on recruitment. All newly employed personnel to the Site shall receive basic induction training by respective Contractors on safety and health, including safety at work, arrangement of first aid, fire and evacuation. *The induction training record forms an essential part of processing the site entry registration for newly employed personnel.* Training may be required even though a worker already holds sufficient experience. The Owner strongly believes that changes in a workers work environment may cause his/ her to be exposed to new or increased risks, requiring further training. The need for further training should be considered when there is a change in the work environment or systems of work in use. A significant change is likely to need a review and re-assessment of risks, which may indicate additional training needs.

The Owner proposes a safety-training program as follows:

a) Safety Induction Course

Contractors are required to conduct Safety Induction Course for every employee before they begin work on the project. The content of the course should include, but not limited to, the following subjects:

- Health and Safety Policy
- General Duties of Employees
- In-house Rules
- Procedures for Reporting Injuries
- Fire Emergency Procedures
- Use of Fire Extinguishers
- Working at Height including the exercise of the use of safety harness and fall arrester.
- Other hazardous works with their corresponding safety measures.
- Use of Personal Protective Equipment
- Permit to Work System(s)
- Foreseeable Hazards of the Site
- General Environmental Protection Rules on Construction Sites
- Site Layout and Welfare facilities.

b) Tool-Box Talks (TBT)

This type of training is to provide small group discussions about on-site safety issues between the Contractors' site supervisors and their workers in a 15-30 minutes training sessions during tea breaks. It is recommended to conduct a subject twice a week.

c) Specific Job Safety Training Courses

Contractors are required to prepare a safety training program in line with the project progress. The training should specify the hazards associated with the specific work and the precautionary measures recommended. The content of the training should be based on the relevant method statements and risk assessments.

These training are provided for the workers engaged in hazardous tasks, include but not limited to the following:

- Erection, alteration and dismantling of formwork;
- Working at height;
- Excavation works;
- Entry into confined spaces;
- Handling with dangerous substances;
- Manual lifting operation;
- Gas flame cutting and arc welding;
- Mechanical plant and machinery lifting operation.

d) Occupational Safety Card Training Courses

This safety training course is being organized by the Macau Labor Affairs Bureau, which intends to enforce attendance at these courses by anyone who will be assigned to work on a construction site. The Macau Government is aiming to make this safety training a statutory requirement.

The training will provide attendees with fundamental knowledge of local safety legislation and safe practices at workplaces.

The Owner fully supports this safety awareness-enhancing scheme.

4. Records and Evaluation

Contractors should establish an evaluation procedure to assess the effectiveness of the training program so as to make the training more meaningful and effective.

Contractors are required to have specific forms to record the attendance at safety training sessions. Contractors are responsible for maintaining and keeping the training records of all employees on site. A format for records is to be agreed with The Owner Safety Officers.

All the training records should be ready for checking when required by The Owner Safety Officers, who should be invited to participate in these training courses to evaluate the effectiveness.

5. In- House Arrangements and Rules

5.1 Contractors' Safety Plans

Contractors are required to compile their own safety plans for their tasks and areas of work. The safety plans should be submitted to the Owner for comments and endorsement.

5.2 Contractors' Method Statements

Contractors are required to prepare method statements for all work involving a high risk of accidents. The method statements should detail clearly every step in the work procedures. This will enable The Owner Site Supervisors to monitor the sequences of work.

5.3 Contractors' Risk Assessments

- 5.3.1 Risk Assessment is the evaluation of the chance that a hazard will cause harm, its potential severity, the identification of relevant factors and the establishment of measures to control or eliminate the risk.
- 5.3.2 Before carrying out any high-risk work, Contractors and the parties concerned are required to prepare a method statement, stating the sequences of the work process.
- 5.3.3 The risk assessment should be carried out by experienced and competent persons (i.e. engineers, site supervisors and safety personnel etc.) so as to make the assessment as comprehensive and accurate as possible.
- 5.3.4 The assessment team should determine the rating of the risks by assessing the frequency and consequences of the risks.
- 5.3.5 The risk assessment should also identify the necessary precautions to be taken, and formulate clear instructions on the risk assessment sheet for the personnel supervising and undertaking the work.
- 5.3.6 The risk assessment should be approved and endorsed by Contractors' senior project management personnel and then distributed to the parties concerned.
- 5.3.7 All the risk assessments should be continuously reviewed and up-dated where the process or working procedures have been changed.
- 5.3.8 The risk assessments should be used by the Contractors' Safety Officers/ Supervisors, as training materials on courses to be conducted for workers who will be engaged in the work.

5.3.9 Copies of risk assessments should be submitted to The Owner for reference prior to the commencement of the work.

5.4 Contractors' In-house Rules

5.4.1 In order to effectively control those malpractices, which may lead to injuries in the workplace, it is necessary for Contractors to stipulate specific in-house safety rules to ensure compliance with the required safety standards.

5.4.2 The stipulation of in-house safety rules is additional to the legal requirements. These rules are more specific and are designed to pinpoint the safety issues arising from actual activities.

5.4.3 Contractors are required to stipulate, but not be limited to, the following specialized work rules:

- General Safety Rules on Site
- Safety Rules for Operation of Bench Circular Saws
- Safety Rules for Use of Gas Cylinders
- Safety Rules for Electrical Welding
- Safety Rules for Use of Abrasive Wheels
- Safety Rules for Gas Welding and Cutting
- Safety Rules for Use of Drilling Machines
- Safety Rules for Working at Heights
- Safety Rules for Operations on Suspended Working Platforms -Permit-to- Work Systems.

These systems are designed to eliminate the risks and hazards involved in confined spaces, hot work and excavation etc.

- Safety Rules for Entry into Confined Spaces
- Safety Rules for Lifting Operations
- Safety Rules for Operating Mechanical Plant and Machinery
- Safety Rules for Construction, Maintenance and Dismantling Temporary Works

5.4.4 Safety Rules should be displayed at prominent places where potentially hazardous activities are carried out. This is to draw these to the attention of the persons involved and to make them aware of the safe practice.

5.4.5 Contractors' safety personnel are responsible for monitoring compliance with in-house rules.

6. CEM's Administrative Charges for Breach of Safety Obligations

An administrative charge system has been set up to strengthen the control of compliance with safety requirements by Contractors. The “Administrative Charges for Safety Non-compliance” is available on our website (<http://www.cem-macau.com/Download-Area>)

7. Safety Inspections

- 7.1 Contractors Safety Personnel are required to carry out a daily site safety inspection and record safety defects on a diary.
- 7.2 The Owner Safety Officer will prepare a schedule for safety inspections of all aspects of the Contractors' work. A Joint Site Safety Inspection with individual Contractors will be carried out once a week or as mutually agreed. Large contracts and contracts considered to have a high hazard potential or to be high profile, may be inspected more often. This is to identify potential hazards involved in their workplaces. The observed safety defects will be recorded on the inspection report.
- 7.3 The Owner Safety Officer will issue a Safety Improvement Notice (SIN) or the like in writing to the Contractor concerned for any unsafe practices observed. The Contractor is required to carry out corrective action accordingly.
- 7.4 The Contractor is required to reply The Owner safety officer in writing within the stated time-frame to show the corrective action taken.
- 7.5 If there is no response within the agreed time frame to the safety defects or the rectifying action stated in writing, the Contractor may be charged according to the items stated in the Administrative Charges for Safety Non-compliance list.
- 7.6 If the Contractor still neglects to carry out the rectifying action after being charged or further reminder either by written or verbal, The Owner will correct the unsafe condition by employing another party. The cost incurred will be charged to the account of the said Contractor. No claims of whatsoever nature in this respect shall be allowed.
- 7.7 Inspection of Plant and Equipment
 - 7.7.1 Contractors' competent person or safety personnel are required to check and keep a copy of the validity of test and examination certificates of the plant and equipment required by relevant safety legislation once they have been brought onto the site. The record should be made available for inspection.

- 7.7.2 Contractor is required to inform The Owner regarding the erection, alteration, dismantling, repair and maintenance of heavy plant and machinery such as tower crane, mobile crane, crawler crane, material / passenger hoist, jump lift and etc.
- 7.7.3 The Contractor in control of the premises has the primary responsibility to correct or remove all substandard equipment or facilities e.g. lifting gears, electrical items etc from the Site; otherwise, The Owner will correct the unsafe condition by all effective means including removal or discarding the item at the Contractor's expense. No claims of whatsoever nature in this respect shall be allowed.
- 7.8 When scaffolding or falsework is erected, a competent person should be nominated to conduct periodical inspections at least every 14 days or follow the safety clause as stipulated in the Contract / Owner requirements or immediately after alteration or adverse weather of these temporary structures to ensure its stability and in a safe working condition. The inspection results should be written on prescribed Form 13 and a copy should be displayed at the prominent position of the scaffolds or falsework.
- 7.9 Adequate preventive measures for protection of falling objects of any scaffold that may endanger to any site personnel should be provided and maintained such as installation of catch fan, installation of safety net, etc.
- 8. Personal Protective Equipment (PPE)**
- 8.1 Contractor should take all practicable measures to ensure his direct and indirect employees put on safety helmet while they are on site.
- 8.2 Contractor should require their site personnel to sign for the receipt of PPE issued to them.
- 8.3 Contractor should provide training on the proper use, storage, and maintenance of each type of PPE for their site personnel.
- 8.4 Contractor is responsible for providing suitable PPE for the use of their site personnel. The Contractor should keep sufficient stock of the suitable types of PPE on the work-site for his direct and indirect employees.
- 8.5 Visual inspection of PPE should be carried out frequently by the users themselves. It is the responsibility of the users to maintain this equipment in good condition. If any damage is found, they should ask for a replacement from their employers or Contractors.

8.6 Contractor's security guards at the main entrance to the site will give safety helmets to visitors before entering into the Site.

8.7 All the site personnel must abide by current legislation and in-house safety requirements for the required PPE on construction sites:

a) Safety Helmet

Personnel engaged in all activities within the site area must wear suitable safety helmets. The whole site is regarded as a hard hat area and *the wearing of safety helmet is therefore mandatory.*

b) Eye Protection

When carrying out tasks, which may cause injuries to eyes, suitable eye protectors must be worn.

c) Hearing Protection

Suitable ear muffs or earplugs must be worn when the sound level is at or above 85 dB (A).

d) Respiratory Protection

When grinding, cleaning, spraying, mixing or working with any material, which causes dust, fumes or vapors likely to be injurious to health, suitable respirators must be worn.

e) Fall Arrest Equipment

Where persons are exposed to risk of falling from height more than 2 meters and under a situation where the provision of suitable working platforms is impracticable, they must wear safety harnesses and these must be securely attached to suitable anchor points.

When there are no suitable anchor points, a fall-arrestor, which must be fitted to the deployed independent lifeline, must be used for the anchorage of the safety harnesses.

f) Safety Shoes

All personnel engaged in all activities within the site area must wear suitable

safety shoes. *The wearing of safety shoes is therefore mandatory. The wearing of sandals and canvas, sports shoes on the work-site areas is strictly prohibited.*

g) High Visibility Vest/ Clothes

All personnel engaged in all activities within the site area must put on suitable high visibility vest/ clothes.

- 8.8 The Owner may issue suitable PPE to the site workers who are exposed to the imminent danger of injury. The worker either directly or indirectly employed by the Contractor will be required to sign a receipt to confirm he has received the equipment. The Owner will then counter-charge to the Contractor of the costs of such PPE.
- 8.9 The Owner may impose the administrative charges to the Contractors concerned if their site personnel either directly or indirectly employed are found not using the PPE which have been issued to them.
- 8.10 The Owner prohibit sub-standard PPE brought onto the Site. Any sub-standard PPE will be immediately forfeited without any means of compensation.
The following should be implemented to prevent PPE brought onto site by workers.
1. Contractor's safety personnel should carry out regular inspections to check the whether worker's PPE meet the international standard.
 2. Training should be provided for subcontractors to remind them not to buy PPE which is below the international standard.

8.11 Standards (for reference only)

Item	Personal Protective Equipment	Approved Type/Relevant Safety Standard
1	Safety Helmet	<p>Relevant Safety Standard</p> <ol style="list-style-type: none"> 1. BS EN397 2. AS 1801-1981 3. DIN EN397 4. ANSI Z89.1-1986 5. CSA Z94.1 6. NF-S72-202 7. EN 397:1995 8. JIS T8131-1990 9. GB 2812-89
2	Eye Protection	<p>Approved Type</p> <ol style="list-style-type: none"> 1. BS2092 – Industrial Eye Protectors for general purposes. 2. BS1542 – Equipment for Eye and Neck Protection against Radiation arising during Welding and similar operations. 3. BS-679 – Filters for use during Welding and similar industrial operations. 4. BS1729 – Green Protective Spectacles and Screens for Steelwork operations. 5. AS1337 – Industrial Eye Protectors. 6. AS1338 – Protective Filters against Optical Radiation in Welding and allied operations. 7. ANSI Z87.1 – 1986 – American National Standard Practice for Occupational and Education Eye and Face Protection. 8. German Industrial Standard Specification DIN 58210 and DIN 58211 – Protective Goggles.

<p>3</p>	<p>Hearing Protection</p>	<p>Approved Type</p> <ol style="list-style-type: none"> 1. 3M 1100 / 3M 1110 Ear Plug 2. 3M 1200 Ear Plug 3. 3M 1210 Ear Plug 4. 3M 1220 Ear Plug 5. 3M 1230 Ear Plug 6. 3M 1400 Ear Plug 7. 3M 1410 Ear Plug 8. 3M 1420 Ear Plug 9. 3M 1450 Hard Hat Mounted Ear Muff 10. AO1720 Ear Muff 11. AO1776 Cap Mounted Ear Muff 12. AO Hear-Guard Ear Plug 13. AO Quiet Tips Ear Plug 14. AO Sound Out Ear Cap 15. Bilsom 202 Ear Plug 16. Bilsom 202S/202L Ear Plug 17. Other national safety standards.
<p>4</p>	<p>Respiratory Protection</p>	<p>Relevant Safety Standard</p> <ol style="list-style-type: none"> 1. EN136 2. EN137 EN139 3. EN140 4. EN141 EN142 5. EN143 6. EN145 7. EN146 8. EN149 EN405 9. EN12941 EN12942 10. NIOSH 42 CFR Part 84 ASTM F210-01 11. NFPA 1981 12. JIS T8151 JIS T8152 13. JIS T8153 14. JIS T8157 15. JIS T8160 16. JIS T8115 17. CAN/CSA Z94.4 18. CSA Z180.1

5	Safety Harness	<p>Relevant Safety Standard</p> <ol style="list-style-type: none"> 1. BS EN 361 (Full Body Harness) or other national safety standards. 2. BS 3367 (Safety Lines) or other national safety standards. 3. BS En 353 (Guided Type Fall Arresters) or other national safety standards. 4. BS En 360 (Retractable Type Fall Arresters) or other national safety Standards. 5. BS En 335 (Energy Absorbing Devices) or other national safety standards. 6. BS 1397 or other national safety standards.
6	Safety Shoes	<p>Relevant Safety Standard</p> <ol style="list-style-type: none"> 1. BS EN 345 2. BS En 346 3. BS EN 347 or other national safety standards.
7.	Gloves	<p>Relevant Safety Standard</p> <ol style="list-style-type: none"> 1. EN374-1 2. EN374-2 EN374-3 3. EN 388 EN 407 4. EN 420 5. ASTM D4679 6. ASTM D3578-01 7. ASTM D6319-00 8. ASTM D5250-00 9. JIS T8113 10. JIS T8114 11. JIS T8116 12. AS/NZS 2161.2 13. AS/NZS 2161.3 AS/NZS 2161.4 14. AS/NZS 2161.5 AS/NZS 2161.7 15. AS/NZS 2161.8

9. Accident / Incident Investigation

9.1 Objective

- (a) To ensure all accidents/incidents are reported speedily, so appropriate action(s) can be taken to minimize impact.
- (b) To conduct investigation so as identify the causes of the accident.
- (c) To implement improvement / preventive measures to avoid similar occurrence in the future.
- (d) To be used in critical task analysis and training need analysis in order to improve process control and training quality in future.

9.2 Definition of Reportable Accident

An accident is classified as a reportable accident if:

- (a) It has led to fatality; or
- (b) The victim is in critical condition; or
- (c) The media have arrived on site or have telephoned to ask for information concerning the accident; or
- (d) It will arouse public interest / concern in view of the damage / inconvenience that has been caused or its potential harm to workers and / or the public; or
- (e) The victim is not able to work more than three consecutive days.

9.3 Definition of Serious Incident:-

- (a) Any fracture, other than to the fingers, thumbs or toes; or
- (b) Any amputation; or
- (c) Dislocation of the shoulder, hip, knee or spine; or
- (d) Loss of sight (whether temporary or permanent); or
- (e) A chemical or hot metal burnt to the eye or any penetrating injury to the eye; or

- (f) Any injury caused by an electric shock or electrical burn (including any electrical burn caused by arcing to arcing products) leading to unconsciousness or requiring resuscitation or admittance to hospital for more than 24 hours.

9.4 Definition of Dangerous Occurrence

A Dangerous Occurrence (D.O.) is defined as follows:

- (a) The disintegration of a revolving vessel, wheel, grindstone or grinding wheel that is operated by mechanical power.
- (b) The collapse or failure of a lifting appliance (except the breakage of chain or rope slings) (“lifting appliance” includes crane, derrick, winch and hoist.)
- (c) An explosion or fire that – causes damage to the structure of any workplace, or to any plant or substance at a workplace; and prevents the continuation of ordinary work at the workplace.
- (d) An electrical short circuit or electrical failure of electrical plant that – Is followed by, or associated with, an explosion or fire; or Causes structural damage to the plant, Being a short circuit, failure, explosion, fire or damage that stops the operation of the plant or prevents it from being used.
- (e) An 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 gases.
- (f) A total or partial collapse of a roof, wall, floor, structure or foundation of premises where a workplace is located.
- (g) A total or partial collapse of any overburden, face tip or embankment within a quarry.
- (h) The overturning of, or a collision with any object by a bulldozer, dumper, excavator, grader, lorry or shovel loader;

9.5 Reporting of Incident or Accident or Dangerous Occurrence.

9.5.1 In the event of an incident / accident / serious accident / dangerous occurrence that occurs on the work-site, the concerned Contractor must immediately notify The Owner Safety Officer, who will join and assist the Contractor investigate the event.

9.5.2 In the event of any bodily injury involved, concerned Contractors shall

immediately report the accident to the local Labor Affairs Bureau in writing, The Owner, local police.

- 9.5.3 A preliminary written report of the accident/ incident shall be followed within 24 hours to the Owner's office.
- 9.5.4 A comprehensive written report of the accident/ incident shall be submitted to the Owner **within seven (7) working days**. The comprehensive report shall enclose location, date and time of the accident, nature and brief account of accident, details of injured / killed person(s), relevant sketches and / or photographs. The submission shall include a copy of the investigation report into the cause(s) of the accident, together with recommendations and action plan for preventing recurrence.
- 9.5.5 The Owner will review the comprehensive written report and the effectiveness of the site safety management system of the Contractor.
- 9.5.5 In the event of a serious accident/ incident or dangerous occurrence, the Owner will call for an ad hoc meeting with the presence of Contractor's project management and The Owner relevant personnel.

9.6 Accident Investigation Procedure

Obviously, every accident that occurs should be thoroughly investigated as soon as possible to determine causes and to implement corrective action to prevent recurrence. The major tasks are as follows:

- (a) Dangerous occurrences and accidents which result in death, serious injury or serious damage must be investigated immediately to find out the cause of the occurrence / accidents. The measures can then be formulated for prevention of any recurrence;
- (b) Near misses and minor accidents should also be recorded and investigated promptly as they signify the inadequacies of the safety management; and
- (c) Investigation should be conducted in an open and positive atmosphere that encourages the witnesses to express freely. The prime objective is to ascertain the facts with a view to prevent future and possibly more serious occurrences.

Reporting & Follow-up Action

- The Contractor shall report on the findings and immediate preventive measures to The Owner .

- CEM will circulate the relevant causes and the remedial action recommended to other Contractors on site and internally for as lesson learnt purpose;

9.7 Remedial Actions and Follow-up Actions

All remedial / follow-up actions as listed out on the investigation report are to be carried out to the full by Contractor's assigned personnel, checked for completion by a member of middle management and finally, cross checked by his Safety Officer for adequacy.

The personnel responsible for remedial action(s) will complete such action within time given on the follow-up checklist.

The Owner will ensure adequacy by carrying out follow-up inspection. The Owner will also review the up-dated situation with the Contractor before the expiry of any deadline given in the follow-up checklist.

The Contractor and his Safety Officer review uncompleted follow-up actions periodically to ensure full compliance. They are also responsible for the coordination among various areas or working parties to ensure smooth implementation of remedial works. The progress of remedial action will be discussed to all committee members over the Site Safety Committee Meeting.

Result of accident statistics, lesson learnt and recommendations, etc. will be communicated within the site by means of safety notice board, newsletters, monthly report, training and all other channels.

Contractor shall provide refresh safety training to the injured and/or involved personnel upon his/her return to work.

Contractor shall keep track of the health situation of the injured and report to The Owner accordingly.

9.8 Contractors are required to prepare accident statistics summaries on a monthly basis to analyze the accident trend on the project. The data used for analysis should include:

- Work trades
- Types of accidents
- Incident Frequency Rate (IFR)
- Incident Severity Rate (ISR)
- Days of incapability (absence days).
- Worked Hours
- Name of involved sub/ contractors

10. Emergency Preparedness

10.1 Emergency is hereby defined as fire breakout, collapse of temporary structure / plant and machinery, explosion, serious bodily injury, serious damage to utility service equipment, leakage of harmful chemical substances, tropical cyclones and heavy rainstorm.

10.2 Emergency situation means a situation occurred on site requiring emergency assistance of government services such as fire fighting services, police, ambulance etc, this situation include:

- a. An accident which results in death or serious injury;
- b. A fire breaking out which requires fire fight services to effect control;
- c. A flood that causes or threatens life on site;
- d. Leakage of dangerous goods or chemicals and gases;
- e. Any other accident / incident which creates a dangerous situation.

10.3 Emergency Coordinator

The Contractor should appoint his Project Manager as the emergency team leader and his Site Manager as the emergency coordinator. Their names and contact numbers should be clearly posted on the prominent places of the site.

Contractors should ensure their emergency coordinators are suitably trained to undertake their role effectively.

10.4 Emergency Response Team

All Contractors shall organize an individual emergency team to deal with the emergency procedures within their area of operation against fire / typhoon/ heavy rainstorm / serious accidents.

All Contractors shall appoint an emergency team (if not the same as the day-time's) to deal with the emergency at night and/ or after normal working hours.

The core members of each Emergency Response Team(s) would comprise of the following and shall be well-communicated to The Owner and all interested parties:

- Site Manager or Site Agent (Emergency Coordinator)
- Assistant Site Manager
- Site Supervisor
- Safety Officer

- First Aider

10.5 Emergency Procedures

10.5.1 Fire Evacuation Procedures

On hearing a fire alarm

- immediately check the working area for signs of fire.
- Alert your colleagues and be prepared to evacuate.

Action in case of fire

- Keep calm.
- Try to put out the fire by using fire extinguishers or fire hoses.
- If unsuccessful, leave the premises.
- Alert other site personnel.
- Dial 999 to call the Fire Services Department.
- Switch off all non-essential electrical appliances, except lighting.

10.5.2 Tropical Cyclones and Heavy Rainstorms

- When typhoon signal No. 1 is hoisted, all emergency crews will be alerted who will standby to undertake the precautionary measures identified on the checklists.
- When typhoon signal No. 3 or a heavy rainstorm warning is hoisted, Contractors' emergency teams should take the following actions:
 - Secure loose materials and equipment using ropes.
 - Secure site offices, site huts, hoarding using wire ropes.
 - Secure scaffolding, false work and temporary structures with adequate bracing, securely tied and removal of unnecessary loading..
 - Inspect and clean open channels, catch pits and drains to ensure efficient run off.
 - Place adequate de-watering equipment at excavated areas to avoid flooding
 - Provide extra protection to outdoor power distribution boards to prevent damage.

- When typhoon signal No. 8 is expected to be hoisted in the coming hours, Contractor shall take all reasonable and necessary measures to eliminate any foreseeable dangers incurred and carry out pre-event safety inspection with The Owner representatives. Contractors' emergency teams should further confirm the completion of the above actions and:
 - Move shift-loading machines to flat and upper areas.
 - Lower piling rigs and crane jibs to horizontal levels.
 - Release brakes of turntable of tower cranes to allow jibs to rotate freely.
 - For the sake of site personnel safety, evacuate all site personnel from the work-site immediately except members of the emergency teams.
 - Arrange the emergency team members to be present on site for duty.

- When typhoon signal No.8 is hoisted, the Site will be closed and no construction activities should be observed

10.5.3 Casualty Events

In order to enable site personnel to deal with a casualty efficiently, the following sequences are recommended to be included into Contractors' procedures for dealing with a casualty.

- Notify the respective Contractor's Site Agent immediately after seeing a casualty.
- Notify the first-aider to offer immediate treatment.
- Evacuate site personnel to a safe place if the scene is also dangerous to others.
- Call the relevant Government Departments or parties for assistance if the event involves other handling procedures.
- Notify the safety supervisor and The Owner Safety Officer to investigate the event.
- Assign a member of the site personnel to wait at the site entrance to direct the relevant vehicles and persons to the scene.
- Keep the incident scenes unchanged as far as possible, take photos and record all the relevant information for subsequent investigation.
- Assign a staff member to accompany the injured person to hospital and to notify his/her relatives. The staff member should keep in touch with the site agent regarding the latest situation of the injured person.

10.6 Post-event Follow-up Action

- 10.6.1 Upon the lowering of tropical cyclone warning No. 8 or following a black rainstorm warning, before the site re-opens, all emergency teams will carry out a thorough inspection within their area of operation and preparing reports, detailing damage to any permanent or temporary structures, plant, scaffolding, ladders or access that may adversely affect safety. All safety officers should ensure that arrangements are made for the affected areas to be made before re-opening those parts of the sites.
- 10.6.2 All Safety Officers/ Safety Supervisors should implement steady monitoring to ensure that the follow up action to be taken effectively.
- 10.6.3 The Contractors' inspection reports will be forwarded to The Owner for reference on the same day
- 10.6.4 The contractor will, taking account of the degree of damage caused by the event, coordinate with the Owner to decide the arrangements necessary to recover any losses from the work schedule.
- 10.6.5 If structural damage is identified, an independent surveyor will be called to carry out a detailed survey of the affected areas. No work is allowed to proceed in these areas until the remedial action required by the independent surveyor has been completed.
- 10.6.6 The Contractor will make his own decision to restart normal work if the damage is slight. He will arrange repair or replacement of any damaged items, ensuring that a safe working environment is reinstated.

10.7 Lightning Activity

If lightning activity is observed on site, the construction personnel should observe the following safety precautions:

- **Do Not** use plugged in electrical appliances;
- **Do Not** use landline telephones;
- **Do Not** use mobile phones;
- **Do Not** use/ touch aerials;
- **Do Not** handle flammable materials in open containers;
- **Do Not** touch metal pipes or ducts;
- **Do Not** touch water pipes;

- **Avoid** standing or walking in large accumulations of groundwater;
- **Stay** inside your vehicle if there is no shelter available; and
- **Avoid** standing close to or under the highest object in the area.

“No worker is allowed to work outside”

10.8 Strong Monsoon, Foggy or Low Visibility Weather

- In the event of strong monsoon or low visibility, Contractors shall prepare for facing such adverse weather and therefore, respective safety procedures shall be developed and implemented to ensure the working environment is safe, in particular the lifting operation at high levels, working at edge, etc.

10.9 First Aid Equipment

10.9.1 The first aid box will contain a first aid guide, sterilized unmediated dressings of various sizes, waterproof adhesive wound dressings of assorted sizes, triangular bandages, zinc oxide adhesive plaster, cotton wool pressure bandage, safety pins and eye baths and all the items shall be in sufficient amount. A list of items inside the first aid box shall be available to be checked, reviewed and refilled by the responsible.

10.9.2 Adequate number of first aid boxes will be provided by the Contractors at their work locations.

10.9.3 The contents of the first-aid box must be sufficient for its intended purpose.

10.9.4 Each first aid box will be placed in a clearly identifiable and accessible location.

10.9.5 Boxes will be constructed to protect contents from dampness, dust or other contamination and be clearly marked with red or green cross.

10.9.6 First aid boxes and kits will be inspected by the First Aider once a week to ensure they are kept fully stocked.

11. Evaluations and Control of Contractors

11.1. Contractors Pre Start Kick-off Meeting

- (a) Prior to the commencement of work or as soon as possible upon the Contractor on site, The Owner will together with site management hold ‘Contractors Pre

Start “Kick-off Meeting” with Contractor in-charge for the discussion of the safety issues.

- (b) The Contractor is required to appoint a competent representative for ensuring compliance of statutory regulations, contractual requirements and The Owner’s safety procedures. The representative is also responsible for coordination with The Owner and other Contractors in respect of safety matters and attends safety meetings.
- (c) All Contractors will be required to conform to the requirements of The Owner’s Health and Safety Manual that may be amended from time to time.

11.2. Control of Contractors

11.2.1 General Safety Requirements in Contracts

All contracts for Main Contractors and Selected Sub-contractors will include a section relating to general safety requirements in the contracts.

11.2.2 Monthly Safety Performance Assessment

Monthly “Contractor Safety Performance Assessment” will be conducted by The Owner against a checklist, which includes but not limited to:

- Total administrative charges of the month for infringement of safety requirements;
- Number of accident / incident of the month;
- Number of written safety improvement notice / correspondence.
- Safety promotion exercises such as safety morning briefing, display of safety notice/ poster, safety campaign, etc.

Project Manager of The Owner, will interview the Contractor in-charge due to unacceptable safety performance.

11.3. Monitoring on Accident Rate, Non-compliance and Prosecution

The Contractor Safety Officer will prepare monthly accident statistic of his responsible construction zone(s). Safety Manager will monitor the accident rate and accident severity of Contractor and report to the Project Manager of The Owner with summary report for disciplinary action when necessary.

The Owner’s Safety Officer will prepare monthly non-compliance of safety requirements and prosecution of his responsible construction site. Safety Manager will monitor the accident rate and accident severity of Contractor and report to the Project Manager of The Owner with summary report for disciplinary action when necessary.

11.4 Disciplinary

Contractors, subcontractors and individuals are subject to Site disciplinary systems. Disciplinary actions will be imposed according to the listed non-compliance of safety requirements. Money from the disciplinary system will only be used for promoting safety and health.

11.5 Method Statement proposed by Contractor

For high-risk work, Contractor should submit his method statement with safety concern to bring the attention of his line management as well as The Owner project management prior to commencement of work. The method statement and safety measures taken shall be communicated to all personnel involved.

11.6 Enforcement of Safety Disciplinary System

The Owner will implement a disciplinary system to Contractors on non-compliance to safety rule or statutory safety regulations or contractual safety requirement.

The aim of the system is to deter unsafe practices and to promote Contractors commitment on safety obligations on the Site.

Implementation

All Contractors have the prime consideration to ensure that all construction activities shall be conducted in such a manner as to eliminate or minimize or control risks to persons and property. In situations involving imminent danger, the Contractor has the primary responsibility to stop work until the unsafe conditions have been eliminated, or to remove any person disregarding safety from the Site.

If such breaches persist thereafter, The Owner may exercise its right to suspend any unsafe work until imminent hazard is eliminated, or remove any person disregarding safety from the Site. No claims of whatsoever nature in this respect shall be allowed.

The Owner will impose disciplinary actions in the following 5 different levels by issuing a written correspondence to the offending Contractor:

- (1) Verbal/written notice – First Time
- (2) Penalty letter – Second Time
- (3) Temporary suspension of Work
- (4) Termination of Contract

12. Safety Committees

The Site Safety Committees form a communication channel among The Owner, Contractors and Subcontractors. The safety representatives of Contractors and subcontractors take this opportunity to reflect situations to the Owner. Any safety problems will be raised for discussion during the meetings.

12.1. Contractors' Safety Committee

- 12.1.1 Contractors should establish a safety committee with their sub-contractors. The safety committees are recommended to hold meetings at least once a month or as appropriate to discuss safety issues with regard to their work.
- 12.1.2 The safety committee meetings will act as a two-way communication channel for Contractors to announce their safety strategies to and receive safety comments from their sub-contractors to improve the safety standards at their work stations.
- 12.1.3 The committee oversees all aspects of safety, including monitoring the implementation of safety plan, safety process design, safety promotion, review of accident / incident cases and safety training.
- 12.1.4 Contractor prepares a meeting agenda in advance and invites the The Owner's Safety Officer to participate in the meetings.
- 12.1.5 Contractor shall forward a copy of the meeting minutes to The Owner's Project Manager and Safety Officer for record.

12.2 The Owner Safety Committee

The Owner will hold monthly or as appropriate Site Safety Committee Meetings with Contractors throughout the duration of works contracts, with the following objectives:

- (a) To monitor the adequacy of the Contractor's Safety Plan.
- (b) To review emergency procedures.
- (c) To review accident trend and statistics so as to identify unsafe practices and conditions, and to ensure the implementation of suitable correction actions.
- (d) To review risk assessment / method statement submitted by Contractors.
- (e) To discuss Contractors' Monthly Safety Reports.
- (f) To promote safety and health activities.
- (g) To present and discuss topical safety issues.

The Composition of The Owner's Site Safety Committee will be:

- Project Manager of CEM (Chairperson)
- Safety Officer of The Owner
- Contractors' Project Managers / Site Managers
- Contractors' safety personnel

Minutes of the Site Safety Committee Meetings will be distributed to all attendees within ten working days of the meeting. One copy of the minutes will be posted at a prominent place on the Site.

13. Job Hazard Analysis

As an integral part of the Project accident prevention program, The Owner will exercise arrangements to ensure that all critical activities are subject to a formal assessment of risk prior to the commencement of individual operations. The control measures will be evaluated and monitored by the Contractors and The Owner's safety officer.

Arrangements for identification of potential hazards and assessment of safety and health risks associated with Works should be carried out by trained Contractor's safety personnel and competent persons involved in the work activity for the development of safe working procedures and method statements to ensure the satisfactory elimination, reduction or control of such risks before work starts.

A Job Hazard Analysis should:

1. Ensure that all relevant risks or hazards are addressed;
2. Address what actually happens in the work place or during the work activity;
3. Ensure that all groups of workers and others who might be affected are considered;
4. Identify groups of workers who might be particularly at risk;
5. Take account of existing control measures in place and the extent to which they control the risks.
6. Be used to develop safety rules, instruction and guideline that will be displayed in the workplace and used as a training material.
7. Be regularly reviewed to ensure that the risk control measures contained therein are suitable and relevant to the Works being undertaken;
8. Be recorded in writing and communicated to those supervising and carrying out the Works.
9. Be signed by Contractor's Project Manager or his authorized representative, Safety Officer, Engineer if any and other suitable personnel.

Classification of Risk

Severity Classification

Severity Factor	Severity Class	Description
1	Trivial	First aid. Does not result in one or more days off work Minor equipment or operational damage
2	Minor	Results in one or more days off work Damage requiring outside help or minor delay
3	Serious	Requires hospitalisation Damage preventing operations
4	Critical	Life threatening Major equipment or operational damage
5	Catastrophic	Fatalities Severe structural and/or environmental damage

Probability Classification

Probability Factor	Probability Class	Description
1	Highly Unlikely	May occur only in exceptional circumstances
2	Unlikely	Could occur at some time
3	Moderate	Might occur at some time
4	Likely	Will probably occur in most circumstances
5	Very Likely	Is expected to occur in most circumstances

Risk Ranking Matrix

Probability \ Severity	1	2	3	4	5
1	2	3	4	5	6
2	3	4	5	6	7
3	4	5	6	7	8
4	5	6	7	8	9
5	6	7	8	9	10

Risk Classification

Risk Class	Explanation
Low Risk (≤ 5)	These risks are considered acceptable. No additional controls are required unless they can be implemented at very low cost (in terms of time, money and effort).
Moderate Risk (6-7)	Hazardous non-routine tasks or routine tasks with high loss potential. Additional control measures should be implemented to reduce risk in a pre-defined period of time, as far as practical with consideration to cost and operational impacts.
Significant Risk (≥ 8)	Potentially disastrous or catastrophic operations. Activity cannot start or must be stopped until effective control measures lowering the risk to at least moderate level are implemented.

Hierarchy of controls

	Type of controls	Explanation and examples
1	Elimination	This is to <i>eliminate the hazard at its source</i> . Getting rid of a hazardous job, tool, process, machine or substance is perhaps the best way of protecting workers. For example, a salvage firm might decide to stop buying and cutting up scrapped bulk fuel tanks due to explosion hazards.
2	Substitution	This is to seek for proper <i>substitution</i> that is less hazardous. Sometimes doing the same work in a less hazardous way is possible. For example, a hazardous chemical can be replaced with a less hazardous one. Controls must protect workers from any new hazards that are created.
3	Engineering control	There are different types of engineering control that can be applied. Examples may be, but not limited to: <i>Redesign</i> - Jobs and processes can be reworked to make them safer. For example, containers can be made easier to hold and lift. <i>Isolation</i> - If a hazard cannot be eliminated or replaced, it can sometimes be isolated, contained or otherwise kept away from workers. For example, an insulated and air-conditioned control room can protect operators from a toxic chemical. <i>Automation</i> - Dangerous processes can be automated or mechanized. For example, automatic machines can handle some type of hazardous operations in a plant. <i>Barriers</i> - A hazard can be blocked before it reaches workers. For example, special curtains can prevent eye injuries from welding arc radiation. Proper equipment guarding will protect workers from contacting moving parts. <i>Absorption</i> - Baffles can block or absorb noise. Usually, further control keeps hazard away from workers, the more effective it is. <i>Dilution</i> - Some hazards can be diluted or dissipated. For example, ventilation systems can dilute toxic gases before they reach operators.

4	Administrative Controls	<p>There are different types of administrative control that can be applied. Examples may be, but not limited to:</p> <p><i>Procedures and work instructions</i> - Workers can be required to follow standardized safety practices as guidance to ensure that they follow the safety rules and precautions. Procedures and WI must be periodically reviewed and updated.</p> <p><i>Supervision and training</i> – Initial training on safe work procedures and refresher training should be organized. Appropriate supervision to assist workers in identifying possible hazards and evaluating work procedures.</p> <p><i>Job rotations</i> and other procedures can reduce the time that workers are exposed to a hazard. For example, workers can be rotated through jobs requiring repetitive tendon and muscle movements to prevent cumulative trauma injuries. Noisy processes can be scheduled when no one is in the workplace.</p> <p><i>Housekeeping, repair and maintenance programs</i> - Housekeeping includes cleaning, waste disposal and spill cleanup. Tools, equipment and machinery are less likely to cause injury if they are kept clean and well maintained.</p> <p><i>Hygiene</i> - Hygiene practices can reduce the risk of toxic materials being absorbed by workers or carried home to their families.</p>
5	Personal Protective Equipment	<p><i>Personal protective equipment (PPE)</i> is used when other controls measures are not feasible and where additional protection is needed. Workers should be able to use and maintain PPE properly.</p>

14. Safety Promotion

Safety promotion is a positive and constructive approach to raise safety awareness and developing a safety and health culture amongst all persons on the Site. The methods of promotion that are also applicable to all Contractors at their own expenses include:

- (a) The display of the company safety policy, accident statistics, safety signs and posters and the showing of safety videos and films.
- (b) Procedure for the selection of appropriate safety promotion items for displaying on site,
- (c) The conduct of talks, campaigns and distribution of safety bulletins or newsletters drawing attention to particular safety issues and emergency procedures, and
- (d) Procedure to recognize and commend those site personnel, teams, sub-contractors or Contractors with good safety performance.

14.1 Safety Banners and Posters

Safety banners and posters issued by the Labor Affairs Bureau Macao SAR or other appropriate sources shall be displayed as appropriate so as to enhance the safety awareness persons working on site.

14.2 Safety Notice Board

A safety notice board for the purpose of display safety information such as Contractor's safety policy (if applicable), emergency contacts and procedures, general safety rules, training program and so on, should be provided on site in a prominent location where the workers can see. The items displayed on the board will be maintained and reviewed at least once a month by the Contractor's safety personnel.

15. Health Assurance Program

15.1 Welfare Facilities for Workers

The Contractors arrange to provide welfare facilities for workers employed on the Works, irrespective of whether they are in the employment of the Contractor or his sub-contractors. The Contractor maintains the welfare facilities provided on the Site throughout the Contract, and removes the facilities and reinstates the areas after removal of the facility to upon completion of the Works where necessary.

The sufficiency of provision for the welfare facilities will be monitored and reviewed in the Contractor's Safety Committee meetings and/or The Owner's Site Safety Committee meetings. The Contractors replenish the insufficiency of provision to meet The Owner's requirements and will not be entitled to claim the cost of such replenishment.

15.2 Welfare Amenity Facilities

Contractors shall provide sufficient and suitable amenities for workers include arrangement for sanitation, washing facilities and storage of personal belongings such as clothing, safety helmets and etc.

(a) Storage Compartments

The Contractor provides storage compartments for use by workers. The storage compartment should be placed at a location close to the main site entrance to facilitate workers to obtain / place their personal protective equipment such as safety helmet, reflective vest, eye protectors, safety harness etc. when they enter or leave the Site.

(b) Drinking Water Facilities

The Contractors shall ensure the supply of drinking water available for workers working on the Site throughout the Contract. The Contractors are responsible for maintaining the drinking water facilities in clean and hygienic condition.

(c) Toilet Facilities

The Contractors must provide sufficient male and female toilet facilities for workers working on the Site throughout the Contract.

The Contractors must maintain the toilet facilities in clean and hygienic condition.

(d) Hand-wash Facilities

The Contractors must provide sufficient hand-wash facilities in the form of water points and sinks for workers working on the Site. The discharge from hand-wash facilities shall be collected to prevent spillage on the floor.

(e) Rubbish Bins

The Contractors must provide sufficient and suitable rubbish bins with covers at strategic locations on the Site for collection and disposal of general wastes generated by workers throughout the Contract. The rubbish bins should be provided in pairs, one for aluminum cans and plastic bottles and the other for general refuses. The locations for the rubbish bins in pairs should be placed at convenient locations close to the workers' workplace to facilitate use.

The Contractors must maintain the cleanliness of rubbish bins, and arrange collection and disposal of general waste inside the rubbish bins regularly, but in any case shall be *not less than once in every two days*.

15.3 Noise Control Practice on Site

- (a) Contractor's Safety Officer / Supervisor will undertake regular noise level surveys of respective area or activities suspected of generating excessive noise levels. A purpose of the survey is to identify which of the Contractor's employees or others are so exposed to the excessive noise. The surveys will be conducted using a calibrated industrial grade noise level meter. The results of the surveys will be recorded in a specific noise assessment form.
- (b) Protective hearing gear should be provided to workers exposing to noise level of 85dBA or more. To minimize the noise nuisance generated by construction works, it is important to use equipment, which has been effectively silenced. Wherever possible, the quietest alternative should be used.
- (c) In addition, it should be ensured that the equipment in use is the type most suitable for the job. The site supervisor should take necessary precaution and ensure that the

operations of all plant and work will not annoy any nearby noise sensitive receiver.

15.4 Prevention of Stagnant Water and Anti-mosquito Measures

In order to avoid infection diseases through mosquito bite e.g. dengue fever, Japanese Encephalitis, Contractors should implement effective measures to prevent accumulation of stagnant water within the Site to eliminate breeding of mosquitoes.

15.4.1 In carrying out prevention and control work against mosquito breeding, assigned staff should, as far as possible, remove all the potential breeding places that could be eliminated. The following can be noted as controls by environmental improvement;

- To tidy up premises/drainages/facilities and check for any accumulation of water at these places;
- To remove all unnecessary water collection and eliminate the sources;
- To change at least every week the water in flower vases and saucers of potted plants to prevent breeding of mosquitoes. The use of saucers should be avoided whenever possible;
- To properly cover all containers that holds water to prevent mosquitoes from accessing the water;
- To properly dispose of articles that are able to contain water such as cans and tires;
- To make large holes on tires used as anti-bumping measure in garage to prevent water trapping;
- To remove rain water in excavations and pits and/or to fill up with sand as appropriate.

15.4.2 Killing of Mosquito Larvae

Pesticide/Chemical should only be used for killing of mosquito in its breeding place or preventing its breeding only if the breeding sources or potential breeding grounds are inaccessible or could not be eliminated for the time being.

15.4.3 Further Control Measures

- (a) The Contractors identify the potential stagnant water areas on the Site, and to cooperate with The Owner's site supervisory staff that may point out from time to time locations on the Site, which may become potential mosquito breeding grounds, and to take prompt rectification action on such notification.
- (b) Contractor's Safety Officers should include the above checking mosquito control

and potential stagnant water areas into the checklist for weekly safety walks, and take prompt rectification action.

- (c) The Contractor should include as a standard agenda item on “effective control of mosquitoes and removal of stagnant water: in Site Safety Committee meetings to be reviewed the effort on mosquito control.
- (d) The Contractor’s Safety Officer develops and provides toolbox talk training to raise the awareness of dengue fever and mosquito control on site.

15.5 Rodent Prevention

- Contractors are required to provide litter bins with lids to prevent rodents from gaining access to these rubbish collection points.
- Rubbish should be removed regularly but *not less than once in every 2 days* to ensure the workplace is kept in a tidy condition.
- Rodenticide should be laid to kill mice at rest areas.
- Warning notices to draw workers’ attention should be displayed whenever rodenticide is laid.

15.6 Use and Control of Substances Hazardous to Health

15.6.1 The Contractor’s Safety Officer should carry out health risk assessment to identify the potential hazards associated with the hazardous substances and the necessary actions to be taken such as monitoring the exposure level, providing training, supervision and personal protective equipment or even making substitution where necessary. The suitability of the working environment should also be assessed.

15.6.2 The Contractor’s Safety Officer should review the health risk assessment every 6 months.

15.6.3 The Contractor’s Safety Officer should carry out health risk assessment with the provision of the Material Safety Data Sheet (MSDS). THE MSDS should contain the following items :

- The Contractor’s Safety Officer should carry out health risk assessment with the provision of the Material Safety Data Sheet (MSDS). THE MSDS should contain the following items : -The chemical identification / name used on the label.
- Physical and chemical characteristics of the hazardous chemical, boiling point, melting point, specific gravity, appearance and odour.
- Composition of substances: chemical names of constituents, proportions, impurities.
- Risks: chemical hazards, physical hazards, short and, on and term effects.

- Primary route of entry into the body: inhalation, skin contact, ingestion, and injection.
- Labeling, storage and package.
- Any generally applicable control measures other than PPE.
- Recommended PPE.
- Any special precautions for safe handling and use.
- Emergency and first aid procedures.
- Legal requirements.
- Sources of information and the preparation date of MSDS.
- The name, address and telephone number of the chemical manufacturer or supplier.

15.6.3 Workers involved in using hazardous substances should be trained in advance by the contractor, about the potential hazards, emergency procedures and precautionary measures.

15.6.4 Appropriate personal protective clothing as specified in the health risk assessment sheet should be provided to workers exposed to substances hazardous to health.

15.7 Controls

- (a) All dangerous goods and hazardous substances must be declared by the user before bringing into the site.
- (b) Hazardous substances assessment form will be used to identify level of potential harm and proposed control measures for all hazardous substances to be imported to site.
- (c) MSDS must be produced together with notice in advance.
- (d) A dangerous goods and hazardous material register will be maintained to trace and control quantity consumption of such material.
- (e) Emergency procedures should be established to deal with accidents such as spillage and accidental contact with substance.
- (f) First aid facilities should include those, which can serve this project.
- (g) Workers must be trained on health and hygiene frequently to ensure proper knowledge has been communicated. Sufficient information for all kinds of health and hygiene problems that may be encountered on this site must be included.

16. Process Control Program

- 16.1** This element aims at identifying construction safety and health risks and properly planning the work process to control those risks. An effective process control program requires a systematic approach to evaluating the whole work process.
- 16.2** Using this approach, the process design and technology, operational and maintenance activities and procedures, training programs, and other elements that impact on the process are all considered in the evaluation.
- 16.3** **Part C** of this Manual stipulates preferred safe work practices for some of the main processes. The methodologies therein are not intended to be exhaustive and will be reviewed and updated from time to time. *The methodologies shall be regarded as the minimum to be achieved and shall not relieve the Contractor of any of his contractual duties or responsibilities.*
- 16.4** Effective Safe System at Work or Permit-To-Work Systems should be launched for high-risk construction activities such as crane overlapping operations, work in confined spaces, hot work, etc. The Owner may require Contractors to exercise such systems for other activities that are considered to be high-risk or high-profile.
- 16.5** Contractors involved in the process operations should ensure site personnel understand and strictly follow a high standard of safety and health practice by establishing appropriate work instructions, implementing monitoring programs and conducting periodic inspection and auditing.
- 16.6** The Contractor in control of the premises has the primary responsibility to correct or remove all substandard equipment or facilities e.g. lifting gear, electrical items, etc from the Site; otherwise, The Owner *will correct the unsafe condition by all effective means including removal or discarding the item at the Contractor's expense. No claims of whatsoever nature in this respect shall be allowed.*

III Safety Audit

1. Purpose

To determine whether or not the Contractor's and The Owner's safety management system:

- Conform to the planned arrangements in safety and health respects;
- Have been properly implemented and maintained; and
- Are effective in achieving the safety objectives.

2. Intervals

- 2.1 Contractors shall conduct a regular Internal Safety Audit at least once during the contractual period and a copy of the report including score sheet shall be submitted to The Owner within twenty-eight (15) days after the completion of the internal safety audit.
- 2.2 In case the safety performance of a Selected Subcontractor(s) is not satisfactory to the Main Contractor, the Main Contractor has the right to request the concerned Subcontractor (s) to carry out an Internal Safety Audit to measure his compliance of safety requirements. A copy of the report including score sheet shall be made available to The Owner within twenty-eight (28) days after the completion of the audit.
- 2.3 If a fatality or serious accident or dangerous occurrence occurs, The Owner has the right to conduct an Independent Safety Audit by an outside safety consultant to assess the effectiveness of the site safety management of the concerned Contractor or Subcontractor at his own expense.
- 2.4 The Owner will regularly conduct safety audits on the effectiveness, efficiency and reliability of Contractor's safety management system and the result will be discussed in site safety meeting.
- 2.5 Upon The Owner's request, Contractor with unsatisfactory safety performance is required to carry out independent safety audit, at his own expense.

Part C

Safe Work Practice

1. Process Control Program

1.1 Piling

- The Safety Officer and Site Manager shall ensure that adjoining structures that may be affected by pile driving work are adequately supported. The secure and adequate temporary supports shall be provided and examined by competent person.
- The Site Manager shall ensure that:
 - Suitable PPE are provided to protect the rig operators signal-man and workers from falling objects, noise, etc.
 - The piling crew is fully instructed on their work.
- The Site Manager shall inspect the piling rig prior to starting work. Defects shall be immediately rectified before work may commence.
- All persons not involved in the supervision or operation of the piling rig and equipment or are not handling the piles are not permitted to access the piling area.
- Where piling rig or crane is to be driven on soft ground, suitable footing shall be provided such as steel plate or hardcore.
- When the piling rigs are not in use, the hammer shall be choked or lowered to the ground.
- The Safety Officer shall ensure that the noise due to piling operations does not exceed the levels 85 dBA. In case it exceeds the noise levels, the Safety Officer shall inform the Project Manager to ensure appropriate safety measures in place or re-planning of activities is undertaken to reduce noise levels.
- Warning signs and barricades are put up to prevent unauthorized entry into the pile zone.
- All piling machines will be inspected daily by a designated person before start of work and every defect will be immediately corrected before boring operation commences.
- Piling machines in good and safe condition will be operated only by competent and authorized person.
- The operator of every piling machine will be protected from falling objects by a substantial covering.
- Each member of the piling crew will be properly instructed in the work he is to do and the operation will be in the charge of a designated person, who will personally direct the work and give the operating signals.
- The preparation of the metal casings and reinforcement cages will be done at a safe distance from the boring operation. During the hoisting of metal casing/reinforcement cages, all persons not actually engaged in operating the equipment and handling the metal casing/reinforcement cages will be kept out of the area.
- Proper working platforms will be provided for workers hacking the piles.
- Pile hole must be securely covered with sound material.

1.2 Floor and wall openings and stairways

- a) Floor Openings
 - i) All floor openings, corners, breaks and edges through or from which a person is liable to fall a distance of more than 2 meters, must be securely covered or

provided with guard-rails of adequate strength to a height between 900 mm and 1150 mm.

- ii) Covers for holes must be securely fixed and clearly marked.
 - iii) Guard-rails and toe-boards can only be removed for the passage of materials or persons if it is the only means of access but they must be replaced as soon as possible.
- b) Wall openings
- i) All openings in walls, lift shaft etc. should be barricaded with toe-boards.
 - ii) Warning signs should be posted near all wall openings, lift shafts etc. to warn persons working in the vicinity.
- c) Stairs
- i) Adequate lighting should be provided to all stairways.
 - ii) Handrails or rope railing must be provided to all stairs in order to prevent persons from falling more than 2 meters.
 - iii) Stairs must be treated if they become slippery, with grit or a suitable non-slip coating.

1.3 Electricity

- (a) All electrical equipment should be inspected monthly by competent electrician and the results entered into the identified form before it is taken into use, to ensure that it is suitable for its proposed use.
- (b) Display the name and contact telephone number of registered electrician on the main switch box.
- (c) The wiring, switchgears and distribution boards should be properly fixed above ground and inaccessible to the general public.
- (d) The sheath of all portable electric cable shall be heavy-duty type or otherwise adequately protected against mechanical damage if laid on ground. They shall be hung overhead as far as possible.
- (e) When relevant, electrical cables should be adequately suspended to avoid them from lying on ground.
- (f) Electrical conductors and equipment should only be installed and repaired by competent electricians.
- (g) No work should be done on live conductors or equipment.
- (h) Before any work is begun on conductors or equipment that does not have to remain live:
 - The current should be switched off.
 - Adequate precautions should be taken to prevent the current from being switched on again.
 - The conductors or the equipment should be tested to ascertain that they are dead.
 - The conductors and equipment should be earthed.
 - In the vicinity of live parts there should be adequate protection against

accidental contact.

- (i) After work has been done on conductors and equipment, the current should only be switched on again on the orders of a competent person.
- (j) Procedures for electric shock handling and resuscitation should be posted on site.
- (k) Generator should be earthed and exhaust fumes discharged in a direction not to cause harm.
- (l) Examination by competent electrician should be made for the electrical equipment routine inspection.

1.4 Cranes

All crane operators must be trained and with proven experience.
All cranes and lifting gear must possess valid test certificates issued by a competent examiner.
A safety latch must be in place on crane hooks
Outriggers of cranes will be fully extended and rested on a flat and solid surface with a piece of “sleeper” in between before lifting operation
Suitable grillages will be used to support the legs of outriggers if the ground is in any way suspected
A shackle or a ring will be used to connect multiple slings to the hook of the crane, so as to let the weight of the object to be lifted be equally distributed along the slings.
A tag line will be tied to the object to be lifted to direct it into the position and prevent it from spinning
A trained person will be appointed to give signals to crane operators and carry out lifting operations
Automatic safe load indicator must be in good operation condition and examined by competent examiner.
Crane must be fitted with lights on the boom and jib head.
Effective anti-collision device and permit-to-work system will be imposed for tower cranes overlapping situations.
Sufficient and effective communication means must be provided to crane operator(s) and banksman.
Crane must be safely positioned and Contractor shall carry out a regular check for the crane sitting safely.

1.5 Lifting Gear & Appliances

- All lifting gear and appliances must possess valid test certificates issued by a competent examiner.
- All lifting gear and appliances will be marked with their safe working load.
- Lifting gear will be inspected every time before being put into use, ensuring that they are not damaged.
- Never use any unidentified lifting gear for lifting operations.
- Lifting operators and signalers shall be properly trained.

1.6 Portable Electric Tools

- Check that the electricity supply and the tool are of appropriate rating with the plug and socket.
- Before using a portable electric tool check to see if it is properly earthed, unless it is an approved type that does not require earthing.

- Before using an electric tool, make sure that the casing is undamaged. If it is damaged, don't use the tool.
- Make sure that all cables, plugs or connectors are of appropriate ratings suitable for the tools and are sound properly wired up.
- Ensure that switches are working smoothly and freely before connecting to the supply.
- Make sure that the power cable is long enough to reach your working place without straining it, and of sufficient size to prevent overloading and excessive volt drop.
- Keep power cables off the floor. They may get damaged or trip somebody.
- Never stand on a damp or wet surface when using electrical equipment, and keep the equipment clean and dry.
- Never connect a portable electric tool to a lighting socket.
- Never use worn, blunt or damaged bits or other accessories. **Disconnect tools when not in use**
- Electric power tools should be regularly inspected and maintained by a competent electrician or a competent person on a monthly basis and the results recorded.

1.7 Housekeeping

- The layout of material storage area, site offices, parking areas, etc. shall be planned in advance so as to afford safe access about the site for pedestrians, vehicles, and equipment.
- Keep working area free of unnecessary obstruction, place tools, materials, and equipment so that they do not cause hazards, and clean the work site every day when the daily work is finished. Small tools, nuts, bolts and fittings shall be kept in suitable containers. To prevent tripping hazards, electricity cables and welding hoses shall be placed out of walkways.
- Timber with protruding nails shall not be permitted anywhere on work site where it would cause a hazard.

1.8 Works in Confined Space

- The Safety Officer shall identify and evaluate hazards in the confined space.
- The Safety Officer shall take all practical steps to remove the hazards identified. Where the removal of such hazards is not possible, testing of the confined space shall be undertaken.
- The Oxygen level should be between 19.5% and 23.5%, level of flammable gas shall be within 10% of lower explosive limit and level of toxic substances shall be within the stipulated limits as per the Factories (Permissible Exposure Level of Toxic Substances) Order.
- Blowers/fans where required shall be installed to remove the toxic, flammable or oxygen-displacing gases and provide the confined space with ready supply of air throughout the operations.
- The Safety Officer shall ensure that effective steps have been taken to ensure that the conditions in the confined space are suitable for works.
- The Safety Officer shall then apply for a permit to work in confined space that shall be approved by the Site Manager.
- The Site Manager shall make arrangements to disengage affected service lines in the confined space.
- Upon verification that the site is safe to commence work, the Site Manager will issue the permit to

commence work.

- The Safety Officer shall identify and issue the suitable PPE (e.g. respirator, safety harness) to the workers.
- The Safety Officer shall arrange briefing on the rescue/emergency operation, the use of PPE and the safe work practice in the confined space.
- Warning signs shall be prominently displayed in the vicinity of the confined space work.
- The Safety Officer shall keep track of the identity and number of persons entering the confined space area.
- The Safety Officer shall appoint an attendant to be stationed outside the confined space. The attendant shall not be assigned other duties but to serve as a standby for rescue operation.
- The attendant shall be in constant contact (whether visual or speech) with the workers inside. In the event of emergency, the attendant shall immediately seek assistance and notify the Safety Officer.
- The workers shall observe the following rules while working in the confined spaces:
 - No smoking
 - Do not use defective electrical tools.
 - No consumption of food or drinks.
 - No smoking
 - Maintain communication with the attendant.
 - No resting in confined space.
 - Observe instructions stated in the permit-to-work.
 - Wear appropriate PPE.
 - Check the escape route.
- The Safety Officer shall ensure that emergency procedures and equipment are on standby at all times.
- The attendant shall be alert to detect difficulties encountered by the workers and seek assistance and notify the Safety Officer for emergency operation.
- The attendant shall not enter the confined space until help arrives, and then only with proper protective equipment.

1.9 Fire Extinguishers

- Fire extinguisher shall be placed as prescribed in applicable safety regulation. Fire extinguishers of an approved type and size shall be placed for use wherever flammable liquids are stored, transported or handled. They will be inspected and certified by local authorities regularly.

1.10 Ladders

- Ladder is solely used for access and egress, not for working station.
- Before use of the ladder, make sure the ladder is in good condition and free from defects.
- The ladder should be properly secured near the top or it should be footed near the bottom.
- Using the right length ladder for the job.
- Remember always face the ladder when climbing or descending.

- Defective ladders should be removed from service immediately and properly repair or destroy are required.
- Never lash two ladders together to make it longer.
- Ensure that the ladder rises at least 1 meter above the landing, unless there is suitable handhold at the place of landing.
- Ensure that no overhead power lines are in the vicinity when handling and using ladders.
- Never use a ladder that has been painted so that defects cannot be seen.
- Do not reach over sideways more than you can safely reach.

1.11 Overhead and underground services

- If any overhead and underground services will be involved for site activities, the following safe system of work should be applied:
- Check the Utilities drawings to see if any overhead power lines or underground services in the vicinity of works. If drawing not available, consult concerned utility company for assistance.
- Erect warning notice to distinguish the restriction.
- Identify and mark warning notice onto the underground cables or utility services to prevent accidentally damaged of such items.
- Before excavation or work locates the position of the cables, hand digging trial holes should be carried out.
- When site problems arise due to presence of utility services, contact their representative for diversion or temporary isolation.
- The location of all mains and services must be identified before carrying out any works involving breaking out or excavation etc. Particular attention must be paid to electricity cables, both underground and overhead, and also to gas mains. In addition, it is advisable to verify the given location of any main with trial holes before commencing other excavation works in the locality.
- Give instructions to the workers who will actually carry out the work in the vicinity of the overhead power lines or underground services.
- Safety supervisors should carry out closely inspection to ensure that the workers do above the instructions given.
- Competent person should be appointed in writing for detection of the buried underground utilities in advance before carrying out any excavation works. The cable detection report must be submitted to The Owner before works commencement.

1.12 Compressed Air Tools

- All receivers/compressors must be thoroughly examined by a competent examiner and hold valid certificates.
- Compressors

The compressor itself should always be under the supervision of a competent person who should be responsible for ensuring that the guards for the V-belt and pulley drive are in place and also for the regular inspection of the necessary hose and couplings.

- A check must also be made that the oil feed to the air line is properly topped up. Compressors

require adequate ventilation and special provision therefore needs to be made when compressors have to be sited in confined spaces.

- Air receivers must be marked with their safe working pressure and distinguishing number. They must also be fitted with a safety valve, pressure gauge, drain Air receivers must be cleaned and thoroughly examined regularly.

1.14 Hand Tools

- The handles of the hand tools should be regularly checked for splits or cracks and wedged where necessary to keep them tight. They should be of good quality plastic or well-seasonal ash or hickory, of smooth finish and firmly fixed.
- Any chisels or punches with mushroomed heads should be grounded.
- Make sure all cutting edges, teeth, etc., are adequately sheathed or suitable protected.
- Grease, moisture and dirt should be regularly cleaned off. Any moving and adjustable parts should be lightly oiled to protect against corrosion and to prevent wear and misalignment.
- Cutting edges should be kept sharp to permit accurate working and to avoid the hazards arising from unnecessary pressure.
- Tools should be regularly checked. They should be thoroughly examined before storage and, if worn or damaged, they should be properly repaired or discarded.
- All metal tools are conductors of electricity. Where work takes place on, or near electrical apparatus, only properly insulated and where appropriate, earth continuity should be tested at regular interval by a competent person. Switch off current if possible.
- Appropriate personal protective equipment such as eye protection, ear protectors and dust mask etc, are to be worn when circumstances require their use.

1.15 Protection Against Lightning

- If lightning activity is observed on site, no worker is allowed to work outside.
- It is desirable to erect a lightning rod and earthing to protect the open site during electrical storms. The lightning rod should be:
 - Designed by a competent person specialist to protect the whole work-site.
 - Higher than any extensions of crane booms.
 - Placed out of range of plant operation.

1.16 Cartridge Operated Power Tools

- Worker using tool must be properly trained.
- Check immediately that the tool is not loaded.
- Always load the gun with the barrel pointing in a safe position – away from yourself, and others.
- Never walk around the site with a loaded gun.
- Hold the tool to a right angle to the job when firing.

- Never place your hand over the barrel.
- The tool must not be fired in a place where flammable vapours or dust may create the risk of explosion.
- Stocks of cartridges must be stored in a damp proof and flame proof box or cupboard, which can be securely locked.
- Always be aware of the possibility of the pin being fired through the material into which it is being fixed. Carry out test first, to find the correct strength of cartridge. When such tests are being out, make sure that no one is allowed behind the material into which the pin is being fixed.
- Carry out routine maintenance and the replacement of worn parts that are interchangeable. However, all major repairs must be done by the manufacturer.
- Always wear head protection, eye protection and ear protection when using the tool.

1.17 Work at Height

- All working platforms and scaffolds shall be well designed and constructed by suitable and sound material of sufficient strength and properly maintained.
- All scaffolds shall be constructed, or substantially added to, altered or dismantled, by worker who are trained and experienced and under the supervision of a competent person.
- All scaffolds and working platform shall be inspected by competent person before use, after alteration, or exposure to weather conditions likely to affect its stability.
- All scaffolds and working platform shall be inspected by competent person at an interval every 14 days or follow the safety clause as stipulated in the Contract / Construction Manager requirements or immediately after alteration or adverse weather of these temporary structures to ensure its stability and in a safe working condition.
- Any open edges from which a person is liable to fall a vertical distance of more than 2 meters shall be protected by suitable fencing barriers of a height of between 900 and 1,150 mm.
- Intermediate guardrail at the height between 450mm and 600mm should be installed at any place on work on a working platform, gangway, run, or stairway.
- Toe-board or other similar barrier of not less than 200mm high should be installed at the edges of any place on work on a working platform, gangway, run, or stairway.
- Platforms, gangways or runs from any of which a person is liable to fall a vertical distance of more than 2 meters shall either be closely boarded, planked or plated.
- Every board or plank forming of a working platform shall be of sound construction, adequate strength and free from patent defect. Each board or plank shall be not less than 200 mm in width and not less than 25 mm in thickness or not less than 150 mm in width when the board or plank exceeds 50 mm in thickness.
- Every board or plank shall rest securely and evenly on its supports. No board or plank shall project beyond its support to a distance exceeding 150 mm unless it is sufficiently secured to prevent tipping.
- Any working platform from which a person is liable to fall a distance of more than 2 meters is at least 400 mm wide.
Any gangway or run from any part of which a person is liable to fall a distance of more than 2 meters shall be at least 400 mm wide if it is used for the passage of persons only. Its width shall

be extended to at least 650 mm wide if it used for the passage of materials.

- Workers working at height where erection of fencing barriers are impracticable shall be provided with suitable safety belts or harnesses and suitable and sufficient safe anchorage points or life line system for securing the safety of the workers. Safety netting shall also be used appropriate.
- Every person shall ensure no objects, including hand tools, timbers, scraps, material or the like, will or likely to fall from height.
- If it is impracticable to provide adequate guard rail or platform access conforming to the requirements listed, then safety nets can be erected or approved type safety belts can be used to prevent injury due to fall of persons.
- Safety nets can be temporarily removed for the access of persons or movement of materials for the purpose of the work but shall be replaced as soon as possible.
- If safety belts are used, suitable and sufficient anchorage fittings are to be provided.
- The safety nets and safety belts shall be properly maintained.

1.18 Protection against Falling Objects

- Adequate effective protection such as nylon mesh and catch-fans shall be provided to the entire building face against fall objects.
- Regular inspection should be carried out by appointed person to such protection measures.
- Procedure for erecting mesh and fans :
 - All nylon ties wire cables and other materials used in the scaffold shall be free of patent defects and of the required strength for their intended purposed to prevent falling objects.
 - Safety nets comprising of nylon mesh of minimum 15 core threads with grids not more than 12mm or similar shall be provided to cover the entire face of building. The safety nets to be tautly fixed with reasonable laps (450mm).

Catch fans at intervals of reasonable floors (First 10 m and every 20 m) are to be provided. The catch fan is to given a minimum horizontal coverage of 1500mm and to consist of galvanized metal sheeting 0.8mm (minimum) thick; otherwise, the design of catch fan must be approved by relevant consultant.
 - Dust sheets, tarpaulins, boards, etc. shall be provided where necessary to protect against the spread of dust and other nuisances to adjacent building and public.
 - A Permit-to-Work for precaution against falling object may be required upon the Construction Manager's request.
- Procedure for Dismantling of nylon mesh and fans.
 - Check the scaffolding is safe and secure prior to dismantling commencing.
 - Check all ties and tapes are properly fixed at joints.
 - Clear all debris and waste material.
 - Do not drop any objects.
 - Fence off the ground and display warning signs to alert persons not to come near the affected area.
- In the course of the construction, alteration and dismantling of nylon mesh and fans workers must wear protective equipment.

1.19. Protection of Public

- No unauthorized entry is allowed on site.
- The site entry shall be provided with gate and security guard to control the trespassing by persons and vehicles.
- The flashing warning light shall be installed at the entrance of the gate.
- Sufficient warnings and notices and signs shall be displayed at the entrance of the site to alert the public.
- Authorized visitors shall be provided with protective clothing including safety helmet and shall be accompanied by site representative whilst on site.
- If applicable, adequately protected pedestrian crossing or walkways must be constructed for use of the general public. These pedestrians crossing or walking must be clearly indicated.
- Cables, hoses that run across footpath or pavement must be adequately covered with timber nailed in position and ramps provided on both sides.
Warning sign to the effect that the walkway is uneven must be displayed at conspicuous places to draw the attention of the pedestrians using the walkway.
- Where appropriate, adequately lighting lamp must be provided at hoarding and barriers. Light bulbs must be adequately protected from breakage and should be replaced once damaged.
- Where appropriate, the voltage for lighting is suggested to reduce to low voltage and all electrical fittings must be adequately bonded to earth.
- Where it is necessary for loads to be swing across pavement, walkway of other public thoroughfare banksmen must be available to stop the approach of the public during the operation.
- Banksmen must be available to stop and direct the pedestrians and traffic to permit vehicle entering or going out of the site.

1.20 Flammable Liquids and Gases General

- Naked flames, welding and heating troches or smoking materials should be prohibited in any area where highly flammable liquids are present.
- Any spillage should be soaked up by dry earth, sand or properly absorbents.
- Drip trays should be used to catch any spillage.
- Adequate ventilation shall be ensured at highly flammable liquid storage areas.
- Adequate fire extinguisher shall be readily available where flammable liquids or gases are present.
- “NO-SMOKING” sign signs shall be displayed.
- No exceed quantities of flammable liquids or gases shall be stocked.
- No flammable liquids or gases shall be allowed in confined space.
- Inspection and maintenance are required on weekly basis.

- **Acetylene Gas Bottles Handling**

- Always handle cylinders with care and do not throw them or bump them heavily.
- Do not rest material on cylinders, especially when welding or cutting.
- Always keep cylinders in an upright position.
- Store cylinders (full or empty) in a cool place not in the sun or near a hot surface or anything giving off heat.
- Always open cylinder valves very slowly.
- Always close the cylinder valve when the job is complete.
- Keep regulators, tubes and blowpipes in perfect condition.
- Use a regulator with gauges fitted and they are in proper working order.
- Ensure suitable flash back arrestors are installed on regulator so as to prevent accident caused by backfire.
- Correct type of fire extinguishers shall be available at work site when hot work in progress.
- Compressed gas cylinder shall only be lifted by lifting cage or by trolley.
- If an acetylene cylinder is heated accidentally or becomes hot through severe flashback or other cause, action should be taken promptly in the following manner:
 - ◁ Shut the cylinder valve.
 - ◁ Clear all personnel from the area.
 - ◁ Cool the cylinder with a copious supply of water from a fire hydrant.
 - ◁ The person directing the fire hose should be protected by some suitable shelter.
 - ◁ Continue cooling the cylinder with copious quantities of water until it is quite cool. This may be determined by removing the cooling water at intervals and watching whether the water on the cylinder dries off, or whether the cylinder remains wet.
 - ◁ Notify the supplier and emergency crew if necessary.

1.21 Roadwork

- All roadwork shall minimize the inconvenience and potential hazard to all road users.
- All persons working on or near the carriageway shall wear high visibility reflective jackets.
- Sufficient numbers of lighting; signing and guarding shall be prepared and placed.
- If it is applicable, valid road permit shall be obtained and copies shall be available on site.
- Where the length of control ex. 15 M but not ex. 30M shall use portable light or GO/STOP signs.
- Where the length of control exceeds 30 M shall use portable traffic light signals.
- Interlocked guarding shall be provided where necessary for protection of pedestrians.
- Flasher lamps shall be placed to the height of 1.2 M.
- Automatic reversing warning indicators should be fitted on all road working vehicles and machines.
- Workers should be instructed of the use of thermoplastic substances and bituminous materials supplied and used in hot form.

1.22 Health and Safety in Office

- All sites offices, depot and stores shall be provided with adequate lighting and ventilation.
- All electricity installations shall be in charge of a licensed electrician and inspected at regular intervals.
- Properly signed safe access from site entrance to site office shall be provided.
- All steps, stairs and floors in the office shall be maintained in good condition and free from tripping hazard.
- Adequate signed fire-fighting equipment; fire exit signs and emergency escape route shall be provided.
- Planned fire drill and evacuation shall be practiced in connection with emergency program.

1.23 Excavation

- Site manager shall obtain all utility drawings from utility companies, consider suitable work methods and the work.
- Before excavation begins on any site, the stability of the ground should be assessed and verified.
- Before work begins on any excavation, the position of all underground services such as sewers, gas pipe, water pipe and electric cables that may cause danger during the work must be identified.
- Trial holes shall be done whenever necessary.
- Gas, water, electrical and other public utility should be shut off or disconnected if necessary to prevent danger.
- If underground pipes, conductor etc. cannot be removed or disconnected, they should be fenced, hung up or otherwise protected.
- Excavations should be examined by a competent person at a regular interval to ensure the soil stability.
- Sides of excavation should be thoroughly inspected by a competent person:
 - After an interruption in work of more than one day;
 - After an unexpected fall of ground;
 - After substantial damage to supports;
 - After heavy rain or storm
- Safe means of access and egress should be provided to every place where persons are employed in excavations.
- No person, plant and equipment should work on loose ground if the slope is too steep to ensure

a safe foothold.

- No ground should be undermined without adequate support.
- When loose masses or large boulders and rocks are encountered they should be removed as soon as practicable from above; and workers should leave and kept out of the danger zone until it is safe to return.
- Where persons are working at different levels, adequate means should be provided to prevent persons below from being struck by tools or other objects falling from above.
- As far as practicable, excavation should be kept free from water and effectively protected with tarpaulin.
- When internal combustion engines are operated in an excavation, steps should be taken to avoid the accumulation of dangerous gases by providing exhaust scrubbers, improved ventilation or other effective means.
- Suitable barriers should be erected as closed as practicable to the edge of the excavation. These barriers should be provided such that they may not fall into the excavation causing danger to the person below.
- No load, plant or equipment should be placed or moved near the edge of any excavation where it would be likely to cause a collapse of the size of the excavation and thereby endanger any person.
- Ladder should extend from the bottom of the excavation to at least 1 meter above the ground with suitable landings.
- All struts, braces and walling in excavations should be adequately secured so as to prevent their accident displacement
- Temporary sheet piling installed for the construction of a retaining wall should not be removed until the wall has attained its full strength.
- It must ensure no person is working below when filling of material by machine.

1.24 Manual Handling

- Mechanized method shall be planned for material handling tasks as far as possible.
- Project Safety Officer or competent person appointed shall conduct manual handling assessments. This includes if 10 or more employees are normally employed at a workplace at any time to undertake manual handling operations, safety officer will be appointed as competent person for carrying out the manual handling assessment and monitor the carrying out of preventive and protective measures.
- The weight to be lifted must be within the lifting capacity of the individual worker.
- Ensure the lifting and lowering areas are clear of tripping hazards and likewise check the route over which the load is to be carried.
- One person should give directions during lifting, carrying and loading in team lifting.
- The feet shall be positioned about a hip's width apart, one foot slightly in front of the other to maintain a comfortable balance of the body.
- The back should be straight from hips to shoulder.
- Arms should be close to body and well tucked in to provide maximum support the load.
- The load should be tilted with hands not fingers.

- The load should be lifted by straightening the legs so that the body and load move upwards in unison
- All movement should be smooth and natural. Jerking, twisting and straining movements should be avoided.

1.25 Temporary Works

- Where relevant, a method statement shall be prepared by competent person for temporary work including but not limited to formwork and false work.
- Temporary work coordinator of competent knowledge shall be appointed to supervise temporary work.
- When necessary, design, erection, installation, loading and unloading of temporary works shall be checked and certified by a professional engineer.
- Basic guidance for temporary works are:
 - Component of temporary work erection shall be of sound material
 - Works shall be carried out by competent workers
 - Works shall be carried out according to method statement and supervised
 - Safe means of access and egress shall be provided including for those to inspect the temporary work. Where relevant, suitable guardrails shall be provided
 - Follow the control measures and safe system of work as a result of Risk Assessment
 - Temporary work structure shall be checked by technical competent persons on daily and weekly basis. The safety checklist must be endorsed by a professional Engineer to suit the live site situation.

1.26 Structural Steel Erection

- Major hazards of structural steel erection are fall from height, falling of objects and instability of structure during erection so that risk assessment shall be conducted so as to recommend control measures.
- Safety consideration shall be given at design stage and a method statement shall be prepared.
- Identify the erection sequence and ensure safe means of access and working places;
- Identify the lifting points and loading of components for safety handling, lifting, storing, stacking and transportation of components;
- Consider the ground bearing capacity and existing underground services;
- Provide and use appropriate type of plant and equipment as specified in method statement;
- Work shall be supervised;
- Work team involved in structural steel work shall be informed about the sequence of work and method statement.
- Suitable storage areas for components waiting for erection shall be provided.

1.27 Welding Operation

- No welding or cutting operation should be allowed near places where combustible material are stored, or near material or plant where explosive or flammable dust, gases or vapor are likely to be present or given off.
- Combustible materials and structure that cannot be removed from the vicinity of welding operations should be shielded or protected by other suitable means.
- Welders should wear fire-resistant protective clothing, helmets and goggles with suitable filter lenses.
- Welders should wear clothing that is free from grease, oil and other flammable material.
- Workers when removing excess metal, slag, etc. should wear suitable personal protective equipment; chip away from the body; and ensure that other person are not struck by chips.
- Adequate precautions such as welding screen should be taken to protect persons working or passing near welding operations from dangerous sparks and radiation.
- Suitable fire extinguisher should be kept ready for immediate use at places where welding is done.
- When welding and cutting operations are carried out in confined space, adequate ventilation by means of exhaust fans or forced draught should be constantly provided.
- Electrode conductors or cables should not be excessive in length.
- Return conductors should be taken directly to the work and securely connected mechanically to it or to the work bench, floor, etc.
- Frames of arc-welding machines should be effectively earthed.
- In hand-operated arc-welding machines, cables and cable connectors used in arc-welding circuits should be effectively insulated on the supply side.
- The outer surface of electrode holders of hand-operated arc-welding machines, including the jaw should be effectively insulated.
- When lengths of cable have to be jointed, only insulated connectors should be used, on both the earth line and the electrode holder line.
- Welding circuits should be switched off when not in use.
- Electrodes should only be inserted in the holder with insulating means such as insulating gloves.
- No person shall carry out welding with wet body or welding in wet.

1.28 Site Traffic and Site Transport

- Operators should be experienced and licensed drivers regardless of whether they are operating on or off, on trained if for special type of vehicle.
- When the driver leaves the driving seat, the engine of the vehicle or machine shall be switched off, the gear engaged and parking brakes applied.
- Vehicle or machine should only be backed under the direction of a trained banksman. In dumping areas, the banksman should be identified by a reflecting jacket.
- Vehicle or machine regularly used for transportation of personnel, but not designed for the purpose, shall be provided with safe seating, and side and end protection to prevent falls.
- All site vehicles and transports shall be well maintained in a safe working condition.
- The outdoor speed limit for all vehicles on site is 8 Km per hour. Sufficient numbers of speed

limit signs shall be displayed at site entrances and along vehicle access.

- Vehicle accesses shall be of sufficient width to allow the passages.
- Where appropriate, mirrors shall be provided at corners and maintained properly.
- No vehicle or machine, except approved by the Main Contractor or The Owner, shall be operated in any building or structure.
- Vehicle or machine must keep the headlights on and be equipped with sufficient warning signals when in operation indoor.
- Sufficient signing, lighting and guarding shall be provided for work to be carried out along vehicle access.
- Workers work along vehicle access shall wear reflective clothing.
- All vehicles shall use low gear when running down inclined road.
- Where appropriate, wheel washing bay shall be provided for moving mud prior to going onto public access.
- All vehicles and transports shall be parked at designated areas so those site roads specially emergency escape routes are not obstructed.
- Reversing audible warning shall be equipped to all site vehicles and transports.
- No motor cycle or bicycle is permitted for any transportation means on the Site.
- **No driver who is under the influence of alcoholic drinks or the like substances is permitted to operate a vehicle or plant on the Site. Otherwise, he/she will be removed from the Site immediately and will not be allowed to re-enter the Site.**

1.29 Wood working Machines

- Woodworking machine must not be used by anyone who has not received training or instruction.
- No person under eighteen years of age shall be employed on any woodworking machine.
- Woodworking machine shall be maintained in good condition.
- The working area shall be kept clean, free from obstruction.
- Finished products shall be stacked properly.
- Safety devices must be provided and used properly.
- Power must be switched off during repair or inspection.
- No smoking shall be allowed in woodworking area and suitable fire extinguishers shall be readily available.
- The following safety devices must be provided and safety regulations should be observed where a circular saw is used:

Adjustable Top Guard

- ◁ The guard made of stiff sheet metal and normally is semi-circular
- ◁ The guard shall be adjustable to various levels to suit the thickness of wood
- ◁ Proper adjustment of the guard must be made before work is started so that the wood may just past underneath it.

In the event of the operator slipping, the guard shall be able to prevent his body coming in contact with the saw teeth. ◁ Adjustment of the guard shall only be made whilst the saw is at rest.

Riving Knife

- ◁ The riving knife shall be fixed that the distance between the knife and the saw teeth is

no less than 3 millimeters and not more than 12 millimeters.

- ◁ The bolts or studs for securing the knife should be properly tightened to prevent being pulled out against the revolving saw and caused damaged.

Under Bench Plate

- ◁ This plate shall be installed to prevent workers from being hurt by the saw when removing sawdust.
- ◁ The sheet metal used for guarding each side of the saw should not more than 150 mm apart.
- ◁ The bottom side should be at least 50 mm lower than the saw teeth.

Push-sticks

- ◁ Operators to prevent the hands from being too closed to the saw shall use push sticks.

Emergency Stop switch

- ◁ An efficient stopping switch shall be provided and be readily and conveniently operated by the person in charge of the machine

1.30 Abrasive Wheels

- Check the speed of the spindle of the machine does not exceed the maximum permissible speed of the wheel as specified by the manufacture.
- All mounting of wheels must only be done by competent persons appointed in writing and subject to an audit procedure which able to ensure no abrasive wheel is mounted other than persons appointed. Such procedure shall be part of the regular checks or inspection of abrasive wheel. A wheel should not be mounted on a machine for which it is not intended and certainly not on any makeshift apparatus or where there is a vibration of the machine.
- The bush, if any, should not project beyond the sides of the wheel.
- The wheel should be fit freely but not loosely on the spindle.
- Flanges should not be less than one-third of the diameter of the wheel and their bearings surface should be true and free from burrs.
- A guard should be provided and kept in position at every abrasive wheels, unless the nature of the work absolutely precludes its use, for the following purposes:
 - ◁ To hold the wheel parts in event of breakage.
 - ◁ To protect the wheel from accident damage.
 - ◁ To prevent the operator from coming into contact.
 - ◁ To prevent an oversize wheel being fitted.
- For bench and floor stand, a work rest has to be provided and properly adjusted as close as possible, in any case not exceeding 3.2mm (1/8 inch), to the wheel.
- Transparent screens, which are fitted in front of the exposed part of the wheel, shall be provided.
- Persons carrying out dry grinding operations and turning or dressing an abrasive wheel should wear properly fitted eye protector and protective clothing in cases.
- There should have trained machine operators to operate machine safety in the workshop.
- The maximum permissible speeds of the wheels and the spindle, statutory warning notice for using

abrasive wheel should clearly be displayed.

- The working floor surrounding the abrasive wheel should be kept clear of loose material, in good and even condition and prevented from becoming slippery.
- An efficient stopping switch shall be provided and be readily and conveniently operated by the person in charge of the machine.

1.31 Substances Hazardous to Health

- Material safety data sheet shall be obtained and Safety Officer shall conduct substance assessments.
- Direct contact with chemicals shall be avoided as much as possible and amount to be chemical applied shall be as low as possible.
- Material safety data sheet for substance/material shall be available.
- No person shall work alone without supervision when using particular dangerous goods.
- All substance containers shall clearly be labeled in accordance with statutory requirements and warning signs shall be posted at working area to warn persons passing by.
- Suitable first aid equipment and sufficient amount of clean water shall be available on site.
- Adequate training, information and instruction should be provided to relevant parties.
- Substances should not be left unattended unless stored in suitable danger goods store.
- Prolonged exposure to chemical shall be avoided.
- No eating, drinking or smoking is allowed.
- Sufficient correct type of personal protective equipment shall be available and used.
- Amount of substances stored inside the workplace shall be limited to necessary to complete the daily job requirement.
- Substances shall be stored according to the compatibility categories.
- Curb shall be erected around store containers to prevent spillage flow into drainage system. Any disposal of waste shall be separately packed according to their categories and dump by cleaning contractor when necessary.
- Mechanical ventilation shall be provided when necessary.
- The volume of airflow shall be of sufficient. Guidance of airflow might refer to occupational exposure limit (OEL) when necessary.

1.32 Alcohol Control

Alcohol Breath Test (used for the measure of the Blood Alcohol Concentration) for workers of contractors will be done upon the request from The Owner. Regardless of the limit imposed, workers of contractors must be conscious of being in the possession of their faculties to perform activities.

- Breath Alcohol Concentration limits:
 - ✓ Workers performing critical activities: BrAC=0
 - ✓ Workers performing non-critical activities: BrAC≤0.24mg/l

		BrAC Test Results	
		0 < BrAC ≤ 0.24mg/l	BrAC > 0.24mg/l
1	Workers of contractors performing critical activities	The worker must not perform the assigned activities. He/she can be allocated to other non-critical activities, or be suspended from work for the rest of the working period or day, as considered appropriate by the project/contract manager.	The worker must be suspended from work for the rest of the working period or day, as considered appropriate by the project/contract manager.
2	Workers of contractors performing non-critical activities	No action required	The worker must be suspended from work for the rest of the working period or day, as considered appropriate by the project/contract manager.

- Alcohol Breath Test shall be performed at the work place to contractors' workers upon decision of The Owner and proactively by the contractor.
- The tests shall be done using alcohol test kits provided by The Owner or by the Contractor, in accordance with the manufacturer's instructions.
- Test results exceeding the limit shall be documented. Tests results shall be considered restricted information that can only be made available to the tested person, employees in charge of the control process, and contractors' hierarchies and the respective project/contract manager in the case of contractors' workers.
- Tests conducted shall be recorded.