

Project Research

**Study Report on the Guidelines for the
Management of Safety for Construction
Works in Japanese ODA Projects**

Final Report

Guidelines (Preliminary Draft)

<Volume 2/3>

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Composition of the Outcomes

The outcomes of the Project Research: “Study Report on the Guidelines for the Management of Safety for Construction Works in Japanese ODA Projects” are composed of the 3 volumes shown below.

This volume is the “Guidelines (Preliminary Draft)” of the reports. See each report, other than this, for the “Main Text,” and “Samples of Practical Tool for Safety Construction Management on Site.”

First of the 3 volumes:

Main Text	
Introduction	Background of Working out the Guidelines (Preliminary Draft)
Chapter 1	Outline of the Field Study Results
Chapter 2	Current Status of Safety Management in Construction Works in Advanced Countries
Chapter 3	Review on Other Guidelines
Chapter 4	Outline of the Guidelines for the Management of Safety for Construction Works
Chapter 5	Considering the Operation Policy on the Guidelines

Second of the 3 volumes: This document.

Guidelines (Preliminary Draft)	
Chapter 1	General Rules
Chapter 2	Basic Policies for Safety Management
Chapter 3	Contents of the “Safety Plan”
Chapter 4	Contents of the “Method Statements on Safety”
Chapter 5	Technical Guideline for Safe Execution (by the Type of Work)
Chapter 6	Technical Guideline for Safe Execution (by the Type of Accident)

Third of the 3 volumes:

Samples of Practical Tool for Safety Construction Management on Site	
1.	Risk Assessment Form
2.	Operating Instructions
3.	Record of Meetings
4.	Weekly & Monthly Report
5.	Site Inspection Check Sheet
6.	Occupational Safety & Health Management System
7.	Partnership with Locals etc.

Project Research
Study Report on the Guidelines for the Management of Safety for
Construction Works on Japanese ODA Projects

Final Report

Guidelines (Preliminary Report)

<Volume 2/3>

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Introduction

Japan's Official Development Assistance Charter was formulated to assure fairness by giving consideration to the condition of the socially vulnerable, and the gap between the rich and the poor as well as the gap among various regions in developing countries whilst paying great attention with respect to factors such as the environmental and social impact on developing countries arising from the implementation of ODA. In particular, emphasis is put on "ensuring human safety" by focusing on individuals when implementing safety management on ODA construction works.

When ODA construction projects are implemented, it is a very important task to establish a safe and health-conscious working environment in order to achieve the goal of "ensuring human safety." The establishment of such an environment should minimize the negative impact on the environment or society of the recipient countries and improve efficiency and productivity. If the objective of an ODA construction project is successfully completed in a safe and health-conscious working environment, this will help enhance the standards of social culture in the recipient country and greatly encourage their socio-economic advancement.

In order to realize a safe and health-conscious working environment, it is important for the project stakeholders to realize the importance of safety management and their own responsibilities, and fulfill their roles to the fullest. The stakeholders should also cooperate closely with each other to conduct multifaceted safety management and undertake construction works while ensuring not only the safety of construction sites but also the safety of the people of the recipient country.

The stakeholders involved in the execution of ODA construction projects are required to conduct the works by respecting "that all persons have the right to life, liberty and safety" based on the World Human Rights Declaration (in respect of basic human rights) and giving serious consideration to the safety of all people, including third parties, involved in the works.

"Ensuring human safety" and "respect for basic human rights" have the top priority in ODA construction works. The stakeholders are therefore obliged to comply with the relevant laws and regulations of the recipient country in order to establish a safe and health-conscious working environment. They also need to establish a "culture of safety", whereby all organizations and individuals involved in the works prioritize safety, is clearly understood, establish a mechanism that automatically promotes active implementation of occupational safety measures in the relevant organizations, and enhances people's awareness of safety.

Furthermore, ODA construction projects require general management, including compliance with the time for completion, quality assurance, and improvement of productivity. It is necessary for all project stakeholders to be aware that appropriate safety management will produce specific benefits such as improved efficiency, productivity and sufficient quality assurance, and that appropriate cost sharing is necessary to manage safety in an appropriate manner.

Although these draft guidelines are intended to apply to contractors and other stakeholders responsible for occupational safety on ODA construction works, they are not formulated for the purpose of replacing laws or regulations of recipient countries or any standards of approval. Practically speaking, safety management on construction works varies depending on the specific conditions or environment of each recipient country. It is expected that stakeholders involved in ODA construction works have a full understanding of the importance of "ensuring human safety" and "respecting basic human rights" and take the initiative in establishing and promoting "a culture of safety", and in this way use these Guidelines as specific policies to be complied with when managing safety in order to help prevent or reduce occupational accidents on ODA construction works.

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Definitions of Basic Words

1. **Employer**

"Employer" is the organization or party appointed by the recipient country that places an order for an ODA construction work project, and includes their legal successor.

2. **Engineer**

"Engineer" is the person engaged by the Employer to supervise the works on an ODA construction project.

3. **Contractor**

"Contractor" is a party appointed as the contractor on an ODA construction project by the Employer, and includes their legal successor.

4. **Subcontractor**

"Subcontractor" is a party engaged by the Contractor as a subcontractor to carry out part of the construction work, and includes their legal successor.

5. **FIDIC**

"FIDIC" is the abbreviation of "Fédération Internationale Des Ingénieurs-Conseils," which English title is "International Federation of Consulting Engineers".

6. **Construction site**

"Construction site" is a place or an area where all kinds of work defined in Clause 1.2.1 hereof including the main work and ancillary work are conducted, a place or an area where mechanical equipment, materials, and machines are brought to or stored, a place or an area that is explicitly indicated in the contract documents entered into by the Employer and the Contractor as a place that constitutes the construction site, or any other places that are directly or indirectly managed by the Contractor.

7. **JICA**

"JICA" is the abbreviation of "Japan International Cooperation Agency".

8. **Grant aid and ODA loan**

"Grant aid" or "ODA loan" is a type of Japanese government official development assistance.

9. **Third party**

"Third party" is a person or an organization other than the Employer, Engineer, Contractor, subcontractor or worker.

10. **Safety Plan**

A "Safety Plan" is a document formulated by the bidder or the Contractor in the pre-construction stage. See 1.3.1 Safety Plan.

11. Method Statements on Safety

A "Method Statements on Safety" is a document formulated by the Contractor in the construction stage.
See 1.3.2 Method Statements on Safety.

12. Project Stakeholder

"Project Stakeholder" includes the Employer, Engineer, Contractor, subcontractors and workers.

13. ODA

As the abbreviation for "Official Development Aid", ODA is a form of assistance using public funds offered by a national government, or its implementing agency, to developing countries or international organizations, which is intended to provide financial or technical assistance to assist in the development or improvement of the economy, society or welfare of a developing country.

14. Managing Office

"Managing Office" is the head office or any branch office of the Contractor or Engineer who conducts guidance, assistance and general management services for construction work.

15. Relevant laws and regulations

"Relevant laws and regulations" include laws, statutes, regulations, approval standards and other legal instruments applied to construction work. They also include those guidelines established by relevant organizations that have legal binding force.

16. Scaffolding

"Scaffolding" is a temporary structure composed of a temporary floor (work floor) and its supports used by workers to safely carry out work at a high place, where there is a risk that the workers might fall.

17. Work floor

See 16. Scaffolding.

18. High place

"High place" is any place that is more than two meters above the ground.

19. Trench timbering

"Trench timbering" is a temporary structure composed of earth-retaining walls that take on the pressure of the earth or hydraulic pressure of the excavated sides and of timbering that supports the walls in order to prevent the collapse of the ground to be excavated.

20. Work with the danger of oxygen deficiency

"Work with the danger of oxygen deficiency" is work conducted at a place or in an atmosphere where there is a risk that workers may be exposed to danger by breathing in oxygen-deficient air or other toxic gases such as hydrogen sulphide.

21. Work with the danger of dust

"Work with the danger of dust" is work conducted at a place or in an atmosphere where workers may be exposed to hazardous dust that affects their health, including their lungs, as a result of breathing in the dusty air.

22. Work with the danger of noise/vibration

"Work with the danger of noise/vibration" is work conducted at a place or in an atmosphere where workers may be exposed to hazardous noise or vibration generated by or associated with that work.

23. Work over water

"Work over water" is work conducted at a place where workers could drown.

24. Form shoring

"Form shoring" is a temporary structure that supports concrete forms, which is attached to construct slabs, girders or beams of a concrete structure.

25. Mobile crane

"Mobile crane" is a machine, used mainly in construction work to hoist and laterally move materials, which is equipped with a motor and capable of moving to an unspecified place.

26. Precast pile foundation work

"Precast pile foundation work" is a process of driving shop-fabricated piles such as pre-stressed concrete piles into the ground by screw piling or hammering in order to set foundation piles.

27. Cast-in-place pile foundation work

"Cast-in-place pile foundation work" is a process of forming reinforcing steel in a cylindrical pattern at a site or at a factory, inserting them into the hole drilled in the ground in advance, and casting concrete into the hole so as to construct piles.

28. All casing method

"All casing method" is a type of cast-in place pile foundation work that drives a casing tube into the ground by vibration or screw piling, excavating the ground with a hammer grab, removing the excavated earth, constructing rebar cases in the excavation, and casting concrete so as to construct piles in the ground.

29. Reverse circulation drilling

"Reverse circulation drilling" is a type of cast-in-place piling that maintains the wall of a hole by applying hydraulic pressure against the area under a stand pipe pressed against the surface area of the hole, and excavating the ground with drill bits, extracting drilled earth and water from the hole with a drill pipe, inserting reinforcing steel into the hole and casting concrete in the hole.

30. Sorting

"Sorting" is a process of classifying things into necessary and unnecessary things for storage or discarding.

31. Decluttering

"Decluttering" is storing materials or equipment in such a way that promotes their efficient reuse or recycling.

32. Cleaning

"Cleaning" is maintaining a clean environment at a work place by removing dust or refuse after sorting and decluttering.

33. Near-miss

"Near-miss" is a dangerous event that may lead to the occurrence of accident, although it is not in itself an occupational accident. "Employer" is the organization or a party appointed as the ordering party of a recipient country that places an order for an ODA construction work project and their legal successor.

Chapter 1 General Rules

1.1 Purpose

1.1.1 Purpose

The Guidelines contain the basic policies for safety management, and technical guidance on specific methods for safe execution of works in order to prevent occupational accidents and public accidents on ODA construction projects for public and other facilities.

By fully understanding these Guidelines and complying with the regulation therein, Project Stakeholders will be in a position to respect the basic human rights of all parties involved in ODA construction projects. This will help prevent the occurrence of occupational and public accidents by creating a culture of safety, and help realize social development in the recipient country. This is the purpose of these Guidelines.

1.1.2 Composition of the Guidelines

The Guidelines are composed of the following six chapters:

Chapter 1 General Rules

Chapter 2 Basic Policies for Safety Management

Chapter 3 Contents of the “Safety Plan”

Chapter 4 Contents of the “Method Statements on Safety”

Chapter 5 Technical Guideline for Safe Execution (by the Type of Work)

Chapter 6 Technical Guideline for Safe Execution (by the Type of Accident)

1.1.3 Out-of-scope items

Since the Guidelines specifically contain the recommended practice for safety management for ODA construction works, these Guidelines are not intended to cover the occupational health and sanitation or environmental or social considerations related to works other than general construction works.

1.2 Scope of Application

1.2.1 Relevant projects

The Guidelines apply to works for public and other facilities to be constructed with ODA support (including both grants and loans) (hereinafter "**ODA Projects**").

Although the Guidelines do not apply to plant works based on EPC (Engineering, Procurement, and Construction) Contracts which cover a whole range of design, procurement of materials, and construction, this does not preclude the application of the whole or part of the clauses or sub-clauses of these Guidelines to policies for safety management of those projects.

1.2.2 Relevant parties

These Guidelines apply to all Project Stakeholders involved in ODA Projects, including the Employer, Engineer, Contractor, subcontractors, and workers.

1.2.3 Applicable provisions

All provisions contained in these Guidelines are the basic requirements to be complied with by the Project Stakeholders to ensure safety of ODA Projects.

1.3 Plans for Safety Management

In the Guidelines, two plans for the safety management for construction work sites shall be prepared and implemented by the Contractor, namely the "Safety Plan" and "Method Statements on Safety." The Contractor/Tenderer shall prepare the Safety Plan in the pre-construction stage. The Contractor shall however prepare Method Statements on Safety in the construction stage.

1.3.1 Safety Plan

1.3.1.1 Preparation of the Safety Plan

The Contractor/Tenderer shall prepare the Safety Plan at the pre-construction stage and submit it to the Employer/Engineer.

1.3.1.2 Role of the Safety Plan

The Safety Plan is positioned as the basic plan for safety management in ODA construction works at site and establishes basic policies on the general safety management and operation for the entire works at site.

1.3.1.3 Items to be incorporated into the Safety Plan

Chapter 3 "Contents of the Safety Plan" specifies the items to be incorporated into the Safety Plan.

1.3.1.4 Timing for Submission of the Safety Plan

The Tenderer shall submit his Safety Plan to the Employer/Engineer at the time specified in the Tender Documents. The Contractor shall submit the Safety Plan to the Employer/Engineer at the time specified in the contract documents. If no submission deadline is specified in the contract documents, the Contractor shall submit the Safety Plan to the Employer/Engineer no later than seven (7) days prior to the commencement of the relevant works.

1.3.1.5 Review of the Safety Plan

The Employer/Engineer shall review the Safety Plan prepared and submitted by the Contractor/Tenderer taking into account the need to maintain safety during construction works at site.

1.3.2 Method Statements on Safety

1.3.2.1 Preparation of the Method Statements on Safety

The Contractor shall prepare a Method Statements on Safety at the construction stage and submit the statements to the Employer/Engineer.

1.3.2.2 Role of the Method Statements on Safety

The Method Statements on Safety shall define a detailed plan to implement and manage safety in ODA Projects and shall include specifics for the safe execution of works and safety measures for each type of work in accordance

with the execution plans specifying the method or sequence for implementation.

1.3.2.3 Items to be incorporated in the Method Statements on Safety

In Chapter 4 "Contents of the Method Statements on Safety" specifies the items to be incorporated in the Method Statements on Safety.

1.3.2.4 Timing of submission of the Method Statements on Safety

The Contractor shall submit the Method Statements on Safety to the Employer/Engineer prior to commencement of the relevant works according to the execution plans or their equivalent document. If the submission date of the Method Statements on Safety is specified in the contract documents or other applicable documents, then this deadline shall be followed.

1.3.2.5 Review of the Method Statements on Safety

The Employer/Engineer shall review the Method Statements on Safety prepared and submitted by the Contractor from the viewpoint of maintaining safety during construction works at site.

1.4 Roles and Responsibilities of Project Stakeholders

1.4.1 Precedence

The roles and responsibilities of Project Stakeholders specified in the contract documents shall take precedence over these Guidelines.

1.4.2 Employer

The roles and responsibilities of the Employer relating to the management of safety on construction sites at site are as follows:

- (1) The Employer shall endeavor to strictly comply with the relevant laws and regulations of the recipient country and use the Guidelines to ensure the safety of the Project Stakeholders during construction works at site and protect nearby local residents, and any other third parties, from every potential accidental risk foreseen to arise from the construction works at site.
- (2) The Employer shall, in collaboration with the Engineer, review the Safety Plan and the Method Statements on Safety prepared by the Contractor and provide notice, suggestion or guidance for improvement to the Contractor if there are any risks to safety.
- (3) The Employer shall, in collaboration with the Engineer, make sure the work is carried out in accordance with the Safety Plan and the Method Statements on Safety prepared by the Contractor and provide notice, suggestion or guidance for improvement.
- (4) The Employer shall endeavor to create an environment where all Project Stakeholders positively participate in activities to promote safety on construction sites.
- (5) When two or more Contractors carry out work at the same construction site, the Employer shall establish an environment for mutual cooperation and coordination on safety management.

- (6) The Employer shall notify the Contractor of natural conditions, social conditions or any other factors that may affect the management of safety for construction works at site.

1.4.3 Engineer

The roles and responsibilities of the Engineer relating to the management of safety for construction sites at site are as follows:

- (1) The Engineer shall have a full understanding of the roles and responsibilities of the Employer on the management of safety for construction works at site and, together with the Employer, appropriately implement activities to manage safety, including these obligations specified in the contract documents.
- (2) The Engineer shall, in collaboration with the Employer, review the Safety Plan and the Method Statements on Safety prepared by the Contractor and provide notice, suggestion or guidance for improvement to the Contractor if there are any risks to safety.
- (3) The Engineer shall, in collaboration with the Employer, make sure the work is carried out as per the Safety Plan and the Method Statements on Safety prepared by the Contractor and provide notice, suggestion or guidance for improvement.

1.4.4 Contractor

The roles and responsibilities of the Contractor relating to the management of safety on construction sites are as follows:

- (1) The Contractor shall be responsible for operation and management of safety on construction sites.
- (2) The Contractor shall appropriately prepare the Safety Plan at the appropriate time in the pre-construction stage in accordance with the relevant laws and regulations of the recipient country and these Guidelines. In the construction stage, the Contractor shall appropriately prepare the Method Statements on Safety, which shall specify the details of safe methods to implement safety measures prior to the start of each item of work and submit the document to the Employer and Consultant for review.
- (3) The Contractor shall make appropriate revision or correction whenever any insufficiency or suggestion for improvement relating to safety is raised following the review of the Safety Plan and the Method Statements on Safety.
- (4) The Contractor shall undertake work according to the Safety Plan and the Method Statements on Safety they prepared. Whenever the Safety Plan or the Method Statements on Safety need to be amended in consideration of the latest site conditions, social and environmental conditions and/or any other relevant particulars. The Contractor shall without delay update and maintain the documents for review at will by the Employer and Engineer.
- (5) The Contractor shall take into account the safety of nearby local residents and any other parties, as well as all Project Stakeholders of the construction project.
- (6) The Contractor shall carry out construction works for the safety of nearby local residents and any other third parties, as well as Project Stakeholders of the project.

1.4.5 Subcontractor

The roles and responsibilities of the subcontractor relating to the management of safety on construction sites are as follows:

- (1) Each subcontractor shall carry out construction works in compliance with the relevant laws and regulations of the recipient country applicable to the construction work and these Guidelines.
- (2) Each subcontractor shall establish and maintain safe and sanitary site conditions according to the instructions of the Contractor.
- (3) Each subcontractor shall cooperate with other subcontractors engaged on the construction site in accordance with the instructions of the Contractor.
- (4) Each subcontractor shall receive from the Contractor an explanation on the Safety Plan and the Method Statements on Safety prepared by the Contractor. Each subcontractor shall pass on the explanation received from the Contractor to their employees and have them fully comply with those explanation to ensure safety.

1.4.6 Workers

The roles and responsibilities of each worker relating to the management of safety on construction sites are as follows:

- (1) Each worker shall carry out construction work in compliance with the relevant laws and regulations of the recipient country applicable to construction work and these Guidelines.
- (2) Each worker shall follow the instructions given by the Contractor and their managers.
- (3) Each worker shall cooperate with the Contractor and their managers to maintain safety at the construction site.
- (4) Each worker shall pay attention to their own safety as well as to the safety of their co-workers, all Project Stakeholders, as well as the nearby local residents and any other third parties affected by the work.
- (5) Each worker shall comply with the Safety Plan and the Method Statements on Safety prepared by the Contractor and the rules applicable to the entire construction works at site.
- (6) When undertaking work, each worker shall use protective equipment for safety and sanitation, either designated or provided, in an appropriate manner and at the appropriate time and location.

Chapter 2 Basic Policies for Safety Management

2.1 Basic Principles of Safety Management

2.1.1 Basic principle 1: Safety is a top priority

All Project Stakeholders shall put top priority on safety and use their best endeavours to eliminate the occurrence of accidents.

2.1.2 Basic principle 2: Elimination of causes

The Contractor shall identify every possible danger in each process of construction work, and examine, analyze and eliminate the causes of such danger and take appropriate action to ensure the safe execution of the work.

2.1.3 Basic principle 3: Thorough precautions

The Contractor shall give consideration to in advance the inherent risk of accidents at each stage of construction work, review appropriate measures to cope with such risks, and commence work once these preventive measures have been implemented.

2.1.4 Basic principle 4: Thorough compliance with relevant laws and regulations

2.2 Compliance with Relevant Laws and Regulations shall be complied with.

2.1.5 Basic principle 5: Thorough prevention of public accidents

All Project Stakeholders shall implement safety management measures taking the interests of third parties duly into consideration in order to prevent public accidents.

2.1.6 Basic principle 6: Thorough implementation of PDCA cycle for safety management

2.3 PDCA for Safety Management shall be complied with.

2.1.7 Basic principle 7: Thorough sharing of information

All Project Stakeholders shall share all safety-related information they possess in a manner and at times as appropriate in the circumstances.

2.1.8 Basic principle 8: Thorough participation of all Project Stakeholders

All Project Stakeholders shall actively participate in activities related to safety management at construction sites.

2.2 Compliance with Relevant Laws and Regulations

2.2.1 Compliance with laws and regulations of recipient countries

In addition to following the Guidelines the Contractors shall conduct ODA Projects in compliance with all related laws and regulations of the recipient country.

2.2.2 Survey of relevant laws and regulations

The Contractors shall survey all relevant laws and regulations applicable to construction work in the recipient country prior to the commencement of the ODA Project. The Employer/Engineer shall provide information on the relevant laws and

regulations to the Contractor and provide maximum assistance to the Contractor on the procedures that they should take as per the relevant laws and regulations.

2.2.3 Confirmation of the relevant laws and regulations

The Contractor shall prepare the Safety Plan and its Method Statements on Safety in compliance with the relevant laws and regulations.

The Employer/Consultant shall review the relevant laws and regulations noted therein and instruct the Contractor to consider any additional laws or regulations not considered by the Contractor.

2.2.4 Confirmation of the compliance levels

The Employer/Consultant shall check the Contractor's compliance with the relevant laws and regulations on a regular basis. If the Contractor fails to comply with the relevant laws and regulations, the Employer/Consultant shall instruct the Contractor to so comply.

2.3 PDCA for Safety Management

2.3.1 Basic principle of PDCA for safety management

The basic principle of PDCA for safety management shall be the cycle of "Plan, Do, Check, Act" with "Plan" being the process of establishing the Safety Plan and its Method Statements on Safety, "Do" being the specific implementation of the plan thus established, "Check" being the observation and confirmation of the safety management process, and "Act" being the implementation of improvements to the implemented plans based on the past performance to ensure the continuous development of field site safety standards. The cycle of these processes shall be defined as PDCA for safety management. The Contractor shall have chief responsibility for the implementation of safety management.

2.3.2 Formulation of the "Plan"

As part of the "Plan" the Contractor/Tenderer shall formulate the Safety Plan as the basic safety management.

The Contractor shall then formulate a Method Statements on Safety as the more detailed safety management plan for implementation.

2.3.3 Broad Publication at the "Planning" stage

The Contractor shall document the items necessary to ensure safety at construction sites, disclose the same to all Project Stakeholders and ensure that those items are fully understood at the "Planning" stage.

2.3.4 "Do"

The Contractor shall implement safety management on construction sites according to the Safety Plan and its Method Statements on Safety as formulated at the "Planning" stage.

2.3.5 Observation and confirmation ("Check")

The Employer/Engineer shall review the Contractor's implementation of the "Doing" stage in accordance with the Safety Plan and the Method Statements on Safety and give guidance where it is in any way insufficient or incorrect.

The Contractor shall check their own implementation of the "Doing" stage and implement improvements where insufficient in any way.

The managing office's safety managers shall make regular observations and undertake checks.

2.3.6 Disclosure of results at the "Check" stage

The Contractor shall document and disclose the results of the "Check" stage to the Project Stakeholders.

2.3.7 "Act"

The Contractor shall examine specific methods of implementing safety measures or related management systems and take corrective action based on their results at the "Checking" stage. In addition, the Contractor shall review their Safety Plan and the Method Statements on Safety and submit revised versions to the Employer/Engineer.

The Employer/Engineer shall review the submitted documents.

2.3.8 Broad publication of the results of the "Acting" stage

In case the Safety Plan or the Method Statements on Safety is revised, the Contractor shall document the revision and disclose such revision to the Project Stakeholders. In particular, the Contractor shall explain the types of work to which such change is to be implemented and ensure that, prior to the commencement of the relevant work, the change is understood by workers who engage in such work.

2.3.9 Investigation of causes of occupational accidents

If an occupational accident takes place, the Employer, Engineer and Contractor shall suspend construction work to the extent necessary during the necessary period and investigate the cause. The Contractor shall remove the cause in accordance with the basic principles of safety management, clarify measures to prevent the risk of accidents occurring and resume work with the approval of the Employer.

The Contractor shall re-examine the Safety Plan and the Method Statements on Safety based on the results of the examination and revise them as required. The Employer/Engineer shall review those documents if revised.

2.3.10 Continuous improvement

The Contractor shall ensure that the PDCA safety management process is implemented and continuously improved in order to maintain safety at construction sites.

Chapter 3 Contents of the "Safety Plan"

3.1 Composition of the Safety Plan

3.1.1 Items for inclusion in the Safety Plan

A typical Safety Plan shall comprise of the following:

- (1) Basic Policies for Safety Management
- (2) Internal Organizational Structure for Safety Management
- (3) Promotion of the PDCA Cycle
- (4) Monitoring
- (5) Safety Education and Training
- (6) Voluntary Safety Management Activities
- (7) Sharing Information
- (8) Response to Emergencies and Unforeseen Circumstances

3.1.2 Compliance with items for inclusion

Since items that constitute the Safety Plan as described in Clause 3.1.1 apply generally to all ODA Projects, the Contractor shall incorporate all those items into their Safety Plan.

Items other than those specified in Clause 3.1.1 "Items for inclusion in the Safety Plan" which arise with respect to the scope of work or the conditions for construction, shall also be specified in the Safety Plan.

3.2 Basic Policies for Safety Management

The Contractor shall determine the basic policies for safety management applicable during construction (hereinafter the "Basic Policies") based on the scope of work, the environment where the works are performed, relevant laws and regulations of the recipient country, contract documents and other applicable or documents or data incorporated into the contract. It is also recommended to describe the basic policies of the managing office.

3.3 Internal Organizational Structure for Safety Management

The Contractor shall determine an internal organizational structure to manage safety and prevent accidents at construction sites in accordance with the Basic Policies and the following requirements to:

- (1) Establish an internal organizational structure for safety management.
- (2) Appoint appropriate personnel, including a supervisor responsible for safety management and safety officers, within the internal organisational structure and clarify their respective roles, responsibilities and authority.
- (3) In accordance with any requirements under the contract documents, consider establishing an organization appropriate to manage safety, such as a safety committee, which may be

composed of appropriate Project Stakeholders including the Employer, Consultant, and subcontractors.

The names of individual persons need not be mentioned in the Safety Plan to be submitted together with the tender documents.

3.4 Promotion of the PDCA Cycle

The Contractor shall set out the basic principles for promotion of the PDCA Cycle at construction sites in accordance with Clause 2.3 "PDCA for Safety Management".

3.5 Monitoring

The Contractor shall set out the basic principles for monitoring safety management while considering the following requirements:

(1) Monitoring by the Contractor

The Contractor shall undertake tests at all areas on site to determine the extent of implementation of and compliance with safety management principles in accordance with the Safety Plan. In addition, the Contractor shall undertake tests to determine the extent of implementation of strategies for the safe execution of each type of work in accordance with the Method Statements on Safety.

(2) Monitoring of accidents or injuries

The Contractor shall report to the Employer/Engineer in accordance with the contract documents in the event of injury attributable to an occupational accident or construction work. On receipt of such report, the Employer/Engineer shall notify the competent governmental organization and JICA of the accident or injury in accordance with the relevant laws and regulations of the recipient country and the contract documents. The Employer, Engineer and Contractor shall keep records of all such reports and maintain them until the completion of the work.

(3) Monitoring near misses

The Contractor shall collect and analyze information on dangerous incidents that do not result in occupational accidents but may lead to such accidents ("near-misses") and utilize that information to prevent future occupational accidents.

The Employer/Engineer shall monitor the Contractor's implementation of safety management principles and give appropriate guidance to the Contractor where they find any safety-related problems.

3.6 Safety Education and Training

The Contractor shall set out the basic principles for education and training on safety to maintain safety during the construction works and take into account the following requirements:

- (1) Compliance with laws and regulations of the recipient country on education and training on safety
- (2) Education to all Project Stakeholders (and to all new entrants to the site) on:
 - 1) An overview of the construction site
 - 2) General rules on the construction site including the Safety Plan

- 3) Protective gear
- 4) Items necessary to ensure safety when carrying out work in addition to 1) through 3) above
- (3) Education on the Method Statements on Safety for the assigned work
- (4) Education when changes are made to work
- (5) Education and training for special workers
 - 1) Workers engaged in work that is regulated by the laws and regulations of the recipient country
 - 2) Operators or drivers of construction machinery or equipment
 - 3) Workers engaged in work in excavated areas, shafts, underground passages or tunnels
 - 4) Workers handling explosives and engaged in blasting work
 - 5) Workers engaged in work that uses compressed air
 - 6) Workers engaged in reinforcing bar work, concreting work, or formwork
 - 7) Workers engaged in other kinds of work belonging to special categories
- (6) Education and training for emergency response personnel
- (7) Education for visitors
 - Education for third parties (other than Project Stakeholders) when they enter the work area
- (8) Training for emergencies and unforeseen circumstances
- (9) Activities to promote safety awareness
- (10) Language used for education and training
- (11) Confirmation and recording education and training

3.7 Voluntary Safety Management Activities

The Contractor shall set out the basic principles for voluntary safety management activities while taking into account the provisions in the tender documents, the contract documents and the following requirements:

- (1) Morning meetings on safety
- (2) Foreseeing hazardous activities
- (3) Tool box meetings
- (4) Safety rota systems
- (5) Regular, monthly and periodic inspections
- (6) Sorting, decluttering and cleaning

- (7) Safety conventions
- (8) Safety patrol
- (9) Near-miss reporting system
- (10) Other activities

3.8 Sharing Information

The Contractor shall set out the basic principles for sharing information necessary to ensure effective safety management while taking into account the following requirements:

- (1) Description of education for new entrants
- (2) Other information necessary to maintain safety

3.9 Response to Emergencies and Unforeseen Circumstances

3.9.1 Response to emergencies

The Contractor shall determine the policies for responding to emergencies considered to be caused by accidents whilst taking into account the following requirements:

- (1) The priority of saving human lives
- (2) The establishment of an emergency communication network
- (3) Procedures for responding to emergencies
- (4) Responding to first-aid treatment
- (5) Reporting on accidents and injuries

3.9.2 Responding to unforeseen circumstances

The Contractor shall determine the policy for responding to any unforeseen circumstances considered to be caused by natural disasters such as rainstorms or earthquakes while taking into account the following requirements:

- (1) Emergency evacuation procedures
- (2) The establishment of an emergency communication network system
- (3) Procedures for responding to unforeseen circumstances
- (4) Collection of weather information

Chapter 4 Contents of the “Method Statements on Safety”

4.1 Composition of the “Method Statements on Safety”

4.1.1 Items for inclusion in a “Method Statements on Safety”

The Contractor shall formulate a Method Statements on Safety for each type of work based on the design or documents implementing the design in order to accurately and efficiently undertake work, maintain a safe working environment and prevent any unsafe action by workers. The Contractor shall incorporate the following items in any Method Statements on Safety:

(1) Construction plant and machinery

The Contractor shall include the specifications and quantity of any construction plant and machinery to be used for the works.

(2) Equipment and tools

The Contractor shall include any equipment and tools to be used for the works.

(3) Materials

The Contractor shall include the specifications and quantities of any major materials to be used for the works.

(4) Necessary qualifications and licences

The Contractor shall include the required qualifications and licences required for each type of work.

(5) The order of command for the works

The Contractor shall include the order of command for the works specifying the relevant supervisors for each type of works. At times, the process for monitoring the implementation of works may be unclear, especially in cases involving subcontractors. As such, in order to avoid any confusion, the Method Statements on Safety should specify the relevant supervisors for each type of work (including subcontract works).

(6) Work items

The Contractor shall categorise each item of work and set them out according to the works schedule.

(7) Procedure for the execution of the works

The Contractor shall specify the procedure for the execution of major work operations for each type of work.

(8) Foreseeable risks

The Contractor shall include all foreseeable risks for each work item.

(9) Precautionary measures

The Contractor shall review and include precautionary measures to prevent occurrence of foreseeable risks, including information on the type of protective gear required for the works.

4.1.2 Method Statements on Safety - Template

A template for a Method Statements on Safety is shown below for guidance. A form different to that below is acceptable as long as it fully satisfies the requirements as set out in Clause 4.1.1 "Items for inclusion in a Method Statements on Safety".

Method Statements on Safety [*Enter the type of work or Project name*]

(1) Construction plant and machinery	[<i>Enter the specifications and quantity of construction machines to be used in the work.</i>]
(2) Equipment and tools	[<i>Enter the equipment and tools to be used in the work.</i>]
(3) Construction materials	[<i>Enter the specifications and quantities of major materials to be used in the work.</i>]
(4) Necessary qualifications and licences	[<i>Enter the qualifications or licenses necessary for the work.</i>]
(5) Order of command (including names of supervisors)	[<i>Enter the name of supervisors for each section of work.</i>]

(6) Work items	(7) Procedure for the execution of the works	(8) Foreseeable risks	(9) Precautionary measures
[<i>Enter the work items classified into the unit work according to the order in the works schedule.</i>]	[<i>Enter the procedure for the execution of the major work operations for each type of work item.</i>]	[<i>Enter the foreseeable risks for each work item.</i>]	[<i>Enter the countermeasures to prevent the foreseeable risks and the necessary protective gear.</i>]

4.2 Applicable Standards for the "Technical Guideline for Safe Execution of Works"

4.2.1 Technical Guideline for Safe Execution of Works

The Technical Guideline for Safe Execution of Works ("Technical Guidance") is composed of two chapters - Chapter 5 "Technical Guideline for Safe Execution (by the Type of Work)" and Chapter 6 "Technical Guideline for Safe Execution (by the Type of Accident)".

4.2.1.1 Works subject to the Technical Guideline

The Technical Guideline applies to the type of work set out in Clause 1.2.1 "Relevant projects".

4.2.1.2 Purpose

The Technical Guideline provides the minimum safety standards for the management of works and accidents that are commonly applied in ODA Projects, according to the type of works in question. The Technical Guideline is generally applied when the Contractor plans and executes the safety management principles and the Consultant tests and confirms the same. It is recommended that prior to determining an agreed plan and procedure for the execution of the works, safe work methods and procedures and strategies for safety be fully reviewed in light of foreseeable risks of accident (if any) and with reference to the Technical Guideline, and that the results of that review be compiled in writing in a Method Statements on Safety in order to eliminate or reduce the risk of accidents occurring.

Such recommended application of the Technical Guideline, however, does not preclude any party from adopting in their construction contract any other standards which are more comprehensive and stringent than those stipulated in the Technical Guideline. This is particularly the case with respect to individual contracts which require special attention to safety measures such as those concerning the construction of very long bridges, underground work, submarine work, or work near existing traffic or construction projects.

4.2.2 Applicable Standards for the Method Statements on Safety

When any risk specified in Clause 4.1.1(8) "Foreseeable risks" is foreseen, that risk shall be identified with reference to the checklist shown in Clause 4.2.3. The counter measures for those foreseeable risks must comply with the provisions of the corresponding items shown in Chapter 6 "Technical Guideline for Safe Execution (by the Type of Accident)".

4.2.3 Checklist for foreseeable risks

1) Does the work involve a risk that workers will fall from high places?

If the answer is yes, comply with the provisions of Clause 6.1 "Measures for Prevention of Fall Accidents".

2) Does the work involve a risk that flying or falling objects will hit workers?

If the answer is yes, comply with the provisions of Clause 6.2 "Measures for Prevention of Accidents involving Flying or Falling Objects".

3) Does the work involve a risk that workers will be crushed by the collapse or fall of sediment or structures?

If the answer is yes, comply with the provisions of Clause 6.3 "Measures for Prevention of Accidents involving Collapse of Structures".

4) Does the work involve a risk that workers will be caught or entangled by machines or structures?

If the answer is yes, comply with the provisions of Clause 6.4 "Measures for Prevention of Accidents involving Construction Machinery".

5) Does the work involve a risk of explosion?

If the answer is yes, comply with the provisions of Clause 6.5 "Measures for Prevention of Explosion Accidents".

6) Does the work involve a risk of fire?

If the answer is yes, comply with the provisions of Clause 6.6 "Measures for Fire Prevention".

7) Does the work involve a risk that the general public or any other third party will suffer adverse effects?

If the answer is yes, comply with the provisions of Clause 6.7.1 "General rules for prevention of third-party accidents".

8) Does the work involve a risk that underground facilities, aerial lines, or surrounding facilities will be damaged?

If the answer is yes, comply with the provisions of Clauses 6.7.2 "General rules on preventing accidents relating to underground utilities or facilities" and 6.7.3 "General rules on preventing accidents relating to aerial utilities including aerial lines".

9) Does the work involve the risk of traffic accidents?

If the answer is yes, comply with the provisions of Clause 6.8 "Measures for Prevention of Traffic Accidents".

4.2.4 Applicable Standards for the Technical Guideline for Safe Execution (by the Type of Work)

When the Contractor executes works which are specified in the Technical Guideline for Safe Execution (By the Type of Work), he shall prepare a Method Statements on Safety and conduct the works in accordance with the provisions for each corresponding type of work as specified in the said Technical Guideline.

Kinds of work specified by the Technical Guideline for Safe Execution (by the Type of Work):

5.1 Excavation Work

5.2 Pile Foundation Work

5.3 Formwork and Form Shoring System Work

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5.4 Reinforcing Bar Work

5.5 Concrete Work

5.6 Work over water

5.7 Demolition Work

5.8 Work where there is danger of oxygen deficiency

5.9 Slinging Work

4.2.5 Applicable Standards for protective gear

Any use of protective gear in the aforementioned types of work shall comply with the provisions specified in Clause 6.9 Protective Gear.

Chapter 5 Technical Guideline for Safe Execution (by the Type of Work)

5.1 Excavation Work

5.1.1 Key points for the preparation stage

5.1.1.1 Understanding of conditions for construction

The Contactor shall give advance consideration to the following conditions for construction:

(1) Ground conditions

Properties and characteristics of the ground to excavate, groundwater, artesian water, water inflow, and the presence of high-temperature gas or toxic gas

(2) Excavation conditions

The depth and area for excavation

(3) Execution conditions

Working space available for excavation work, underground buried utilities or facilities, and aerial utilities such as aerial line.

(4) Natural conditions

Natural properties such as topography, meteorology or oceanographic phenomena

5.1.1.2 Cofferdam walls and timbering

The Contractor shall undertake a stability analysis of the cofferdam based on relevant conditions for construction, and determine the type and specifications of the cofferdam wall and timbering based on results of the analysis.

(1) The Contractor shall consider the following requirements when determining the type of cofferdam wall and timbering:

1) The Contractor shall undertake a comprehensive review based on the relevant conditions for construction once he has a full understanding of various characteristics including water cut-off performance, constructability, and rigidity of the timbering.

2) The Contractor shall check the level of safety against stress, strain, deformation and displacement as well as determine risk of piping, boiling and heaving based on the particular ground properties.

(2) The structure shall be sufficiently strong to prevent ground failure regardless of the local conditions where such structure is constructed, including ground properties, geology, cracking, ground water content, seepage water, and the status of buried utilities or facilities which may compromise safety during excavation work.

- (3) Materials to be used for such a structure shall be sufficient to withstand applied stress, strain, deformation and displacement, and be of good quality, free of cracking, deformation, and corrosion.

5.1.1.3 Excavation slope for open cutting

When the slope is cut using open cutting techniques, the Contractor shall determine the excavation gradient that would prevent ground failure, required for the particular excavation conditions and other relevant factors.

5.1.1.4 Procedure for execution of the works

The Contractor shall determine in advance the excavation procedure and responsible supervisors for the particular conditions for the construction and other relevant factors.

5.1.1.5 Drainage plan

The Contractor shall plan for appropriate drainage of water during excavation based on the conditions of the ground to excavate, including groundwater, artesian water, ground water content, and presence of seepage water, as well as the presence of inflow of surface water to the excavation area.

5.1.1.6 Ventilation plan

The Contractor shall consider the appropriate ventilation required during excavation, based on the properties of the ground to excavate, dust that may be generated during work, the presence of toxic gas and other relevant factors.

5.1.1.7 Construction machinery and equipment plan

When excavation machines are used, the Contractor shall select machines appropriate for the conditions for construction, the scale of work, the period of work, and other relevant factors. In addition, the Contractor shall determine in advance the traveling routes for excavation machines, loading machines, and transporting machines, the earth and material loading sites and how to access the sites.

5.1.1.8 Protective gear

Workers shall wear protective gear such as safety helmets or protective boots during work. When working at a place where there is a risk of falling from heights, they shall use safety belts.

5.1.2 Key points for excavation work

5.1.2.1 Prevention of ground collapse

- (1) The Contractor shall have excavation work undertaken strictly in accordance with the instructions of the responsible supervisor and in accordance with the excavation procedure and methods.
- (2) The Contractor shall not place or store excavated earth and sand near excavated slopes. In case the earth and sand has to be temporarily stored near an excavated slope, the Contractor shall take appropriate

measures to prevent collapse of the excavated slope or falling of the earth and sand into the excavated area.

- (3) When the surface of the ground falls as a result of rain, wind or water flowing from the ground surface to the excavation site, the Contractor shall implement protective measures such as covering the slope surface with protective sheets or nets.
- (4) The responsible supervisor shall immediately evacuate workers to a safe place when there is a risk of ground collapse or landslide.
- (5) The Contractor shall cancel excavation work when there is a risk that workers will be exposed to danger during those excavation works as a result of bad weather such as strong wind or rainstorms.
- (6) When bad weather due to sudden change or a natural disaster occurs, the responsible supervisor shall immediately suspend the work and evacuate workers to a safe place.

5.1.2.2 Prevention of falls

- (1) Where works are undertaken at a place more than two metres above ground level, the Contractor shall construct scaffolding prior to the commencement of work. Where it is impossible to construct scaffolding, workers use protective gear to prevent themselves from falling, such as safety belts or fall arrestors. Where safety belts are used, the Contractor shall ensure that equipment is affixed to which the belts may be attached.
- (2) The Contractor shall install stoppers or similar equipment at appropriate locations to prevent construction vehicles or machines from falling into an excavation area.

5.1.2.3 Prevention of accidents caused by flying or falling objects

- (1) Workers shall wear safety helmets to avoid hazards by earth and sand and other flying or falling objects during excavation work.
- (2) The Contractor shall provide methods to prevent objects falling, such as baseboards, on excavated slopes to prevent objects from falling into the excavation site.
- (3) The Contractor shall ensure that no materials, equipment, excavated earth and sand or other materials are placed near excavated slopes.
- (4) When materials, machines, etc. are transferred from ground surface into an excavation site, the Contractor shall provide all feasible means to protect workers in the excavation site such as ropes and suspension bags.
- (5) When heavy objects are transported to an excavation site with hoisting equipment, the Contractor shall use appropriate hoisting attachments to prevent workers from entering or staying under the cargo. The Contractor shall station flagmen or signalmen to ensure safe operation by operators.

5.1.2.4 Prevention of accidents caused by construction machinery

The Contractor shall ensure that:

- (1) Excavation machines shall be operated by qualified personnel or their equivalent.
- (2) Flagmen shall be stationed in the following locations when excavation machines are being operated:
 - 1) At locations where a work is undertaken in the vicinity of a road, building or any other facility
 - 2) At locations where visibility is poor
 - 3) On the edge of a cliff
 - 4) At locations where there is a risk of earth and sand falling or collapsing
 - 5) At locations where work is undertaken with excavation machines in the vicinity of other workers
 - 6) At locations where work is undertaken on a road
 - 7) When an excavation machine moves backwards
- (3) Standardized signs or signals shall be established to facilitate accurate and smooth communication among operators, flagmen, signalmen and workers.
- (4) When operating excavation machines or other equipment, the places where such machines are operated shall be off-limits.
- (5) No operators shall leave the operator's cabin while keeping the machines in an unstable condition or with the engines running.
- (6) No operators shall park excavation machines on a slope or on weak/fragile ground.
- (7) Excavation machines shall strictly be used within the range for safe use and only for its intended use.
- (8) When work with an excavation machine is undertaken at a place where there is a risk of a rock fall, appropriate protective measures such as head guards shall be provided in the operator's cabin.
- (9) When workers use rock drills, attention shall be drawn to the following:
 - 1) Stabilizing the foothold and keeping the work place in order.
 - 2) Using sufficiently long air hoses for rock drills.
 - 3) When work is undertaken on a slope, making sure that no drills will fall or slide downward. Workers shall also wear protective gear such as safety belts whenever necessary.
- (10) The guidance specified in Clause 6.4 "Measures for Prevention of Accidents Involving Construction Machinery" is complied with.

5.1.2.5 Prevention of public accidents and traffic accidents

- (1) When work is undertaken on a public road, the Contractor shall adopt appropriate measures to prevent the entry of unauthorized personnel including third parties into the work area, such as barricading the work site and stationing the watch-personnel and traffic-control personnel.
- (2) When work is undertaken on a public road, workers shall wear reflector vests.
- (3) Where buried utilities or facilities are located under the ground of a work site or where excavation is undertaken in the ground near a structure, then if damage to those utilities, facilities or structures by overturning or collapsing is likely, the Contractor shall take appropriate measures prior to the commencement of work, so as to prevent the risk, such as the relocation or reinforcement of the utilities, facilities or structures.
- (4) When earth and sand is backfilled over buried utilities or facilities, the Contractor shall undertake backfilling according to the predetermined specifications, without applying unsymmetrical pressure or damaging the buried utilities or facilities.

5.1.2.6 Working environment

- (1) Where there is seepage water at or an inflow of surface water to a work site, the Contractor shall properly treat such water prior to the commencement of any work.
- (2) The Contractor shall provide lighting strong enough to ensure safe excavation at the excavation site, taking into account the depth of excavation and the working environment.
- (3) When powder dust is generated from work, workers shall wear protective gear such as respirators when undertaking the work.
- (4) When loud noise is generated from the works, workers shall wear protective gear such as earplugs when undertaking the work. Since verbal communication is difficult in such circumstances, the Contractor shall determine an alternative means of communication in advance.
- (5) The Contractor shall install ventilation equipment as required to properly maintain the air quality at an excavation site. Particularly when a mechanical apparatus that houses an internal combustion engine is installed at an excavation site, installation of ventilation equipment is necessary to prevent accidents by exhaust gas poisoning.

5.1.2.7 Inspection of excavation sites

- (1) The Contractor shall inspect the ground and the area surrounding at an excavation site as follows:
 - 1) Inspection timing
 - a) Before the start of work and at the beginning of each work shift
 - b) After the occurrence of heavy rain or an earthquake

2) Items to be checked

a) The ground to be excavated

b) The condition of seepage water at an excavation site

(2) In case the ground inspection indicates a risk of ground failure, the responsible supervisor shall immediately suspend excavation work and take appropriate anti-failure measures. The Contractor shall clarify the appropriate method of excavation or means to prevent ground failure taking into account the particular ground conditions, and resume the work only after confirming there is no likelihood of ground failure.

(3) The Contractor shall ensure that mechanical equipment such as excavation machines or rock drills undergo predetermined inspection before the commencement of work and at any predetermined time, so to ensure that equipment is free of all defects. The Contractor shall immediately remove or repair here any equipment that is found to be defective, prior to the start of work.

5.1.3 Key points for cofferdam and timbering

5.1.3.1 When installing cofferdam and timbering, the Contractor shall:

(1) Install cofferdam and timbering in accordance with the predetermined sequences.

(2) Commence excavation only after it is clear that the necessary structurals of the cofferdam and timbering have been precisely safely installed in their correct positions.

(3) Firmly fix the cofferdam wall and timbering to prevent dislocation caused by vibrations and/or other external forces such as excavation works. In addition, the Contractor shall align the structurals of all timbering in a linear fashion and normal to the cofferdam wall.

(4) Not place heavy materials on the structurals of the timbering.

(5) Not use the timbering structurals for suspension used in the protection of buried utilities or facilities unless otherwise specified. The Contractor shall install another structurals columns suspended for purpose of protection separately from the timbering.

(6) Regularly inspect the cofferdam walls and timbering for deformation of the structurals, slackening of the fastening portions, or changes in groundwater or the surrounding ground level of the cofferdam wall and timbering during the construction. The Contractor shall undertake such inspections even during a periods when no work is being undertaken.

(7) Ensure that when any anomaly is observed in the cofferdam wall and timbering, the responsible supervisor shall immediately evacuate workers to a safe place and take all necessary action to cope with the observed abnormal phenomenon. The responsible supervisor shall notify the appropriate manager in charge of the work suspension and also take appropriate action while the work is suspended.

(8) Comply with the guidance specified in Clause 5.9 "Slinging Work".

- (9) Comply with the guidance specified in Clause 6.4.2 "Measures for mobile crane work".

5.1.3.2 Inspection of cofferdam and timbering

- (1) The Contractor shall inspect cofferdam walls and trench timbering as follows:
 - 1) Inspection timing
 - a) Before the start of work and at the beginning of each work shift
 - b) After the occurrence of a heavy rain or an earthquake
 - 2) Items to be checked
 - a) Creak, warp, and damage of structurals
 - b) Degree of compression of timbering
 - c) Slackening of the connections and joints of structurals
 - d) Clearance in the back of the cofferdam wall

5.2 Pile Foundation Work

5.2.1 Key points for the preparation stage

5.2.1.1 Understanding of the execution conditions

The Contractor shall give advance consideration to the following conditions for construction:

(1) Ground conditions

Properties and characteristics of the ground, artesian water, and the presence of high-temperature gas and toxic gas

(2) Execution conditions

Depth to the bearing stratum, working space available for pile foundation work, and utilities such as underground cables and aerial lines

(3) Natural conditions

Natural properties such as topography, meteorology or maritime phenomena

5.2.1.2 Procedure for execution of the works

The Contractor shall determine in advance the procedure and the responsible supervisor for the pile foundation work based on the particular the conditions for construction and other relevant factors.

5.2.1.3 Construction machines

When construction machines such as pile drivers are used, the Contractor shall determine those machines appropriate for the conditions for construction and the scale of work, the period of work and other relevant factors.

- (1) The Contractor shall always level the place where construction machines are positional or operated, check for their respective bearing capacities, and provide appropriate measures, so as to prevent the machines overturning.
- (2) The Contractor shall not undertake work simultaneously at place right above or below the construction machines, and shall ensure that no person is present underneath hoisted cargo, such as structurals.
- (3) When handling, inspecting or servicing construction machines, the Contractor shall stop engines to prevent accidents, such as injuries to workers involving moving parts of machines.
- (4) When two or more pile drivers are used for one limited working site, the Contractor shall maintain sufficient clearance between the pile drivers.

5.2.1.4 Protective gear

Workers shall wear safety helmets, protective boots and other protective gear when undertaking work. Workers shall use safety belts where there is a risk of falling.

5.2.2 Key points for the precast pile foundation work

5.2.2.1 At the time of placing a pile driver

The Contractor shall:

- (1) Take measures to prevent entry of unauthorized workers into the work range.
- (2) Take measures to prevent collapses of pile drivers.
- (3) For positioning of pile drivers on soft ground, check the strength of the ground and take necessary measures to prevent slides and over turning, including ground improvement or the use of iron plates.
- (4) When supports and trestles of pile drivers may cause sliding, provide appropriate reinforcement using, for example, stakes or wedges.
- (5) Always maintain good drainage at places where pile drivers are used.
- (6) Undertake slinging work in a safe and secure manner within the rated loads.
- (7) Not use hoisting wire ropes and hanging hooks that are deformed, cracked or damaged.
- (8) Use marks and other means for hoisting wire ropes, so as to prevent excessive winding.
- (9) Not use the following wire ropes for pile drivers

- 1) Hoisting wire ropes that do not satisfy the standards prescribed in the relevant laws and regulations of the recipient country.
 - 2) Ropes with joints
 - 3) Ropes with noticeable form breaks or corruptions
- (10) When a pile driver is assembled, use the pile driver only after checking the following conditions and making sure no issues pertain thereto:
- 1) The existence of slacks or injuries to the joints of machine parts
 - 2) The installation conditions of hoisting wire ropes, sheaves and pulley blocks
 - 3) The functions of brakes and ratchets of hoisting devices
 - 4) The installation conditions for winches

5.2.2.2 At the time of pile driving work

The Contractor shall:

- (1) Ensure that workers use earplugs as appropriate for the work. Since verbal communication is difficult in such circumstances, the Contractor shall determine an alternative means of communication in advance.
- (2) Maintain a wide ground contact area with the pile driver, and use planking, square timbers and other means as needed.
- (3) When climbing leaders, install main ropes and use fall arrestors and safety belts.
- (4) Take measures to prevent entry of unauthorized workers into the work range.
- (5) Always inspect the structurals of the pile driver and hoisting equipment, and immediately repair or replace defective items prior to use.

5.2.3 Key points for the cast-in-place pile foundation work

5.2.3.1 All-casing method

The Contractor shall:

- (1) Take measures to prevent entry of unauthorized workers into the work area.
- (2) When moving machinery with tractions or jacks, ensure that work shall be undertaken strictly in accordance with the instructions of the responsible supervisor.
- (3) Always maintain jacks and pulleys and use the prescribed wire ropes.
- (4) Ensure that no person approaches the boring gantry during operation of the hammer grabs, and maintain a "no access" policy for this purpose.

- (5) Ensure that workers are allowed to enter a casing only after ventilation equipment is installed inside, toxic gas is measured and safety is confirmed in advance.
- (6) For putting tremies or reinforced frames, operators, slinging workers and signalmen are assigned, and the work is undertaken in accordance with established signals.
- (7) When work ceases, take measures such as installing protection nets, so as to prevent workers from falling into the casing.

5.2.3.2 Reverse circulation drilling method

The Contractor shall ensure that:

- (1) Assembling, dismantling and moving of gantries shall be undertaken strictly in accordance with the instructions of the responsible supervisor.
- (2) For putting tremies or reinforced frames, operators, slinging workers and signalmen are assigned, and the work is undertaken in accordance with established signals.
- (3) While ramming down or drawing casings, only those workers necessary to undertake the work shall be allowed to approach the gantry, and there is no access to the relevant work area for that purpose.

5.3 Formwork and Form Shoring System Work

5.3.1 Key points for the preparation stage

5.3.1.1 Procedure for execution of the works

The Contractor shall determine the procedures for assembling and dismantling of forms and form shoring system, and appoint the responsible supervisors.

5.3.1.2 Structure and materials of forms and form shoring system

- (1) The Contractor shall construct forms and form shoring system to a firm structure matching the shape and dimensions of the concrete structure, concrete placement method and other relevant conditions. The Contractor shall determine the specifications of the structure and materials based on the particular strength analysis.
- (2) The Contractor shall consider loading in the vertical and horizontal direction, and lateral pressure of the concrete in the structural review of the form shoring system. The Contractor shall also determine the structural specifications in consideration of special loads not previously expected.
- (3) The Contractor shall ensure that the materials used for forms and form shoring system have sufficient strength and are free of damage, deformation or corrosion.

5.3.1.3 Protective gear

Workers shall wear protective gear such as safety helmets, protective boots and gloves when undertaking work. Workers shall use safety belts where there is a risk of falling.

5.3.2 Key points for the formwork

5.3.2.1 At the time of fabrication of forms

The Contractor shall:

- (1) Always arrange materials and tools in an orderly manner at form fabrication workshops.
- (2) Always inspect machinery and tools used to fabricate forms, and ensure the safety device functions properly prior to use.
- (3) Take measures to ensure that no unauthorized workers have access to the form fabrication workshop.
- (4) Ensure that two workers carry lengthy or heavy goods.
- (5) Take measures to prevent cargo collapse or scattering when storing form materials or fabricated forms.
- (6) Ensure that fabricated forms are free of protrusions such as nails.

5.3.2.2 At the time of assembly of forms

- (1) When there is a risk of workers being injured by reinforcing bars, etc. after tripping or falling, the Contractor shall take security measures such as covering of reinforcing bars with protective sheets before performing the assembly work.
- (2) Form assembly places shall always be kept in order.
- (3) Measures of no-entry of unauthorized workers shall be taken.
- (4) Where work is undertaken at a place more than two meters above ground level, the Contractor shall construct scaffolding prior to the commencement of work. Where it is impossible to construct scaffolding, workers shall use protective gear to prevent falls, such as safety belts or fall arrestors when conducting the work. Where safety belts are used, the Contractor shall affix appropriate equipment to connect the belts.
- (5) Once reinforcement fabricated, the Contractor shall not use rebars as access platforms or working floors.
- (6) The Contractor shall ensure that heavy or big forms are handled by not a single worker but by two or more workers.
- (7) The Contractor shall firmly affix assembled forms so as to prevent their collapse by wind or vibration.

5.3.2.3 At the time of dismantle of forms

The Contractor shall:

- (1) Ensure that form dismantle places are always kept in order.
- (2) Prevent other workers from entering any authorised access areas.
- (3) Stock dismantled form materials, nails or other fixings, and structurals by type, and at a place that does not disturb dismantling work.
- (4) Where work is undertaken at a place more than two meters above ground level, construct scaffolding prior to the commencement of work. Where it is impossible to construct scaffolding, workers shall use protective gear to prevent falls, such as safety belts or fall arrestors, when conducting work. Where safety belts are used, the Contractor shall ensure that appropriate equipment is affixed to which the belts may be connected.
- (5) Ensure that no work is undertaken simultaneously at places right above or below any dismantling work being undertaken, so as to avoid accidents caused by flying or falling objects. No forms or any other objects shall be thrown from higher to lower levels or directly dropped.

5.3.3 Key points for the form shoring system work

5.3.3.1 At the time of form shoring system assembly and dismantle

The Contractor shall:

- (1) When assembling form shoring system, prepare assembling diagrams in advance, and assemble the shoring system according to the drawings.
- (2) Assemble form shoring system according to the assembling diagrams. No assembling diagrams shall be modified without prior permission.
- (3) Ensure that the responsible supervisor shall directly supervise assembling and dismantling of form shoring system.
- (4) Take measures to prevent settlement of strut posts of the form shoring system.
- (5) Take measures to fasten the posts of the struts, so as to provide reinforcing lateral battens, as well as to prevent the sliding of the strut posts.
- (6) Take measures to ensure that there is no unauthorized access to the area where the assembly or dismantle of form shoring system is being undertaken.
- (7) Use lifting nets or hanging bags, etc. to lift up or down materials, equipment or tools.
- (8) Where work is undertaken at a place more than two meters higher or lower than the ground level, construct scaffolding prior to the commencement of work. Where it is impossible to construct scaffolding, workers shall use protective gear for prevention of falls such as safety belts or fall arrestors when conducting the work. Where safety belts are used, the Contractor shall ensure that appropriate equipment is affixed, to which the belts may be connected.

- (9) Not use the outsides of the assembled reinforcing bars or forms as access platforms or working floors.
- (10) Suspend work in case of danger caused by bad weather such as strong wind or rainstorms.
- (11) Not dismantle form shoring system before the prescribed strength of concrete is ascertained.

5.3.3.2 At the time concrete is laid

The Contractor shall

- (1) Determine the sequence of concrete placing and the placing height in advance to prevent unsymmetrical pressures on the form shoring system, and place the concrete uniformly.
- (2) Inspect the shoring system and undertake repairs if any anomaly is found prior to concrete placing.
- (3) During concrete placing, inspect the conditions of shoring system to make sure the shoring system is always in a safe state. When any anomaly is observed in the form and form shoring system, immediately suspend the placing work, and take appropriate measures to cope with the circumstances.

5.4 Reinforcing Bar Work

5.4.1 Key points for the preparation stage

5.4.1.1 Procedure for execution of the works

The Contractor shall determine the execution procedure and the responsible supervisor for fabrication of rebars in advance based on the particular conditions for construction and other relevant factors.

5.4.1.2 Protective gear

Workers shall wear safety helmets, protective boots and gloves when undertaking work. Workers shall use safety belts where there is a risk of falling.

5.4.2 Key points for the reinforcing bar work

5.4.2.1 At the time of rebar bending

The Contractor shall:

- (1) Always arrange materials and tools in an orderly manner at rebar bending workshops.
- (2) Inspect machines and tools used to fabricate rebars prior to commencement of the work, use appropriate tools, and not use defective ones.

5.4.2.2 At the time of rebar transport

The Contractor shall

- (1) Use two or more workers to transport long size rebars, and shall not allow transportation in an unusual or unreasonable manner.
- (2) Bundle and carry rebars, when they are not already bundled.
- (3) Ensure that attention is drawn to the front and back of transporting workers so as to avoid contact with others. Special attention shall be necessary for bent long size bars.

5.4.2.3 At the time of rebar fabrication

The Contractor shall:

- (1) Construct scaffolding prior to the commencement of work when undertaking work at a place more than two meters above ground level. Where it is impossible to construct scaffolding, workers shall use protective gear, such as safety belts or fall arrestors, so as to prevent falls when undertaking work. Where safety belts are used, the Contractor shall ensure that appropriate equipment is affixed to which the belts may be connected.
- (2) Secure safety paths at areas where reinforcing bar work is undertaken by, for example, providing steel plates on which to walk. When footboards are used, they shall be securely fixed on both ends to prevent overturning.
- (3) Ensure that workers are careful not to have their hands, arms or feet caught by rebars during fabrication work.
- (4) Take measures to protect against rebars projecting at places where work is being undertaken on a higher level and there is a risk of workers' falling.
- (5) Provide appropriate supports to rebars for walls, columns or similar vertical structural, so as to prevent their fall or collapse.

5.5 Concrete Work

5.5.1 Key points for the preparation stage

5.5.1.1 Procedure for execution of the work

The Contractor shall determine the execution procedure and the supervisor responsible for concrete work in advance based on the conditions for construction and other relevant factors.

5.5.1.2 Protective gear

Workers shall wear safety helmets, protective boots and gloves when undertaking work. Workers shall use safety belts where there is a risk of falling.

5.5.2 Key points for the concrete work

5.5.2.1 At the time of assembly and use of concrete plant

The Contractor shall:

- (1) Specify the supervisor responsible for assembly and operation of the concrete plant, and ensure that the plant is operated strictly in accordance with the instructions of the supervisor and in accordance with the assembling diagram. The plant shall be used only after the Contractor has undertaken tests prior to operation.
- (2) Station flagmen at gateways of concrete plant facilities as needed.
- (3) Establish safety paths in concrete plant facilities to separate traffic roads of walkers and vehicles.
- (4) Ensure that lighting for concrete plant facilities is sufficient for the work environment.
- (5) Install ventilation equipment in measuring rooms or at other places where work generates dust and soot. Workers shall also use protective equipment such as dust masks when working in such places.
- (6) Turn off machinery prior to undertaking maintenance to or repairing the concrete plant.

5.5.2.2 At the time of concrete transport

The Contractor shall:

- (1) Establish in advance the routes, that concrete mixers shall take from the concrete plant to the area where the concrete is to be laid.
- (2) When concrete mixers run on public roads, check the traffic conditions of relevant neighbouring routes, and take measures to prevent traffic accidents and other necessary measures.
- (3) When concrete mixers run through other work areas, contact and coordinate the relevant supervisors in those areas, to ensure that safety measures are fully implemented, routes are appropriately indicated and safety passage are maintained.
- (4) Determine in advance the travelling speeds applicable at the construction sites and ensure that operators do not exceed speed limits. Speed limit signs shall be put up at easily visible places and flagmen shall be stationed as necessary.
- (5) Implement measures to prevent runaway vehicles when operators leave the driver's cabin to discharge concrete from concrete mixers, such as using brakes or stoppers.
- (6) Ensure that concrete mixer operators wear safety helmets when discharging concrete.
- (7) When transferring concrete to the area where it is to be laid with a lifting machine, ensure that the access under the transfer range of the conc.-bucket is strictly restricted and take measures to prevent the leak of concrete from the bucket.

5.5.2.3 At the time concrete is laid

The Contractor shall:

- (1) Determine in advance the method and procedure, the range and speeds, etc. for laying the concrete, and ensure that the concrete is laid strictly in accordance with the instructions of the responsible supervisor.
- (2) Ensure that workers laying concrete wear protective gear such as protective gloves and boots to prevent the concrete being in direct contact with the skin.
- (3) Lay concrete in accordance with the predetermined procedures, and avoid laying concrete in a concentrated portion.
- (4) When shoots are used to lay concrete, place the shoots appropriately, so as to prevent overflow of concrete in consideration of the property of concrete, the method for laying the concrete, the shape and gradient of shoot and the connecting method.
- (5) Where there is a risk of workers falling from high places, take measures to prevent falls, such as the installation of scaffolding, provision of handrails and the mandatory use of safety belts when laying concrete.
- (6) Always check forms and form shoring system when laying concrete, so that work can be undertaken in a safe and secure manner.
- (7) Clearly specify the waiting areas and travelling routes for concrete mixers and their stationary positions where concrete is being laid, so as to prevent concrete mixers being involved in accidents or collisions.
- (8) Station flagmen at the stationary positions for concrete mixers and at locations where concrete is being laid.
- (9) When concrete is released for laying from stationary concrete mixers, install vehicle stoppers to firmly prevent the wheels of the vehicles from moving.

5.5.2.4 At the time the concrete pump placer is in use

The Contractor shall:

- (1) Inspect concrete pump placers as appropriate prior to use.
- (2) Ensure that communication with operators of concrete pump placers and workers holding hose tips is maintained by:
 - 1) Installing necessary communication equipment such as radios or bells.
 - 2) Establishing and following standardized signals.
- (3) Undertake concrete pumping operations, including start-up, shutdown, and adjustment of discharge, during pumping of concrete, in accordance with the signals sent from the hose end.
- (4) Securely connect transport pipes to hoses and between transport pipes using couplings and other tools.

- (5) Take measures to prevent falling off or swaying of transport pipes, including fixing the pipes to a firm structure.
- (6) When positioning concrete pump placers, check the ground condition of the positioning area and take appropriate measures as necessary to prevent vehicles from overturning.
- (7) Station flagmen to guide concrete mixers in order to prevent contact between the concrete pump placer and concrete mixer. To avoid collisions with concrete pump placers, the Contractor shall provide vehicle stopper at places where concrete is discharged from the concrete mixer.
- (8) Ensure that flagmen for concrete mixers are not positioned between concrete mixers and pump placers to prevent them being caught between them.
- (9) When the boom of a concrete pump placer is extended close to an aerial line, take measures to prevent contact between the boom and the aerial line.

5.6 Work over Water

5.6.1 Key points for the preparation stage

5.6.1.1 Understanding of execution conditions

The Contractor shall understand the following conditions for construction in advance:

- 1) Water depth, topography, and geology
- 2) Local characteristics mainly concerning maritime phenomena and meteorology
- 3) Traffic conditions in the work area, including traffic routes on the water or fairways
- 4) The presence of underwater obstacles such as sunken ships
- 5) The presence of buried utilities such as communication cables, power cables, gas pipes or water pipes
- 6) Aerial lines and other similar utilities around the work area

5.6.1.2 Procedure for execution of the works

The Contractor shall specify in advance the procedure for executing the work and the supervisor responsible for the work over the water taking into account the particular conditions for construction and other relevant factors.

5.6.1.3 Protective gear

Workers shall use life jackets when undertaking work. They shall use safety belts when working in areas where they may fall and be injured by flying or falling objects or collide with permanent or temporary structures.

5.6.2 When working over water

The Contractor shall:

- (1) Implement the following measures when undertaking work over water:
 - 1) Measures to prevent workers from falling into water
 - 2) Development of systems to rescue workers if they fall into water
- (2) Ensure that workers do not undertake work over water alone.
- (3) Implement measures to ensure safety against floods, rainstorms, or sea waves during work over water.
- (4) Collect information on water levels or tide levels in conjunction with the work.
- (5) Prescribe and communicate emergency response measures to all relevant workers in advance.
- (6) Put in place protective gear for ready use, including life preservers and ropes.
- (7) Draw particular attention to lighting during night work and station watch-personnel as appropriate.
- (8) Prohibit the overboarding and the overloading of any vessel.
- (9) Install and regularly maintain lifesaving appliances at the appropriate positions in the boat.
- (10) Take safety measures when undertaking work on a river with dams located upstream against water release from the dam reservoir.
- (11) Suspend work during stormy weather such as heavy rainfall or strong winds.

5.7 Demolition Work

5.7.1 Key points for the preparation stages

5.7.1.1 Understanding of the conditions for construction

The following conditions for construction shall thoroughly be understood in advance:

- (1) Understanding of the structure conditions
 - 1) Structural strength, scale, shape, structural sections, interior and exterior finishes, and the building services of the structure
 - 2) Previous uses of the structure (presence of chemical substances, flammable materials and other hazardous materials)
 - 3) Status of damage, wear, corrosion, and deterioration of the structure and its structural
- (2) Understanding of the surrounding environmental conditions

This includes topography, geology, structures in the neighbouring area (particularly hospitals and other facilities susceptible to vibration, noise or dust), public transportation such as railroads or roads, underground materials and utilities, aerial utilities and other restricting conditions.

5.7.1.2 Procedure for execution of the works

The Contractor shall specify in advance the procedures for execution of the works and the supervisors responsible for dismantling work, taking into account the conditions for construction and other relevant factors.

5.7.1.3 Protective gear

Workers shall wear safety helmets and protective gear to protect their legs, feet and hands when undertaking work. Workers shall wear goggles when there is a need to protect their faces against flying objects or when undertaking the particular type of work. Workers shall wear dust masks when undertaking work that generates dust. Workers shall use safety belts when working in areas where they may fall.

5.7.2 At the time of demolition work

The Contractor shall:

- (1) Ensure that demolition works are undertaken strictly in accordance with the instructions of the responsible supervisor.
- (2) Take measures to restrict unauthorised access of workers to the demolition area where they are not related to the work.
- (3) Surround areas of a structure where third parties are exposed to danger associated with demolition by the fence or the equivalent and clearly indicate the area as a dangerous work area.
- (4) Construct scaffolds or makeshift passages to ensure the safety of workers during dismantling. The Contractor shall take measures to prevent falls where there is a risk of falling, and instruct workers to use safety belts and other protective gear.
- (5) Not undertake work simultaneously at any places right above or below the level where demolition work is to be undertaken.
- (6) Ensure that no structure being demolished is left in a state where it may collapse due to strong wind or other factors.
- (7) Sprinkle water and take any other necessary action as necessary to prevent the generation of dust when a structure is to be demolished.
- (8) Take measures to prevent unauthorised access to areas where construction machinery is to be operated.
- (9) Suspend work during stormy weather such as heavy rainfall or strong winds.

5.8 Work where there is danger of oxygen deficiency

5.8.1 Key points for the preparation stage

5.8.1.1 Understanding of the conditions for construction

The Contractor shall take appropriate measures that assume oxygen levels are deficient when undertaking works in the following circumstances:

- 1) Wells, open caissons, shafts, tunnels, pneumatic caissons and other similar places that have not been used for a long period of time
- 2) The insides of those places listed in 1) above, that are in contact with or either lead to the following layers:
 - a) Sand gravel layers that have impermeable layers located right above, which have little or no water content or running water
 - b) Strata containing ferrous salts or first manganese salts
 - c) Strata containing methane, ethane or butane
 - d) Strata gushing out or likely to gush out with carbonated water
 - e) Sludge layers
- 3) Cisterns, conduits, manholes and pits
- 4) The insides of cisterns, conduits, manholes and pits where rainwater, river water, or seepage water stagnates or previously stagnated at some point in time.
- 5) The insides of tanks, holds, cisterns, pipes, conduits, manholes, ditches, pits in which human waste, sapropel, sludge, pulp liquid, or other corroded or easily decomposable substances are contained or were once contained.
- 6) An excavation work site, a pile foundation work site or surroundings, where construction by a pneumatic method is or once was carried out .
- 7) Places where work is undertaken with internal combustion engines of construction machines operated in a closed environment.

5.8.1.2 Procedure for execution of the works

The Contractor shall specify in advance the procedure for execution of the works and the supervisors responsible for work to be undertaken where there is a danger of oxygen deficiency, taking into account the relevant conditions for construction and other relevant factors.

5.8.1.3 Measurement of the working environment

The Contractor shall specify in advance the timing and method for measuring oxygen concentration, and the procedure when the management concentrations in various working environments is to be applied.

5.8.1.4 Advance training to workers

The Contractor shall provide training to workers undertaking work in areas where there is a risk of oxygen deficiency on:

- 1) The influence of oxygen deficiency on the human body and the related symptoms

- 2) Usage of protective gear including a respirator
- 3) Evacuation in the event of accident and methods of emergency treatment

5.8.1.5 Protective gear

Workers shall wear safety helmets and protective gear to protect their feet when undertaking work. Where toxic gas exists, they shall wear gas masks or respirators. They shall use safety belts when working at places where they may fall.

5.8.2 Key points for working in places where there is a risk of oxygen deficiency

The Contractor shall:

- (1) Install and maintain measurement equipment necessary to measure gas concentration in the working environment, when working in places where there is a risk of oxygen deficiency.
- (2) Undertake measurements of the working environment when undertaking work in places where there is a risk of oxygen deficiency, prior to the start of each and every work shift. If the measurement result exceeds the management standard, the Contractor shall immediately take necessary measures and ensure that no work is undertaken until the measurement reading shows a value below the standard value.
- (3) Comply with the following requirements when measuring the working environment:
 - 1) When entering the measuring area, protective gear such as respirators shall be worn so as not to directly breathe in the air in the measuring area.
 - 2) Measurements shall not be made by a single worker only; they shall be made always with the appropriate watch-personnel stationed.
- (4) Always maintain ventilation when work is undertaken at a place where there is a risk of oxygen deficiency.
- (5) Provide protective gear including respirators, evacuation tools including ladders and ropes, and other appliances necessary for rescue, when work is undertaken at a place where there is a risk of oxygen deficiency.
- (6) Take measures to prevent unauthorised access in areas where there is a risk of oxygen deficiency, and post relevant signs.
- (7) Ensure that the supervisor responsible immediately suspends the work whenever there is the potential for oxygen deficiency and evacuates workers to a safe place.
- (8) Ensure that rescue crew use protecting gear (such as respirators) when rescuing victims of oxygen deficiency and take measures to prevent secondary accidents.
- (9) Ensure that work is always undertaken with constant ventilation, when working in a closed space where an internal combustion engine of a construction machine is being operated.

5.9 Slinging Work

5.9.1 Key points for slinging work

The Contractor shall:

- (1) Ensure that slinging work is undertaken by personnel who have a license certified in accordance with the relevant laws and regulations of the recipient country or who have the equivalent knowledge, capability and experience.
- (2) Use slinging equipment appropriate for the shape and weight of the cargo to be hoisted.
- (3) Always check slinging equipment before use and specify checkpoints, inspection methods, and the responsible inspectors in advance. Any inappropriate or defective slinging equipment shall be discarded immediately.
- (4) Store slinging equipment in an orderly manner at a place free of rainfall, soot and dust.
- (5) Hoist pipes and other slippery cargo only after measures to prevent falls are taken.
- (6) Not hoist long and short materials together.
- (7) Use hoisting boxes and other appropriate methods when hoisting small materials.
- (8) Prevent unauthorised access to work areas where workers are undertaking slinging work.
- (9) Ensure that no workers are present under hoisted cargo.
- (10) Comply with the guidance specified in Clause 6.4.2.3.” Measures for operation of mobile cranes”

Chapter 6 Technical Guideline for Safe Execution (by the Type of Accident)

6.1 Measures for Prevention of Fall Accidents

6.1.1 General rules

When undertaking work at a place more than two meters above ground level, the Contractor shall construct scaffolding prior to the execution of the works and ensure that workers wear safety helmets when conducting the works.

Where it is impossible to construct scaffolding, workers shall use protective gear such as safety belts, fall arrestors and other anti-fall gear. The Contractor shall affix handrails, main ropes and other equipment as appropriate where the use of anti-fall protective gear is contemplated.

6.1.2 Scaffolding

6.1.2.1 Structure and materials of scaffolding

The Contractor shall:

- (1) Analyze the structural strength required for scaffolding based on the loads to be applied in the working areas and the expected service loads, and determine the appropriate structure for scaffolding.
- (2) Design the scaffolding structure to sustain expected loads for the relevant works after adequate review of the risk of any overturning or collapse of the structure.
- (3) Use materials for scaffolding that can be reasonably procured within the country in which the project is located. More specifically, the Contractor shall select reliable, durable and appropriate materials that are free of defects in terms of strength, damage or corrosion.
- (4) Construct scaffolding on a firm and flat foundation to prevent sliding or collapse and use additional supports as appropriate where any part(s) of the foundation is on soft ground.
- (5) Provide supporting measures such as braces to prevent the collapse of the scaffolding structure.

6.1.2.2 Measures for assembly and dismantle of scaffolding

The Contractor shall:

- (1) Prevent unauthorised access to the area where scaffolding is assembled or dismantled.
- (2) Specify the details of the responsible supervisor(s), the location of the work area, the scope, and procedure for the works, and the required protective gear.
- (3) Ensure that workers use appropriate protective gear such as safety belts when assembling or dismantling scaffolding if there is any risk of falling.

- (4) Install handrails along the entire length of the working floor to prevent accidents. Handrails shall be installed also at places other than working floors, where there is risk of falling. The height or structure of the handrails shall be adequately reviewed to prevent any accidents.
- (5) Install baseboards, mesh sheets, protection nets and other appropriate measures for handrails as required, so as to prevent the fall of objects from the working floor.
- (6) Provide appropriate means for workers to move between higher and lower level working areas
- (7) Apply floorboards to the floor of the working platform at appropriate intervals to prevent workers tripping over any openings between the floorboards. Floorboards shall be firmly fastened.
- (8) Where there are openings on the working area, install adequate handrails or fencing around the opening with sufficient signs and notifications at or near the opening. On non-working days, those openings shall be closed or covered up to prevent any falls.
- (9) Cancel work when workers are likely to be exposed to danger while undertaking work during bad weather such as strong wind or rainstorms. The procedure and requirement for cancellation of the works shall be predetermined based on the working conditions.

6.1.2.3 Measures on the use of scaffolding

The Contractor shall:

- (1) Specify and notify all workers of the maximum live load for scaffolding, and install signs showing such information at locations easily visible to workers.
- (2) Not place materials exceeding the predetermined upper limit of live loads in the working area.
- (3) Draw sufficient attention to where materials are placed in working areas, so as to ensure uniform placement and prevent destabilization of the scaffolding.
- (4) Not use the working platform to store materials other than those for immediate use. No materials or equipment shall be placed at access to the scaffolding.
- (5) Not remove or modify handrails installed at the working area or other parts of the scaffolding without prior approval. When handrails must be removed, the Contractor shall undertake the removal works after ensuring that there is no unauthorised access to the scaffolding and taking all preventive measures to avoid the occurrence of any accidents.
- (6) Inspect scaffolding daily before the commencement of work to ensure there are no problems with the scaffolding structure and the safety handrails. Any defective scaffolding shall be removed and/or repaired immediately.

- (7) In the case of inappropriate weather conditions such as strong wind or heavy rains, or natural disasters such as earthquakes, temporarily suspend works and inspect the scaffolding prior to the resumption of the works.
- (8) Take measures, so as to ensure that there is no unauthorized access into working areas where scaffolding is in place.

6.2 Measures for Prevention of Accidents Involving Flying or Falling Objects

6.2.1 General rules

When undertaking work involving a risk of flying or falling objects, the Contractor shall take the following measures into account for the particular work conditions. The workers shall also wear safety helmets.

- (1) Measures for the installation of safety nets
- (2) Measures for work areas with height differences or openings
- (3) Measures for work conducted at different heights
- (4) Measures for work with rotating machines

6.2.2 Measures for the installation of safety nets

The Contractor shall:

- (1) Install safety nets to prevent workers from being injured by objects falling from higher places.
- (2) Declare an area protected by a safety net to be off-limits, when the safety net is removed due to particular work requirements. After removal, the said area shall be immediately restored to its original condition.
- (3) Use safety mesh nets that fit the intended purpose and use.

6.2.3 Protection against flying or falling objects at work areas with heights or openings

The Contractor shall:

- (1) Use only appropriate lifting equipment such as rope or cranes when objects are to be transferred from a higher to a lower working area.
- (2) Keep clear all work areas where objects may easily fall such as on scaffolding in excavated or access areas. No materials or equipment shall be placed at or near such locations. In case materials or equipment have to be temporarily placed at these locations, appropriate measures shall be taken, such as fastening with ropes or packing in boxes or bags, so as to prevent scattering or fall of those objects or to prevent workers from tumbling or falling by tripping over them.
- (3) Take preventive measures involving the use of baseboards at the edges of working floors, openings, or the top of slopes, so as to prevent the fall of materials or equipment.

6.2.4 Measures for work conducted at different heights

The Contractor shall:

- (1) Coordinate works that are to be executed at varying heights, so as to avoid work being undertaken simultaneously right above or below at different heights.
- (2) Where work must be undertaken simultaneously at different heights, determine in advance the relevant supervisor for such works, the relevant work area, working time, and method and procedure of the works. Workers at different heights shall maintain constant communication with each other while undertaking the work.
- (3) Where work must be undertaken simultaneously at different heights, put up sufficient signage around that area and ensure in advance that workers communicate and coordinate the works to be executed at different heights. Sufficient signalmen and watch-personnel shall be stationed near those working areas, so as to ensure that the works are conducted in a safe and secure manner.

6.2.5 Measures for rotating machines

Machines that produce any flying material or cut waste shall be covered or protected by protective fences. In case it is difficult to use a cover or fencing due to the nature of work, workers shall use protective gear when conducting work. Any area subject to risk of falling or flying objects shall be declared off-limits for unauthorized workers.

6.3 Measures for Prevention of Accidents Involving Collapse of Structures

6.3.1 General rules

Depending on the work conditions, the Contractor shall consider the following measures when undertaking work where there is a risk of accidents involving the collapse of structures. In addition to the measures set out below, workers shall wear safety helmets when conducting the work.

- 1) Measures to prevent the collapse of the natural ground
- 2) Measures to prevent the collapse of cargo
- 3) Measures to prevent the collapse of temporary structures (timbering, forms, form shoring system, scaffolding, etc.)
- 4) Measures to prevent the collapse of structures

6.3.2 Measures to prevent the collapse of natural ground

The Contractor shall comply with the following guidances :

- (1) The guidance specified in Clause 5.1.1.2. "Cofferdam walls and timbering"
- (2) The guidance specified in Clause 5.1.1.3. "Excavation slope for open cutting"
- (3) The guidance specified in Clause 5.1.2.1. "Prevention of ground collapse"

6.3.3 Measures to prevent collapse of cargos

- (1) When loading materials on cargo handling machines, the Contractor shall undertake the loading work, so as to avoid uneven loading. In addition, the

materials shall be fastened or covered with ropes or sheets to prevent any collapse or fall.

- (2) When unloading cargos, the Contractor shall not pull out materials in the middle of the piling.
- (3) The Contractor shall appoint a supervisor for the loading and unloading work, which shall be undertaken under his instructions and control.

6.3.4 Measures to prevent the collapse of temporary structures (timbering, forms, form shoring system, scaffolding, etc.)

The Contractor shall:

- (1) When assembling forms and form shoring system, prepare the assembling diagrams in advance, and assemble in accordance with the plans and drawings. The Contractor shall assign the responsible supervisor for this work and the work shall be undertaken strictly in accordance with his instructions and control.
- (2) Inspect in advance the materials for use in temporary structures and, in particular, those that would be used repeatedly, and shall not use those that are damaged, deformed or corroded.
- (3) Shall prevent unauthorised personnel from accessing work areas when assembling or dismantling temporary structures, and postpone such work in the case of bad weather conditions such as strong wind or rainstorms.
- (4) Follow the guidance specified in Clause 5.1.1.2. "Cofferdam walls and timbering"
- (5) Follow the guidance specified in Clause 5.1.3. "Key points for cofferdam and timbering"
- (6) Follow the guidance specified in Clause 5.3.3. "Key points for the form shoring system work"
- (7) Follow the guidance specified in Clause 6.1.2. "Scaffolding"

6.3.5 Measures to prevent collapse of structures

- (1) The Contractor shall follow the guidance specified in Clause 5.7. "Demolition Work"

6.4 Measures for Prevention of Accidents Involving Construction Machinery

6.4.1 General rules

The Contractor shall consider the following particulars when undertaking work using construction machinery.

- 1) The Operator
- 2) Inspection and maintenance of the machines
- 3) Safety devices on the machines
- 4) Stationing of flagmen

- 5) Measures to prevent unauthorized access
- 6) Measures for the suspension and completion of work
- 7) Provision of training on safety issues

6.4.1.1 Operator

- (1) The Contractor shall appoint and permit only trained, qualified and certified operators of construction machinery to operate the machines. The names of the regular operators shall be inscribed on their respective machines and only those appointed operators shall operate the machines.
- (2) The Contractor shall take steps to ensure the good physical and health condition of the operators. The operators shall be trained to have sufficient rest and shall not be subject to excessive work.
- (3) The Contractor shall not permit any operator to operate construction machinery if he is seen to be under the influence of any of the following conditions:
 - 1) Intoxicated from consumption of alcohol
 - 2) Suffering from the effects of excessive consumption of alcohol
 - 3) Extremely exhausted
 - 4) Suffering from any other condition that makes him unfit for any works for the operation of construction equipment or machinery.

6.4.1.2 Inspection and maintenance

The Contractor's personnel with requisite knowledge and skill shall undertake inspection and maintenance of construction machinery in accordance with the relevant laws and regulations of the recipient country, prior to the start of work and at the predetermined times.

The Contractor shall undertake such inspection and maintenance taking into account the following requirements.

The Contractor shall:

- 1) In principle, undertake inspection and maintenance only after ensuring the machine has ceased to operate and the power is turned off.
- 2) Take appropriate measures to prevent falling or overturning machines.
- 3) Take appropriate measures to prevent any unauthorised access to the work area where inspection or maintenance is undertaken.
- 4) Undertake inspection and maintenance on a flat and secure surface when the machine is not in operation. If for some unavoidable reason it has to be undertaken on a slope, stoppers shall be applied for the undercarriage of the machine to prevent slippage or movement.
- 5) Shut down the engine of the construction machinery, engage the brake and lock all rotating parts.

- 6) Lower all attachments onto the ground. If for some unavoidable reason inspection or maintenance has to be undertaken under a raised blade or bucket, the Contractor shall take appropriate measures to prevent the attachment from dropping, for example, by using supports such as struts or blocks.
- 7) Take appropriate measures when a machine is being repaired, including the complete shutdown of the machine's functions and preventing any operation or movement of the machine during repair.

6.4.1.3 Safety devices

- (1) The Contractor shall check the safety devices fitted to construction machinery confirm the operation of the device, and shall not operate any construction machinery if the safety device has been removed or modified.
- (2) For construction machines capable of moving backwards, the Contractor shall use only such machines fitted with safety devices that give a warning when the machine moves backwards.

6.4.1.4 Stationing of flagmen

The Contractor shall:

- (1) Station flagmen when work is undertaken at the road shoulder, on the edge of a slope, and at other locations where there is a risk of vehicles overturning.
- (2) Station flagmen where workers and construction machinery are required, for unavoidable reasons, to work in the same vicinity.
- (3) Establish standardized signs and controlling procedures where flagmen are stationed.

6.4.1.5 Prevention of unauthorized access

The Contractor shall declare danger zones to be off-limits to unauthorised personnel in order to prevent the occurrence of accidents, such as injury caused by collision with construction machinery. Where it is impossible to restrict access for unavoidable reasons, the Contractor shall station flagmen or other appropriate personnel.

6.4.1.6 Measures for suspension and completion of work

When suspending or completing work using construction machinery, the Contractor shall:

- 1) Station construction machinery on flat and secure ground and lower buckets onto ground level.
- 2) Apply stoppers around the undercarriage of construction machinery to immobilize them when they must be positioned on a slope.
- 3) Turn off the engine, engage the brakes and remove the key from the vehicle.

6.4.1.7 Provision of education on safety

- (1) The Contractor shall provide operators and workers engaging in work using construction machines with necessary training, including training on the deployment of construction machines, the work area, the scope of work, the method of work, and the work procedures to be undertaken prior to the commencement of work.
- (2) Whenever any major changes are made to the deployment of construction machinery, the work area, the scope of work, the method of work, and the work procedures, the Contractor shall provide further training to the relevant operators and workers.

6.4.2 Measures for mobile crane work

6.4.2.1 Guiding and signaling for mobile cranes

- (1) The Contractor shall appoint only one signalman, who shall use the predetermined signals and provide signals in a clear manner.
- (2) The signalman shall give signals from a position outside the work range that holds a good view of the hoisted cargo and is reasonably visible by the crane operator.
- (3) In case the signalman has no choice but to give signals at a position not visible to the operator, he shall use radio or other means to allow the operator to receive the signals.

6.4.2.2 Measures for the arrangement and installation of mobile cranes

The Contractor shall:

- (1) Ensure that there are no obstacles in the work range of the mobile crane.
- (2) Establish a procedure that considers any obstacles in the work area and alerts all relevant workers and operators as to their existence in advance.
- (3) Check the ground conditions on which to position or transport the mobile crane.
- (4) Apply steel plates or conduct ground improvement works when the load-bearing capacity of the ground is insufficient, so as to prevent the crane from overturning.
- (5) Set the body of the mobile crane horizontally and extend the outriggers to their fullest depending on the load.
- (6) Conduct pre-operation inspection of the mobile crane to check safety devices or warning equipment. Safety devices or warning equipment shall not be turned off during work.
- (7) Check the condition of the outriggers or the condition of the ground on which the crane is positioned during operation. Any anomaly, if found, shall immediately be corrected or removed.

6.4.2.3 Measures for operation of mobile cranes

The Contractor shall:

- (1) Immediately suspend work if anomaly is found during the work, investigate the causes, and take all necessary measures prior to resuming work.
- (2) Confirm that the entire weight, including the cargo to hoist, hooks, slinging equipment and other hoisting attachments, is less than the rated hoisting load.
- (3) Provide indications or other means that allow operators and slinging workers to always be aware of the rated load of the mobile crane.
- (4) Use anti-release appliances when hoisting cargo, so as to prevent slinging equipment from releasing from the hooks.
- (5) When slinging cargo, temporarily stop the cargo when it is afloat only slightly from ground level, and check the machine for stability, the centre of gravity of the cargo and the condition of sling.
- (6) When hoisting cargo, position the hook right above the cargo to hoist.
- (7) When turning cargo, confirm that there are no workers or obstacles inside the turning range, and the operators shall slowly turn the cargo.
- (8) Slowly and silently lower cargo.
- (9) Not use mobile cranes to transport or hoist workers unless, because of the nature of the work or the need to complete the work, it is necessary to undertake such crane operation, in which case the Contractor shall take the following measures:
 - 1) Provide means to prevent overturning or falling off of the hoisting basket.
 - 2) Have workers use protective equipment such as safety belts.
 - 3) Use the power-driven lowering when the hoisting basket is lowered down.
- (10) Ensure that no operators leave the operator's cabin with the cargo hoisted up.
- (11) Ensure that no workers are present under the hoisted cargo.
- (12) Take appropriate measures to restrict unauthorised access during the mobile crane work, so as to prevent workers from entering areas where cargo may fall.

6.5 Measures for Prevention of Explosion Accidents

6.5.1 General rules

- (1) When handling explosives in construction work, the Contractor shall:
 - 1) Comply with all relevant requirements prescribed in the relevant laws and regulations of the recipient country.

- 2) Ensure that all necessary arrangements are made by qualified personnel prescribed by the relevant laws and regulations of the recipient country, and that workers are not exposed to any danger related to use of explosives.
- (2) Ensure that work contents, work methods and procedures, and other detailed work plans are prepared by the qualified personnel and made known to all relevant workers.
- (3) Appoint the responsible supervisors among the qualified personnel to supervise the work.
- (4) Ensure that workers to be assigned to blasting work are clearly identifiable from other workers by the use of signs or labels on their safety helmets.
- (5) Provide workers to be assigned to blasting work with sufficient training on the dangers of blasting work and the important particulars about safety and security.
- (6) Conduct blasting work on the ground in the daytime in principle. If blasting work has to be conducted after nightfall for unavoidable reasons, the Contractor shall provide sufficient lighting.
- (7) Secure the safety of workers engaged in other works by taking into consideration the following requirements:
 - 1) Blasting times shall be determined with the consent of the relevant supervisors in other works.
 - 2) An advance warning shall be given to the supervisors in other works, and blasting work shall be conducted after making sure those supervisors thoroughly understand when the blasting work is to be conducted.
- (8) Declare an area a "danger zone" where it is considered to be dangerous for workers as a result of blasting work, and declare an area a "safety zone" where workers can stand by there in safety during blasting work.
- (9) Take measures to ensure that worker's access to the danger zone is restricted by:
 - 1) Setting up a watch-station.
 - 2) Installing a warning signboard.
 - 3) Installing a blasting warning sign at an easily visible location around the danger zone.

6.5.2 Measures for storage of explosives

The Contractor shall:

- (1) Prepare a balance sheet of explosives recording the amount of explosives received, used, and remaining for each implementation of blasting work.
- (2) Strictly manage explosives balance sheets.
- (3) Take adequate care in relation to loss and theft of explosives.
- (4) Store explosives in a place:

- 1) Where access is restricted for unauthorized personnel, there is sufficient ventilation, clean and dry atmosphere is always maintained, and there is no direct exposure to sunlight.
- 2) Where there is no fire or risk of falling stones.
- 3) With a lockable facility to prevent entry from outside.
- 4) Resistant to fire.
- (5) Not store flammable materials such as dried grass, tree leaves or shrubs around the explosives storage.
- (6) Not open the storage door during thunderstorms or when a thunderstorm is expected.

6.5.3 Measures for transport of explosives

The Contractor shall:

- (1) Put detonation devices and explosives in separate containers and transported individually.
- (2) Not put explosives of different kinds in the same container.
- (3) Identify the containers in which the explosives are stored up, as such by attaching explosives signs on their exteriors.
- (4) Ensure that vehicles transporting explosives satisfy the following requirements:
 - 1) They run smoothly and are in good condition.
 - 2) They have a structure that does not cause the explosives to fall from their cargo rack.
 - 3) They are equipped with fire extinguishers.
- (5) Ensure that explosives are not transported by being tucked in workers' pockets or by being carried by workers.

6.5.4 Measures for handling of explosives

The Contractor shall:

- (1) Establish the work procedures for safe and efficient charging of explosives and make these procedures known to all relevant workers.
- (2) Ensure that explosives and detonators are handled carefully and are not beaten, thrown, or dropped.
- (3) Cancel any blasting work when lightning is likely.
- (4) Ignite explosives when conducting blasting, only after it has first evacuated workers in the danger zones, stationed watch-personnel to prevent access to the danger zones, and notified relevant parties of the blasting operation.

- (5) Drill boreholes after ensuring there are no slick holes or remaining powder from the previous blasting.
- (6) Handle and treat any misfired dynamites found after blasting, using appropriate methods.
- (7) Return powder planned to be used but not actually used, to the same explosives storage after completion of work.

6.6 Measures for Fire Prevention

6.6.1 General rules

The Contractor shall:

- (1) Appoint a fire control manager, and establish an emergency communication network and fire prevention management system.
- (2) Install fire-extinguishing facilities appropriate for the type of work conducted at all locations where a fire is handled, and clearly indicate the whereabouts of those facilities.
- (3) Replace fire extinguishers with new ones before expired.
- (4) Establish signals to warn of the outbreak of fire.
- (5) Review and undertake evacuation drills and fire-fighting drills.
- (6) Ensure that qualified personnel take precautionary measures when welding or cutting using fire.
- (7) Store waste contaminated with oil or solvent in metal containers, or dispose of it in the appropriate manner.
- (8) Ensure that no flammable materials are at or around a fire-handling site.
- (9) Immediately give a fire-warning signal following the outbreak of a fire.
- (10) Install warning signals throughout the entire construction site.

6.7 Measures for Prevention of Public Accidents

6.7.1 General rules for prevention of third-party accidents

When undertaking work with a risk of third-party accidents, the Contractor shall review following measures taking into account the particular work conditions:

- 1) Installation of temporary enclosures and gates and related measures
- 2) Measures relating to the area around gates to construction sites
- 3) Installation of temporary pedestrian passages
- 4) Communication with local residents in the vicinity of the construction sites
- 5) Decluttering and cleanliness

- 6) Measures relating to work on public roads
- 7) Prevention of flying or falling object accidents to third parties
- 8) Prevention of dust generation
- 9) Provision of sufficient lighting
- 10) Prevention of noise and vibration
- 11) Site patrol

6.7.1.1 Installation of temporary enclosures and gates

The Contractor shall construct temporary hoarding and gates on the perimeter of the construction site, so as to prevent access by third parties and the occurrence of public accidents.

6.7.1.2 Measures relating to temporary enclosures and gates

- (1) The Contractor shall construct temporary enclosures on the perimeter of the construction site to prevent third parties accessing the site at any given time. The Contractor shall review the structural measures designed to prevent children accessing the work area, taking into account the following requirements:
 - 1) Temporary enclosures shall be of a height that is difficult for children to climb over.
 - 2) The mesh-size used for the temporary enclosure shall be sufficiently small to prevent children from putting their limbs or heads through.
 - 3) Temporary enclosures shall have no open underside, so that children cannot slip through.
- (2) Temporary enclosures shall be made of materials that would withstand strong wind or external forces and be durable enough to persist during the planned installation period.
- (3) When installing temporary enclosures, the work shall be undertaken taking third parties into consideration.
- (4) Temporary enclosures shall be regularly inspected and maintained to ensure they prevent intrusions.
- (5) Gates shall be constructed on the temporary enclosures. The locations of the gates shall not disturb traffic of general vehicles and pedestrians.
- (6) Gates shall be lockable. When the gates are open, the Contractor shall take appropriate measures including the stationing of watch-personnel or flagmen for work vehicles.
- (7) Gates of temporary enclosures shall be indicated as such, and warning signs prohibiting entry of unauthorized personnel into the site shall be put up.

- (8) No third parties or general vehicles shall be allowed to enter the construction area without prior permission, regardless of whether or not work is being conducted.

6.7.1.3 Measures relating to the area around gates to construction sites

- (1) The Contractor shall provide entry and exit areas for work vehicles at the construction site and install appropriate guidance signboards or other similar measures to inform third parties including pedestrians of the entry and exit of work vehicles.
- (2) The Contractor shall ensure that the traffic of third parties is a top priority at the gates, and extend efforts to prevent public accidents associated with entry and exit of work vehicles. Traffic-control personnel or flagmen shall be stationed as needed taking into account the frequency of work vehicles accessing the gate and the general volume of traffic.

6.7.1.4 Measures relating to temporary pedestrian passages

When allowing third parties to use passages temporarily constructed for work, the Contractor shall create temporary pedestrian passage in accordance with the following requirements:

- 1) Fences or panels shall be set up on the border between the temporary passage and the construction area.
- 2) Temporary passages shall be wide and high enough for pedestrians to pass.
- 3) The floor of the temporary passage shall be designed, so as to prevent stumbling, slipping and other injuries.
- 4) Temporary passages shall be identified by the use of signs, and guidance signboards or other similar measures shall be provided to prevent accidental entry into the construction site.
- 5) Appropriate lighting shall be installed and activated on nightfall.
- 6) When work is undertaken above or near a temporary passage, measures shall be taken to prevent accidents caused by flying or falling objects.

6.7.1.5 Communication with local residents around the construction sites

- (1) The Contractor shall, jointly with the Employer and Engineer in accordance with the contract documents, notify the local residents of the outline of the construction work, and promote communication and cooperation with them on the work.
- (2) The Employer and Engineer shall enable communication to be convenient with local residents.

6.7.1.6 Decluttering and cleanliness

The Contractor shall always keep the inside and surrounding of the construction site decluttered and clean, so as to avoid causing nuisance to local residents.

6.7.1.7 Measures relating to work on public roads

When undertaking work on public roads, the Contractor shall take measures to allow the safe passage of general vehicles and third parties, and prohibit the entry of third parties into the work area.

6.7.1.8 Measures for prevention of accidents to third parties caused by flying or falling objects

The Contractor shall take measures to prevent objects flying or falling when undertaking work near the border of the construction site or in high places and there is a risk that third parties will be injured by those objects

6.7.1.9 Measures for prevention of dust generation

When dust is generated by implementing the construction work and can cause damage to the surrounding area, the Contractor shall take measures to prevent spreading of dust to the surrounding area taking the following requirements into consideration.

When allowing third parties to use temporarily constructed passages, temporary pedestrian paths shall be set up by:

- 1) Stopping or reducing the amount of work that generates dust.
- 2) Reducing the amount of dust generation.
- 3) Sprinkling water and using any other appropriate methods as necessary to reduce the spread of dust generated by the work.
- 4) Preventing dust from being scattered close to its source.

6.7.1.10 Provision of sufficient lighting

The Contractor shall provide another appropriate lighting where the construction work requires removal or relocation of existing public lighting facilities, causing any trouble to traffic of third parties.

6.7.1.11 Prevention of noise and vibration

The Contractor shall take measures to mitigate noise and vibration, which is generated when undertaking construction work and can cause damage to the surrounding area, by:

- 1) Stopping or reducing the amount of work that generates noise or vibration.
- 2) Taking measures to mitigate the source of the noise or vibration.

6.7.1.12 Site patrol

The Contractor shall patrol both the construction site and its vicinity to check and find any conditions that may affect third parties.

6.7.2 General rules on preventing accidents relating to underground utilities or facilities

- (1) When the presence of underground utilities or facilities is foreseen at a construction site, the Contractor shall conduct a survey on such buried utilities or

facilities based on the design documents and preliminary survey information, taking into account safe work methods and procedures for the protection of buried utilities or facilities.

- (2) When the presence of underground materials or facilities is foreseen at a work site, the Contractor shall consult with the relevant organisations in charge of such buried utilities or facilities, and after obtaining all appropriate permissions, shall undertake the necessary work in accordance with the relevant laws and regulations of the recipient country.
- (3) The Contractor shall check the kind and type, location (plan and depth), relevant standard, structure, and other details of the underground utilities or facilities in advance, so as to accurately understand the area of impact associated with excavation of those buried utilities or facilities.
- (4) The Contractor shall notify and ensure the relevant workers understand the information on the underground utilities or facilities, the method and procedure of excavation, the method of protection, emergency response and other necessary data relating to those utilities or facilities.

6.7.3 General rules on preventing accidents relating to aerial utilities including aerial lines

- (1) The Contractor shall survey aerial lines or other aerial utilities existing in the construction area and identify the type, location (position, height, etc.) and the relevant organisations of any such aerial utilities in advance.
- (2) The Contractor shall consult with the relevant organisations owning the identified aerial utilities, and after obtaining all appropriate permissions undertake the required work in accordance with the relevant laws and regulations of the recipient country.
- (3) Where construction work is likely to be in contact with or to cut aerial lines or other utilities during the work, the Contractor shall take protective measures by:
 - 1) Protecting aerial utilities such as aerial lines
 - 2) Installing height control facilities at the gate to the construction site
 - 3) Installing signage indicating the location of aerial utilities
 - 4) Restricting access of construction machinery and imposing restrictions on the turning movement range of the machines
- (4) Maintaining sufficient space when conducting work in the vicinity of aerial utilities.
- (5) Providing information to the relevant workers on aerial utilities, including the type and location, the work method and procedure, restricted access areas, and restricted turning movement ranges.

6.8 Measures for Prevention of Traffic Accidents

6.8.1 General rules on construction sites

When there is a risk of traffic accidents within the construction site, the Contractor shall adopt the following measures taking into account the work conditions:

- 1) Installing safety paths and related measures
- 2) Installing travelling routes for work vehicles and related measures

6.8.1.1 Installation of safety paths

The Contractor shall install and maintain safety pedestrian paths to ensure the safe passage of workers within the construction site.

6.8.1.2 Measures relating to safety paths

The Contractor shall:

- (1) Clearly separate safety paths from vehicle routes avoiding complicated crossings between them.
- (2) Ensure safety paths are wide enough to allow safe passage of workers taking into account the number of workers working in each site.
- (3) Take measures that prioritize pedestrians where safety paths cross vehicle routes.
- (4) Ensure safety paths have level floors, so as to prevent stumbling, slipping or other injuries.
- (5) Identify safety paths by signage.
- (6) Ensure no obstacles such as materials or equipment are placed on safety paths.

6.8.1.3 Installation of safety paths

The Contractor shall specify and maintain travelling routes for safe passage of vehicles and construction machines within the construction site.

6.8.1.4 Measures relating to the travel routes of work vehicles

The Contractor shall:

- (1) Clearly separate work vehicle travel routes from safety paths.
- (2) Ensure that work vehicle travel routes are wide enough to allow the passage of work vehicles in terms of the number, size and type of vehicles and machinery, and taking into account the scale of the relevant construction work.
- (3) Determine the alignment, profile and cross-sections for the travelling routes in consideration of the durability of the road surface, drainage systems and other factors in order to ensure safe passage of vehicles.
- (4) Avoid work vehicle travel routes with alignments that represent steep slopes or sharp curves.
- (5) Minimise the number of intersections between vehicle travel routes or crossings with safety pedestrian paths.

- (6) Ensure that no obstacles are placed on vehicle travel routes that would cause disruption.
- (7) Identify work vehicle travel routes using signs.
- (8) Determine and clearly indicate the applicable speed limits for the travel routes, and any weight limits that are imposed.
- (9) Station flagmen as needed at borders between work vehicle travel routes and public roads in order to prevent collisions with pedestrians or public vehicles.
- (10) Indicate height restrictions where aerial lines or other aerial utilities exist above the work vehicle travel routes, and prohibit the use of those routes by vehicles exceeding the restriction.

6.8.2 General rules on public roads

When there is a risk of traffic accidents on public roads in connection with the construction work, the Contractor adopt the following measures as appropriate for the particular work conditions:

- 1) Measures relating to commuting with cars
- 2) Measures relating to work on public roads

6.8.2.1 Measures relating to commuting with cars

The Contractor shall:

- (1) Determine commuting routes in advance and ensure that workers commute to work using the predetermined routes. If traffic conditions require a detour away from the predetermined commuting routes, the Contractor shall ensure workers drive in a safe manner, so as to prevent road accidents.
- (2) Ensure that drivers have a good understanding of the traffic conditions of the commuting routes.
- (3) Ensure that drivers shall consider the road conditions and shall not drive in haste.
- (4) Check the health conditions of drivers prior to driving, and shall prohibit from driving those who are likely to be unable to drive in a safe manner, because of, for example, fatigue, sickness or influence of alcohol.
- (5) Install and use appropriate lighting when driving is necessary after night has fallen.
- (6) Periodically inspect and maintain vehicles used for commuting, so as to prevent traffic accidents due to breakdown or defects.

6.8.2.2 Measures relating to work on public roads

The Contractor shall:

- (1) Obtain the relevant permission when it is necessary to conduct work on public roads, through the relevant procedures in accordance with the provisions of the relevant laws and regulations of the recipient country prior to the commencement of work.
- (2) Clearly indicate work areas on public roads and take measures to prevent unauthorised access by third parties to the area. Relevant watch-personnel shall be stationed as needed.
- (3) Maintain the travelling areas for pedestrians and public vehicles so as to prevent road traffic issues, and station flagmen at appropriate spots to guide public vehicles.
- (4) Maintain safe pedestrian passages for the smooth passage of children and the elderly.
- (5) Take measures to allow drivers of public vehicles to be able to identify the work area from a distance and drive in a safe and secure manner by:
 - 1) Installing road signs at work areas.
 - 2) Installing notice boards to give advance notice of work on public roads.
 - 3) Providing lighting that increases the visibility of road signs and notice boards, when working after nightfall.
 - 4) Firmly affix road signs and notice boards, so as to ensure they do not overturn owing to strong wind or rainfalls.
- (6) Provide appropriate lighting when undertaking work after nightfall, and take care to prevent the dazzling light of the installed lighting fixture from disturbing drivers of public vehicles.
- (7) Install a detour information board to inform public vehicles and pedestrians of the need for diversions of public vehicles, and deploy flagmen as appropriate.
- (8) Notify local residents of the plan to work on public roads, so as to obtain their understanding and cooperation.

6.9 Protective Gear

6.9.1 General rules

The Contractor shall:

- (1) Ensure that workers use personal protective gear appropriate for the type of work and working environment where they may be exposed to danger during construction work.
- (2) Use personal protective gear that is properly certified by the relevant laws and regulations of the recipient country.
- (3) Provide workers with training on how to use and manage protective gear, and instruct them to use it appropriately.

- (4) Ensure that workers use appropriate protective gear depending on the work, and undertake work in a safe and secure manner.

6.9.2 Safety helmet

- (1) The Contractor shall ensure that safety helmets are used to reduce the impact to the head in the event of a fall, and protect the head from flying or falling objects.
- (2) The Contractor shall inform workers of the type and location of work that requires safety helmets to be worn, and provide them with education on how to use the helmets. They shall also be instructed to use them whenever necessary.
- (3) The safety helmet shall be designed or conditioned to fit the head of a wearer, and the chinstrap shall always be tightened when the wearer conducts work with a risk of falling.
- (4) The Contractor shall ensure that damaged safety helmets are never used.

6.9.3 Safety belts

The Contractor shall ensure that:

- (1) Safety belts are used to prevent falls when work is undertaken at a high level, on the edge of a working floor, and near an opening where workers may fall.
- (2) Safety belts are used that are appropriate to the location or contents of work.
- (3) Workers are notified of the type and location of work that requires use of safety belts, and trained to correctly use them. They shall also be instructed to use them whenever necessary.
- (4) Damaged safety belts (even if damaged from a single event) are not used.
- (5) Safety belt hooks that have a latch are used.
- (6) Safety belt hooks are attached at a position higher than the waist.
- (7) A safety belt attaching system is installed whenever using a safety belt. The attaching system is strong enough to support a fall, and shall be checked for any anomalies before use.

6.9.4 Protective gear for the eyes and face

- (1) The Contractor shall ensure that protective gear is used to protect the eyes and face against sparks or minute powder dust generated from grinders, splashes of chemicals from solvents, or sparks or light beams from welding or cutting work.
- (2) When using protective gear for the face such as goggles, the right type of goggles shall be used taking into account the type of work.
- (3) Workers shall be notified of the type and location of work requiring face protective gear, trained to correctly use them and given detailed instructions to use them whenever necessary.

6.9.5 Protective gear for ears

- (1) The Contractor shall ensure that protective gear is used to protect the ears where strong noise is generated.
- (2) When ear protective gear such as ear plugs or earmuffs are used, the right type of gear shall be used taking into account the type of work.
- (3) Workers shall be notified of the type and location of work requiring ear protective gear, trained to correctly use them and given detailed instructions to use them whenever necessary.

6.9.6 Protective gear for hands

- (1) The Contractor shall ensure that protective gear is used to protect hands against substances that may damage the skin, and during welding or cutting work.
- (2) When protective gear such as gloves is used, the right type of gear shall be used taking into account the type of work.
- (3) Workers shall be notified of the type and location of work requiring hand protective gear, trained to correctly use them and given detailed instructions to use them whenever necessary.

6.9.7 Protective gear for feet

- (1) The Contractor shall ensure that protective gear is used to protect feet against injuries from falling objects, being caught between objects, electric shocks and skin-damaging substances.
- (2) When protective gear for feet such as safety boots or high boots are used, the right type of gear shall be used taking into account the type of work.
- (3) Workers shall be notified of the type and location of work requiring feet protective gear, trained to correctly use them and given detailed instructions to use them whenever necessary.

6.9.8 Lifebuoy

- (1) The Contractor shall ensure that lifebuoys are used to prevent drowning accidents, when workers undertake work where they may fall into water.
- (2) When lifebuoys are used, the right type of gear shall be used taking into account the type of work.
- (3) Workers shall be notified of the type and location of work requiring lifebuoys, trained to correctly use them and given detailed instructions to use them whenever necessary.

6.9.9 Respirators

- (1) The Contractor shall ensure that respirators are used to maintain breathing when workers undertake work where there may be explosions, fire, oxygen deficiency, or the handling of toxic gas, and also when such accidents have occurred.
- (2) When respirators are used, the right type of gear shall be used taking into account the type of work.

- (3) Workers shall be notified of the type and location of work requiring respirators, trained to correctly use them, and given detailed instructions to use them whenever necessary.
- (4) Respirators shall be periodically inspected and always be maintained in good condition.

6.9.10 Dust and gas masks

- (1) The Contractor shall ensure that dust and gas masks are used to protect workers against harmful conditions, when undertaking work that generates powder dust, gas or steam, or has other health hazards.
- (2) When dust and gas masks are used, the right type of gear shall be used taking into account the type of work.
- (3) Workers shall be notified of the type and location of work requiring dust and gas masks, trained to correctly use them and given detailed instructions to use them whenever necessary.
- (4) When dust and gas masks are used, the working parts of those masks shall be checked prior to use.
- (5) Dust masks shall not be used in a place, where there is a low oxygen concentration, or when filled with toxic gas.
- (6) When dust masks are used, spare dust masks or filters shall readily be made available.
- (7) When workers find it difficult to breathe with dust masks on, they shall immediately change the filters prior to re-use.
- (8) Gas masks shall not be used at a place with low oxygen concentration.
- (9) When gas masks are used, spare gas masks and canisters shall readily be made available.
- (10) The expected expiry of a gas mask shall be determined prior to use.
- (11) Whenever workers sense any abnormal odour during use of gas masks, they shall immediately check the status of the filter and change canisters in a safe place as required.