

*The Project for
Capacity Development of Road and Bridge Technology
in the Republic of the Union of Myanmar (2016-2019)*



SAFETY CONTROL MANUAL FOR ROAD & BRIDGE CONSTRUCTION

(1st Edition)



April 2019

Ministry of Construction, the Republic of the Union of Myanmar

Japan International Cooperation Agency

PREFACE

In the exercise of its primary mandate as the construction arm of the government, the Ministry of Construction endeavors to keep abreast with systematic quality control and the latest construction techniques, with the ultimate objective of being at par with the more advanced countries in ASEAN.

This quintessential goal cannot be achieved without having to adopt clear-cut, uniform, systematic and definitive procedures on Construction Supervision on Quality/Safety Control in the first place. It is a given prerequisite that Quality Infrastructure must be a direct result of good management and project implementation.

This manual, which was jointly prepared by the MOC Engineering Staff and the Experts assigned for the Project for Capacity Development of Road and Bridge Technology in the Republic of the Union of Myanmar (2016-2019) under the Japan International Cooperation Agency (JICA), serves an effective reference material to field engineers of road and bridge construction, instrumental in our pursuit of the aforementioned ambitious objective.

With this manual, the field engineers should become familiar with and knowledgeable of the overall process in Quality Control and Safety Control, thus making them more competent in constructing government projects that are in accordance with and in strict compliance to the specification/contract requirements of the project.

April 2019



U Han Zaw
Union Minister
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INTRODUCTION

BACKGROUND

The bridge construction technology has maintained in certain technological level since “Bridge Engineering Training Center (BETC) Project (1979-1985: JICA), however, new technology has not been transferred and bridge types that can be constructed in Myanmar are still limited. Besides, insufficient training for national engineers has hampered sustainable transfer of technology in bridge engineering. In this context, the Government of Myanmar requested “the Project for Capacity Development of Road and Bridge Technology” (hereinafter referred to as “the Project”) to the Government of Japan. Through series of discussion, Ministry of Construction (MOC) and JICA concluded the Record of Discussion (R/D) in January 2016 to implement the Project focusing on capacity development on construction supervision of bridges and concrete structures.

The Project was implemented for 3 years since 2016 in corroboration with MOC staff officer and JICA Experts aiming at improvement of quality as well as safety in construction of bridges and concrete structures. As the achievement of the Project, the Manuals on Quality and Safety Control for Bridge and Concrete Structure were developed in 2019 after several workshop and discussion.

Safety control team has made and disseminated this manual through several activities shown below;

Workshop and OJT performed under the Project

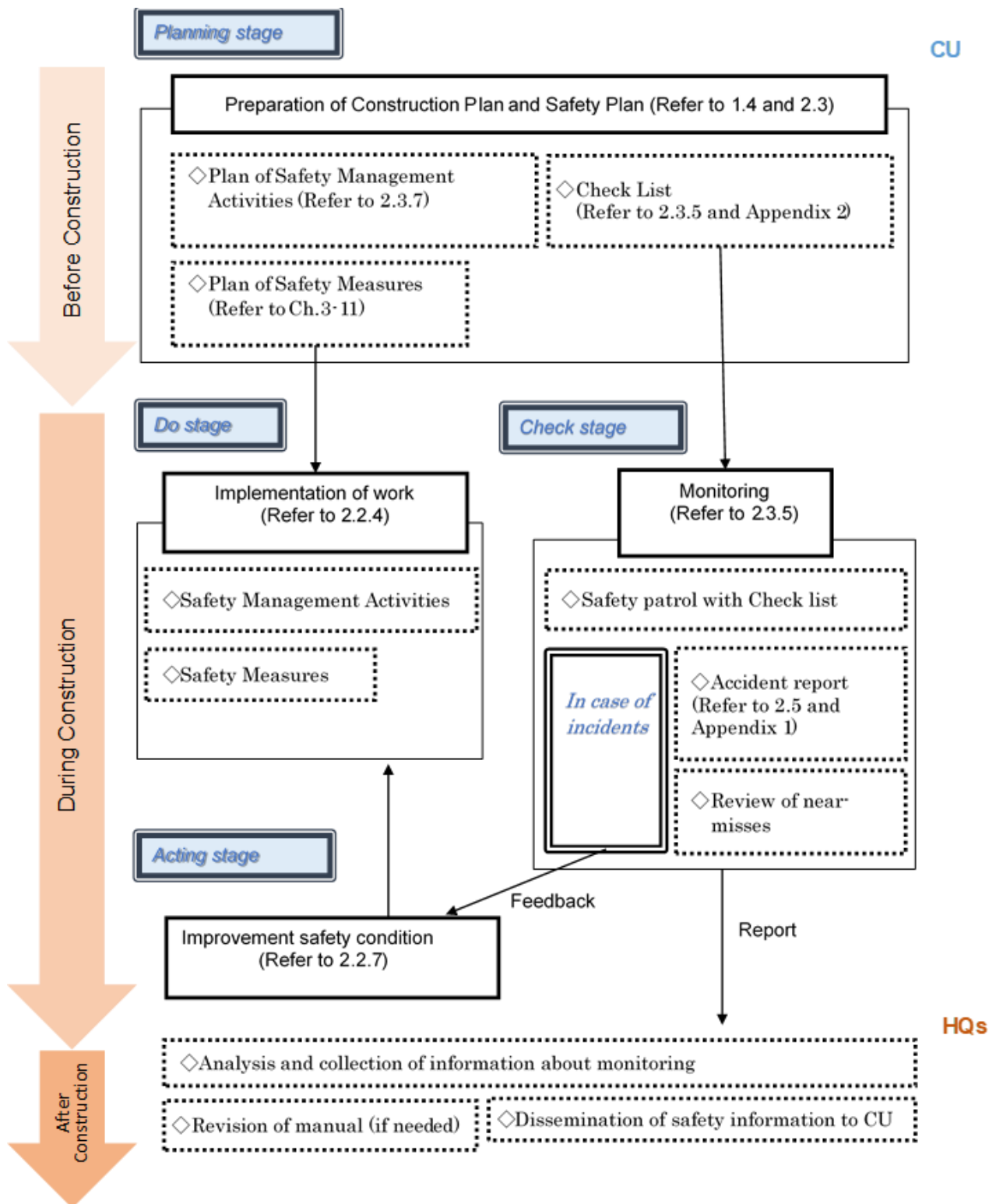
Date	Activity	Contents	Attendee	Site
June, 2016	1 st WS	Introduction	CTs	MOC HQs
February, 2017	2 nd WS	Kick-off meeting of Stage-2	CTs	MOC HQs
March, 2017	3 rd WS	Safety Management	CTs	MOC HQs
March, 2017	4 th WS	Organization for Safety Management	CTs	MOC HQs
June, 2017	5 th WS	Review of 1 st Term of 2 nd Stage and Introduction of 2 nd Term	CTs	MOC HQs
June, 2017	6 th WS	General Safety Measure	CTs	MOC HQs
June, 2017	7 th WS	Underground and Overhead Facilities Machinery and Equipment	CTs	MOC HQs
September, 2017	8 th WS	Temporary Construction	CTs	MOC HQs
September, 2017	9 th WS	Transportation of Bridge Foundation	CTs	MOC HQs
January, 2018	10 th WS	Concrete Structure Bridge Construction (Bridge Erection) Demolition Work of Structure	CTs	MOC HQs
January, 2018	1 st OJT	General Safety Measure	CTs/CU	Taung Bway Br.
April, 2018	11 th WS	General information about bridge erection	CTs	MOC HQs
April, 2018	2 nd OJT	Safety for each construction method (focus on bridge erection)	CTs/CU	Ngawon Bridge
August, 2018	12 th WS	Revising safety control manual	CTs	MOC HQs
August, 2018	Seminar	Introduction of our project and safety management on construction unit	CTs / PD of CU	MOC HQs
November, 2018	13 th WS	Manual Dissemination	CTs	MOC HQs
November, 2018	Seminar	Introduction of the Project & Safety manual	CTs / PD of CU	TTC
November, 2018	3 rd OJT	Examination for safety patrol by check list	CTs	Thilawa access road

REFERENCES

Following technical documents were referred as references.

- 1) Specification for Highway Bridges (2012, Japan Road Association, Japan)
- 2) Standard Specifications for Concrete Structures (2012, Japan Society of Civil Engineering)
- 3) Manual for Construction of Bridge Foundation (2015, Japan Road Association)
- 4) AASHTO LRFD Bridge Construction Specifications (3rd Edition, 2010)
- 5) The Guidance for the Management of Safety for Construction Works in Japanese ODA Projects (2014, JICA)
- 6) Manual for Construction Supervision of Concrete Works. (2016, NEXCO)
- 7) Manual for Construction Supervision of Road and Bridge Structures. (2016, NEXCO)
- 8) Construction Contract MDB Harmonized Edition (Version 3, 2010 Harmonized Red Book)

FLOWCHART OF SAFETY CONTROL



SAFETY CONTROL MANUAL FOR ROAD AND BRIDGE CONSTRUCTION

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ABBREVIATIONS

BSU	Bridge Special Unit
CU	Construction Unit
HQ	Head Quarter
PDCA	Plan Do Check Action
ROW	Right of Way

CHAPTER 1. GENERAL

1.1 PURPOSE

This manual is a guidance for safety construction, specifies general technical key points and required measures in order to ensure safety in civil construction projects.

1.2 SCOPE OF APPLICATION

This manual is applied to bridge construction projects of Ministry of Construction.

1.3 PRELIMINARY SURVEY

1.3.1 Confirmation of Construction Contents and Conditions, etc.

In preparing construction plan, construction conditions of items mentioned in drawing and specification, shall be grasped by preliminary survey, to secure safety.

1.3.2 Preliminary Survey

In preparing construction plan, to survey following natural condition and site condition shall be conducted appropriately.

Natural condition;

- Topographical condition
- Geological condition
- Meteorological condition
- Hydrographic condition
- Others

Site condition;

- Right of way
- Obstacles
- Traffic
- Surrounding environment
- Facility administration
- Others

1.4 CONSTRUCTION PLAN

1.4.1 Preparation of Construction Plan

Construction plan shall be prepared from a comprehensive view point so as to secure construction safety.

General point of view

- Construction schedule
- Equipment
- Labor
- Others

Difficulty degree evaluation point of view

- Quantity

- Topographical and Geological condition
- Size of structure
- Applied construction method
- Construction period
- Construction Schedule
- Materials
- Site
- Others

(1) Items for inclusion in the Construction Plan

Construction Plan shall cover necessary items based on specification and result of preliminary survey.
A typical Construction Plan shall comprise of the following:

Contents of construction plan (Example)

- Outline of construction
- Construction schedule
- Site organization
- Safety Management
- Specified machinery
- Main material
- Construction method
- Construction management plan
- Emergency system and correspondence
- Traffic Management
- Environmental measure
- Preparation of site work environment
- Promotion of using recycled resource and proper disposal of construction by-product
- Items specified in specification
- Others

(2) Consultation and Coordination

In case of construction which needs consultation and coordination with related organization, contents of consultation and decision shall be grasped adequately, and especially securing construction safety shall be taken into consideration. These contents need to be confirmed well because of generally becoming the constraint condition for the planning of construction procedure.

In case of construction of urban area, prevention of accident involving third person is especially important.

(3) Organization of construction project

Organization of construction project shall be described clearly in the Construction Plan.

Site organization

- Organization chart
- Roles and responsibilities
- Chain of command
- Communication network to relevant organization such as hospital, police, fire department, ministry of river and facility administrator, in emergency/ disaster

(4) Arrangement of Worker

Required number of workers shall be secured, and skilled workers shall also be secured. In case of shortage of worker unavoidably, countermeasures need to be taken into consideration in the Construction Plan, construction schedule, organization and construction machinery, etc.

(5) Planning of Construction Machinery and Equipment

Planning and selection of construction machinery and equipment shall be considered from a comprehensive view point.

Viewpoints of planning and selection of construction machinery and equipment

- Construction condition
- Capacity and adaptability of machinery
- Site condition
- Safety
- Environment

1.4.2 Modification of Construction Plan

In the construction phase, construction work shall proceed complying with the original construction plan faithfully.

In case of modifying the original construction plan because of difference between condition of prior examination and actual construction condition or new condition, construction plan shall be modified promptly in adequate consideration of whole situation.

1.5 CONSTRUCTION SITE MANAGEMENT

1.5.1 Construction Safety Organization

In order to ensure safety construction in conjunction with All Project Stakeholders, an organization for safety management on site and communication network with construction related organizations including adjacent construction works shall be established.

1.5.2 Broad Publication of Construction Contents

Contents, design condition, constructing condition and construction method of the construction project shall be disseminated to All Project Stakeholders.

1.5.3 Appropriate Arrangement of Workers

The Construction Plan shall be prepared in consideration of the number of workers possible to secure, and proper arrangement of unskilled/ aged workers shall be planned in consideration of work contents and work place, etc. In addition, individual deference in experience and capability etc. shall be

considered adequately in arrangement of workers.

1.5.4 Measures according to Site Condition

In the situation of difference between construction condition and the Construction Plan, inspection and analysis of the cause of difference shall be conducted promptly. And construction management shall be conducted through examining the measures of difference in consideration of change of condition.

1.5.5 Establishment of Emergency Communication Network

Emergency Communication Network shall be established;

- To keep close cooperation with related organizations and adjacent construction works to define mutual confirmation system for emergency communication.
- To identify a person responsible for report.
- To prepare an emergency contact list which mentioned related contact, person in charge and phone number, and to display it in readily visible location such as site office.

1.5.6 Contingency Measures

When occurrence of accident during construction is anticipated, measures shall be taken adequately based on the condition such as;

- To suspend the construction work promptly
- To guide evacuation of worker
- To report necessary information
- To take safety measures, etc.

1.5.7 Safety Management Activities

Refer to 2.3.7.

1.6 ROLES AND RESPONSIBILITIES

1.6.1 Organization Structure for Safety Management

Basic structure of site organization for safety management during construction is shown below.

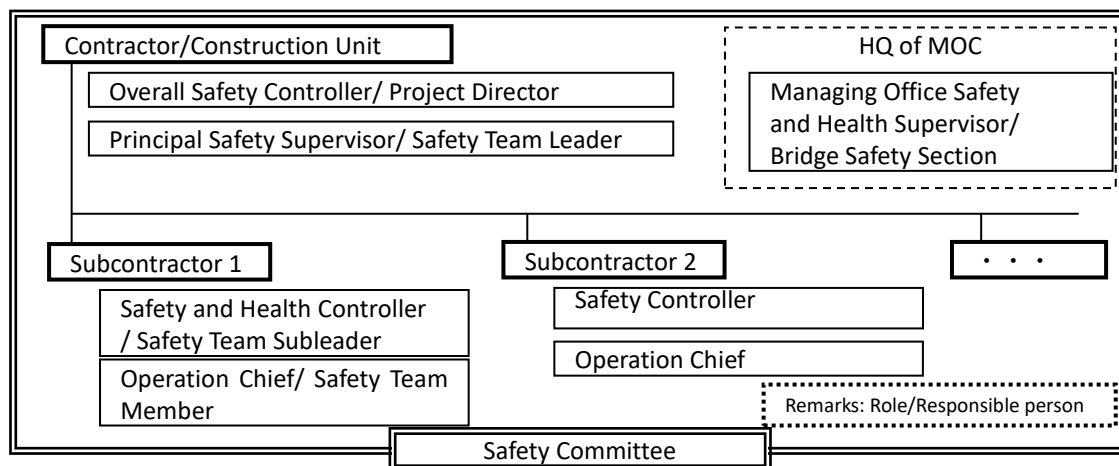


Figure 1.6-1 Basic Site Organization Structure for Safety Management

1.6.2 Roles and responsibility of each Position for Safety Management

(1) Overall Safety and Health Controller

Project Director of Construction Unit shall be appointed as Overall Safety and Health Controller.

Roles of Overall Safety and Health Controller are described below;

- To organize and operate Safety Committee
- To coordinate between relevant works
- To patrol construction site
- To assist safety education and training of worker
- To plan work schedule and installation of machinery and equipment
- Other necessary roles to prevent occupational accident

(2) Principal Safety and Health Supervisor

Safety Team Leader of Construction Unit shall be appointed as Principal Safety and Health Supervisor.

Roles of Principal Safety and Health Supervisor are described below;

- To manage technical matter of Overall Safety and Health Controller's tasks

(3) Managing Office Safety and Health Supervisor

Bridge safety section shall be appointed as Managing Office Safety and Health Supervisor.

Roles of Managing Office Safety and Health Supervisor are described below;

- To patrol construction site as needed through attached the check list for safety section
- To grasp working condition
- To attend Safety Committee
- To confirm plan of work schedule and installation of machinery and equipment

(4) Safety and Health Controller

Safety Team Subleader of subcontractor shall be appointed as Safety and Health Controller.

Roles of Safety and Health Controller are described below;

- To communicate Overall Safety and Health Controller
- To share information from Overall Safety and Health Controller to workers
- To manage implementation of items instructed from Overall Safety and Health Controller
- To coordinate plan of work schedule and installation of machinery and equipment for preparation of work order document
- To assess occupational accident risk of each work
- To contact and coordinate with affiliated subcontractor

(5) Operation Chief

Safety member of subcontractor shall be appointed as Operation Chief.

Roles of Operation Chief are described below;

- To communicate Safety and Health Controller
- To share information from Safety and Health Controller to workers
- To confirm pre-operation inspection
- To direct work method and arrangement of workers directly
- To inspect abnormal materials and eliminate defects

- To inspect safety of equipment and usage of them
- To confirm and direct cleaning of site to workers

(6) Safety Committee

Contractor/Construction Unit shall organize Safety Committee which is composed of all subcontractors. Followings are typical issues to be discussed under the Safety Committee.

- Confirmation of the result of Safety Inspection
- Creation of a check list which is specifically tailored to each site condition.
- (Refer to the attached check list for construction unit (example))
- Modification of Safety Plan
- Other safety topics
- Implementing safety patrol and report the result to Managing Office Safety and Health Supervisor

CHAPTER 2. SAFETY MANAGEMENT

This Chapter is based in the relevant chapter of “The Guidance for the Management of Safety for Construction Works in Japanese ODA Project”, published by JICA in 2014.

2.1 BASIC PRINCIPLE OF SAFETY MANAGEMENT

(1) Basic principle 1: Safety is a top priority

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

(2) Basic principle 2: Elimination of causes

The Contractor/Construction Unit 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.

(3) Basic principle 3: Thorough precautions

The Contractor/Construction Unit 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.

(4) Basic principle 4: Thorough compliance with relevant laws and regulations

Refer to 2.2.

(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.

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

Refer to 2.2.

(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.

(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 PDCA FOR SAFETY MANAGEMENT

2.2.1 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/Construction Unit shall have primary responsibility for the implementation of safety management.

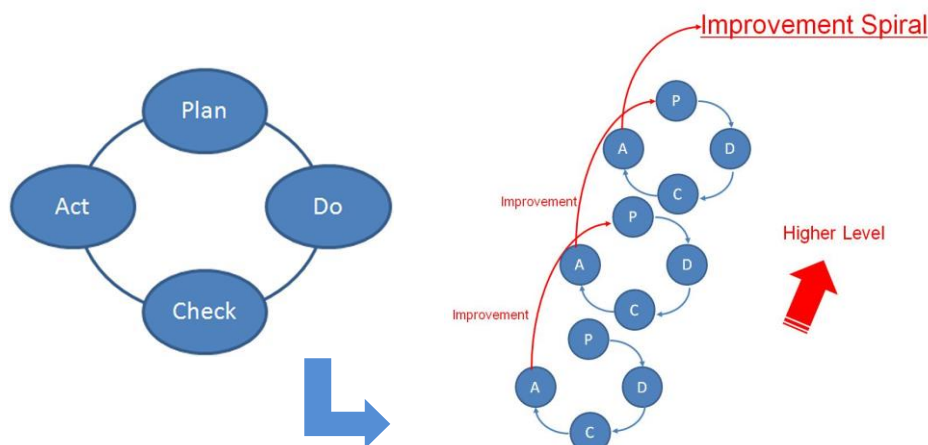


Figure 2.2-1 Conceptual Image of PDCA

2.2.2 Formulation of the "Plan"

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

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

2.2.3 Broad Publication at the "Planning" stage

The Contractor/Construction Unit 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.

2.2.4 "Do"

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

2.2.5 Observation and confirmation ("Check")

The Employer/Engineer shall review the Contractor/Construction Unit'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/Construction Unit shall check their own implementation of the "Doing" stage and implement improvements were insufficient in any way.

The managing office's safety managers/Bridge Safety Section of managing office in MOC shall undertake observations and checks.

2.2.6 Disclosure of results at the "Check" stage

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

2.2.7 "Act"

The Contractor/Construction Unit 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/Construction Unit 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.

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

In case the Safety Plan or the Method Statements on Safety is revised, the Contractor/Construction Unit shall document the revision and disclose such revision to All Project Stakeholders. In particular, the Contractor/Construction Unit 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.

2.2.9 Investigation of causes of occupational accidents

If an occupational accident takes place, the Employer, Engineer and Contractor/Construction Unit shall suspend construction work to the extent necessary during the necessary period and investigate the cause. The Contractor/Construction Unit 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/Construction Unit 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.

2.2.10 Continuous improvement

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

2.3 CONTENTS OF THE "SAFETY PLAN"

2.3.1 Composition of the Safety Plan

(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) Safety Management Activities
- 7) Sharing Information
- 8) Response to Emergencies and Unforeseen Circumstances

(2) Compliance with items for inclusion

Since items that constitute the Safety Plan as described in Clause 2.3.1 (1) "Items for inclusion in the Safety Plan" apply generally to all Projects implemented by MOC, the Contractor/Construction Unit shall incorporate all those items into their Safety Plan.

Items other than those specified in Clause 2.3.1 (1) which arise with respect to the scope of work or the conditions for construction, shall also be specified in the Safety Plan.

2.3.2 Basic Policies for Safety Management

The Contractor/Construction Unit 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 Myanmar, 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.

2.3.3 Internal Organizational Structure for Safety Management

The Contractor/Construction Unit 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 organizational 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 Subcontractor.
- 4) The names of individual persons need not be mentioned in the Safety Plan to be submitted together with the tender documents.

2.3.4 Promotion of the PDCA Cycle

The Contractor/Construction Unit shall set out the basic principles for promotion of the PDCA Cycle at construction sites in accordance with Clause 2.2 "PDCA for Safety Management".

2.3.5 Monitoring

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

(1) Monitoring safety of activities by Safety patrol

The Contractor/Construction Unit shall undertake Safety patrol at all areas on site to determine the extent of implementation and compliance with safety management principles in accordance with the check list.

Each construction site shall develop each check list which depend on site condition, in order to

implement safety patrol in accordance with each site condition.

In addition, the Contractor/Construction Unit shall report to the Employer/Engineer in accordance with the result of Safety patrol after internal discussion.

(2) Monitoring of accidents or injuries

The Contractor/Construction Unit 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 of the accident or injury in accordance with the relevant laws and regulations and the contract documents. The Employer, Engineer and Contractor/Construction Unit shall keep records of all such reports and maintain them until the completion of the work.

(3) Monitoring near misses

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

2.3.6 Safety Education and Training

The Contractor/Construction Unit 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 Myanmar on education and training on safety
- (2) Education to All Project Stakeholders (and to all new entrants to the site) on:
 - An overview of the construction site
 - General rules on the construction site including the Safety Plan
 - Protective gear
 - Items necessary to ensure safety when carrying out work in addition to 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
 - Workers engaged in work that is regulated by the laws and regulations of Myanmar
 - Operators or drivers of construction machinery or equipment
 - Workers engaged in work in excavated areas, shafts
 - Workers engaged in work that uses compressed air
 - Workers engaged in reinforcing bar work, concreting work, or formwork
 - 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

2.3.7 Safety Management Activities

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

- Morning meetings on safety
- Foreseeing hazardous activities
- Tool box meetings
- Safety rota systems
- Regular, monthly and periodic inspections
- Sorting, decluttering and cleaning
- Safety conventions
- Safety patrol
- Near-miss reporting system
- Other activities



Figure 2.3-1 Morning Meetings on Safety



Figure 2.3-2 Other Activities (Training for Extinguishing Fire)

2.3.8 Sharing Information

The Contractor/Construction Unit 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

2.3.9 Response to Emergencies and Unforeseen Circumstances

(1) Response to emergencies

The Contractor/Construction Unit shall determine the policies for responding to emergencies

considered to be caused by accidents whilst taking into account the following requirements:

- The priority of saving human lives
- The establishment of an emergency communication network
- Procedures for responding to emergencies
- Responding to first-aid treatment
- Reporting on accidents and injuries

(2) Responding to unforeseen circumstances

The Contractor/Construction Unit 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:

- Emergency evacuation procedures
- The establishment of an emergency communication network system
- Procedures for responding to unforeseen circumstances
- Collection of weather information

2.4 CONTENTS OF THE “METHOD STATEMENTS ON SAFETY”

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

The Contractor/Construction Unit 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/Construction Unit shall incorporate the following items in any Method Statements on Safety:

(1) Construction plant and machinery

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

(2) Equipment and tools

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

(3) Materials

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

(4) Necessary qualifications and licenses

The Contractor/Construction Unit shall include the required qualifications and licenses required for each type of work.

(5) The order of command for the works

The Contractor/Construction Unit 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/Construction Unit shall categorize each item of work and set them out according to the work schedules.

(7) Procedure for the execution of the works

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

(8) Foreseeable risks

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

(9) Precautionary measures

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

2.4.2 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 2.4.1 "Items for inclusion in a Method Statements on Safety".

(Template)

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

2.5 REPORTING ON DISASTER AND OCCUPATIONAL ACCIDENT DURING CONSTRUCTION

2.5.1 Report on Disaster

When disaster corresponds to the following condition of damage by disaster, it shall be reported to Head Office promptly.

- Disaster involving third party (public).
- Disaster requiring cost and long period to recover.
- Disaster socially high interest as news.
- Disaster affecting schedule of opening to traffic.
- Disaster affecting wide area damage.
- Other serious and emergency disaster.

2.5.2 Report on Accident during Construction

(1) Case of Report required

When accident occurs during construction and corresponds to the following items, it shall be reported from Construction Unit to Head Office promptly according to 2.5.2 (2) Report Method.

- Accident causes death or casualty of third party (public)
- Occupational accident causing death of construction participant (including MOC staff)
- Occupational accident causing a number of casualties of construction participant (including MOC staff)
- Occupational accident causing casualties of MOC staff
- Accident causing socially serious damage
- Accident tending to occur similar
- Accident that news coverage is expected

(2) Report Method

(i) Prompt report (The 1st Report)

When an accident occurred, the information shall be reported from Construction Unit to Head Office first of all. Even if details and severity of the accident are not clear, reporting promptly is the first priority. Only the fact that becomes clear shall be reported by telephone or Accident Report (Form-1), etc. as a prompt report.

(ii) Accident report (The 2nd Report)

In addition to the 1st Report by telephone, etc. the 2nd Report shall be reported promptly by Accident Report (Form-1). Priority of the 2nd Report is also prompt report, therefore it does not need to fill out all information, attached documents and drawings to the 2nd Report.

(iii) Accident report (after the 3rd Report ...)

Based on the investigation and interview, additional information shall be filled out in Accident Report (Form-1), and the Form-1 shall be reported timely.

(3) Report Items

(i) Accident Report (Form-1)

Table 2.5.1 Report Item

Item	Contents
Organization	Construction Unit number
Project Name	xx Construction Project, etc.
Date, Time, Weather	Sunny, Cloudy, Rainy, Snowy, Foggy, Storm, Rainstorm, etc.
Place	State/Division, District, Township, Village, Ward, Kilometer post, Inbound, Outbound, etc.
Project Outline	Section/ Contractor, Contract Period, Contract Amount
Description of Accident	Detail and explanation of accident
Status of Accident	Occupation/ Career, Career of this site, Address, Company, etc.
Damage severity	Instant death, X hours later death, Serious injury of complete cure for X month, Cutting of X part, etc.
Type of accident/ Classification of injury	Type of accident: “A” Self-inflicted accident or “B” Extra punitive accident Classification of accident: “1” Death, “2” Critical condition, “3” Serious or Slight injury, “4” Only property damage
Status of Object damage	Type of damaged item, Extent of damage, etc.
Comments on Accident	Cause, Comments of Police/Authority, etc.
Measures to be taken after the accident	Treatment of victim or Consideration matter, Protection measure of the site of accident, etc.
Interview/ News	News coverage by press regarding the accident, Situation of news

(ii) Documents required for Report

Following documents shall be attached for explanation of Accident Report (Form-1) as needed. However, reporting promptly is high priority, therefore it does not need to report with collecting all documents, and these documents can be reported separately according to circumstances.

- (1) Site location map: To clearly indicate construction area.
- (2) Drawings for explanation of accident situation: Plan view, etc. to grasp accident situation easily.
To attach cartoon, if accident situation is easily grasped by it
- (3) Supplementary explanation documents: To supplementary explain matters, which is difficult to explain with Accident Report (Form-1), in detail as far as possible.
- (4) Photos of the site:
- (5) Other necessary documents: newspaper report of the accident, time series, recommendation of corrective action, etc.

(4) Items to be sorted out after the accident in order to prevent future accident

(i) Accident List (Form-2)

Accident List of Form-2 shall be prepared based on Form-1. In addition to the data of Form-1, Category

of accident and Type of accident shall be filled out. And Accident List (Form-2) shall be maintained every time when accident occurs.

a) Definition of Accident

Accident means the applicable case of human loss (condition of injury: death, serious* injury, slight injury) and/or material loss.

* Serious means approx. one month and more

b) Category and Type of Accident

Table 2.5.2 Category and Type of Accident

Accident Category	Accident Type	Remarks
Fall	Scaffolding	Scaffolding, Temporary passage, Foot board, Landing
	Ladder	Ladder, Stepladder, Trestle
	Bridge	
	Form	Form, Form support
	Machinery and Equipment	
	Slope	Slope, Cliff
	Others	Others, except for the above
Flying or Falling objects	Carry by crane	Objects (suspended load) which is carried by crane
	Member before the installation	Instrument, Load, Member, etc. before the installation
	Member after the installation	Log, Square timber, Panel, etc. after the installation
	Others	Others, except for the above
Collapse	Rock falling, Spalling, Loose rock falling, Collapse of face	
Crane	Turnover, Scrap, Contact, Collision, etc.	
Vehicle	Turnover, Scrap, Contact, Collision, etc.	
Construction machinery	Turnover, Scrap, Contact, Collision, etc.	
Transport	Turnover	Including piling up, unloading, fall down by human power
	Scrap, Contact, Collision, etc.	
Others	Electric shock	
	Explosion, Fire	
	Handling tools	

c) Type of Machinery

Table 2.5.3 Type of Machinery

Accident Category	Type of Machinery	Remarks
Crane	Stationary type	Derrick crane, Cable Crane, etc.
	Mobile type	Mobile crane
	Elevator	Construction work elevator, Construction work lift
	Winch	Lifting device using winch
	Others	Other lifting devices
Vehicle	Dump truck	
	Truck	
	Car	
	Concrete mixer truck	
	Others	
Construction machinery	Backhoe	
	Bulldozer	
	Tunnel Machinery	Tunnel earth-moving machineries, Railway equipment, Conveyor belt, etc.
	Roller	
	Grader	Motor grader, Motor scraper, etc.
	Pile driver	Pile driver, Pile extractor, etc.
	Others	

(ii) Prevention Initiative List (Form-3)

To mention cause of accident, countermeasures, progress after the accident (initiatives for prevention of accident, return to work of victim, etc.) in Form-3 concisely.

(iii) Detailed Accident Report

a) Accident situation

- To mention the outline concisely using photo and illustration.

b) Cause and Measure

- To mention based on corrective instruction, result of emergency safety inspection and safety committee.
- To insert figure and photo as needed.

(iv) Data aggregation

Data collection period: 1 year

Target project: All construction project during data collection period

Note; In order to add up total working hours, to pay attention so as not to omit target construction project.

(5) Procedure of Report and Arrangement

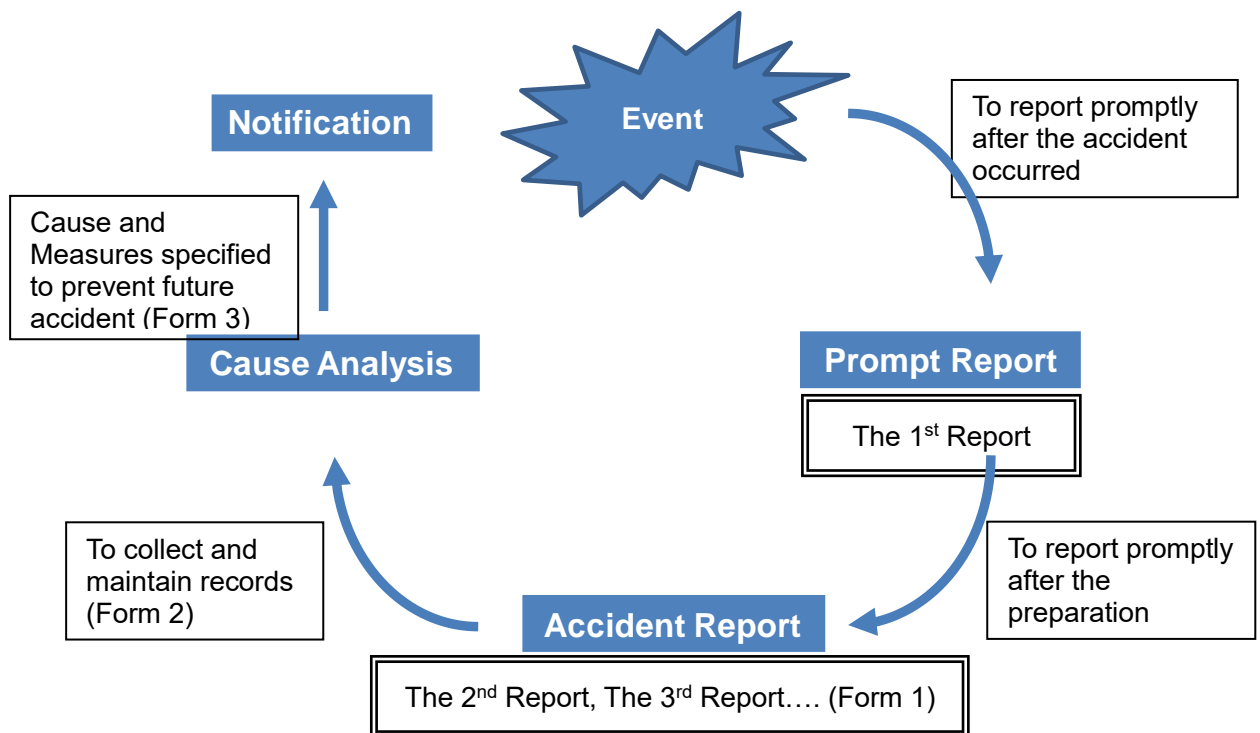


Figure 2.5-1 Procedure of Report and Arrangement of Accident

(6) Report Form

Table 2.5.4 Report Form

Form	Item	Unit	Purpose	Remarks
1	Accident Report	Each accident	To report accidents	Prepared by CU/BSU* Collected and Maintained by Bridge Safety
2	Accident List	Each accident	To collect and maintain records	
3	Prevention Initiative List	Each accident	To analyze cause and countermeasure	

*CU: Construction Unit, BSU: Bridge Special Unit

CHAPTER 3. GENERAL SAFETY MEASURE

3.1 CONSIDERATION OF WORK ENVIRONMENT

3.1.1 General Measures

- Site shall be clean and in orderly condition.
5-10 minutes cleaning before end of work is recommended.
- When temperature is high and sunshine is strong, countermeasure of heatstroke such as stock of salt candy/electrolyte beverage and skip work on high temperature time shall be necessary.
- A doctor should be assigned for the construction sites on remote areas as needed.
- Health condition of workers should be checked timely. If health condition of worker is bad, medical check-up should be provided as soon as possible.
- Medical check-up (e.g. blood pressure, heart beat) should be prepared for workers who are assigned for high-place or underwater works before commencement of work.
- First Aid Box should be prepared at every construction site.
- Worker shall wear proper equipment as below;
All site: helmet, shoes, clothes with long sleeves and reflective jacket etc.
High place: safety belt
Required place: gloves, goggles and mask



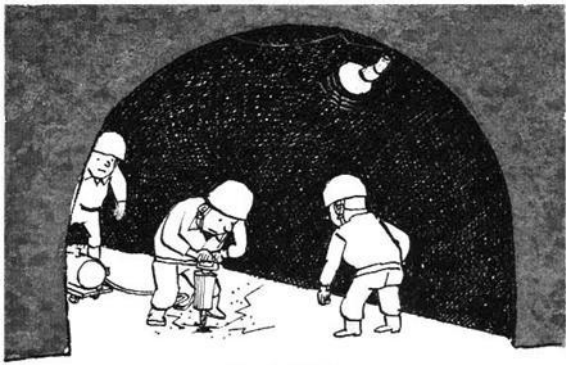



Figure 3.1-1 Proper Equipment (All site)



Figure 3.1-2 Proper Equipment (High place)

3.1.2 Measures needed at Poorly Ventilated Place

- Using machinery having internal-combustion engine shall be prohibited at the place where natural ventilation is insufficient. Sufficient ventilation measure shall be taken, when unavoidably using internal-combustion engine.
- Prevention measures of scattering of dust shall be taken. Especially, personal protective equipment shall be used at the place where dust occurs remarkably.

	
<p>Figure 3.1-3 Internal-combustion Engine</p>	<p>Figure 3.1-4 Ventilation Measure</p>
	
<p>Figure 3.1-5 Dustproof</p>	<p>Figure 3.1-6 Dust Respirator/Mask</p>

3.1.3 Measures to be taken at Extremely Noisy Place

- It shall be indicated that extreme noise occurs at the place, and to disseminate it to workers.
- Personal protective equipment shall be used such as earplug at the extremely noisy place.

3.1.4 Ensuring Safety on the occasion of Construction using Machinery in Narrow Working Space

- Working space and operating range/ working capacity, etc. shall be grasped and consider selection of machinery sufficiently in preparation of Construction Plan.
- Safety measures shall be planned through examination of work method and work plan such as work procedure etc. among operator, worker and operation chief in advance, for the work in combination with machinery and manpower at the narrow place.

3.1.5 Working Environment Measurement

Each required environment items shall be measured at the following places;

- Measurement of amount of dust: pit, indoor, etc. where dust such as soil and stone, rock, etc. occurs remarkably.
- Measurement of quantity of airflow, temperature, carbon dioxide gas, etc.: In a pit where ventilation equipment is installed.
- Measurement of concentration of oxygen and hydrogen sulfide, etc.: At the work place at risk for



Figure 3.1-7 Sign of High Noise Area

oxygen deficiency.

3.2 SECURING OF CONSTRUCTION SITE

3.2.1 Entry Prevention Facility of Construction Zone

- Construction site shall be divided clearly between workers and third party, by surrounding construction site with steel plate, sheet or guard fence, etc. as required.
- Entry prevention facility shall have a structure that prevents third person such as children from entering easily.
- Entry prevention facility, construction sign, lighting equipment, etc. shall be maintained.
- A locking device shall be installed in a gate of entry prevention facility.
- Fall prevention measures shall be taken by covering or enclosing an opening by a fence, in case that an opening by excavating is located close to a road and a passage.



Figure 3.2-1 Guard Fence and Sheet 1



Figure 3.2-2 Guard Fence and Sheet 2

3.2.2 Occupation of Existing Road

- Conformable equipment to conditions for permission of occupation shall be installed, and be maintained adequately, in case of occupation of existing road.
- Signboards shall be installed in specified place without traffic disturbance and be maintained adequately.
- Condition of night lighting, security lighting and guide lighting shall be inspected and be maintained adequately.



Figure 3.2-3 Occupation of Existing Road with Signboards, Lightings

3.2.3 Installation of Signboards

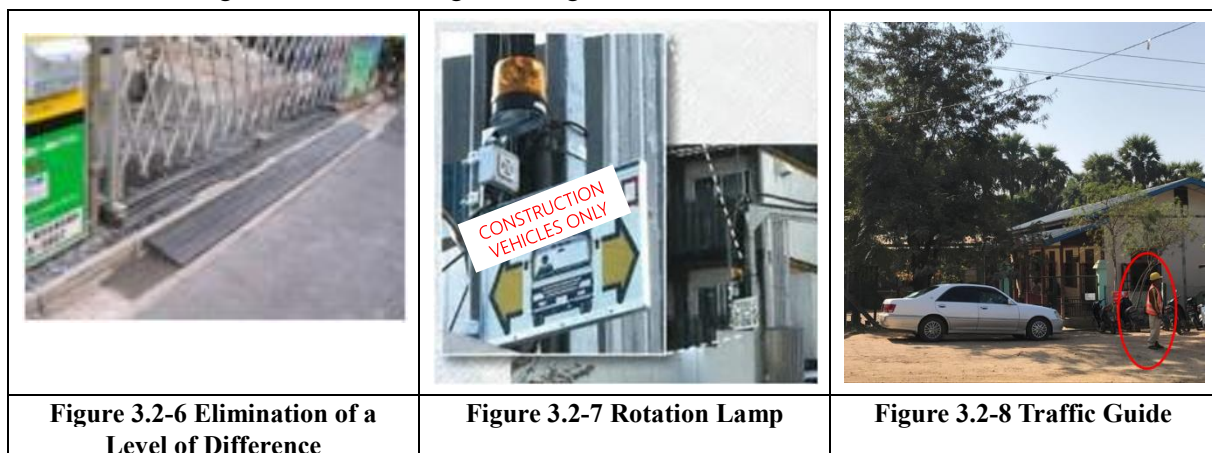
- Signboards shall be installed such as construction signboard, diversion board, etc. in specified place without traffic disturbance, and be fixed so as not to fall down.
- Guide signs shall be installed at the place where driver and pedestrian can watch it easily.
- Measures of keeping visibility of signboards in night time shall be taken.
- Signboards shall be adequately maintained.

- Signboards shall be described by Myanmar language which worker can understand.



3.2.4 Traffic Accident Prevention near the Gate of Construction Site

- A level of difference, a gap and a slip shall be eliminated at the gate facing on existing road.
- Buzzer or rotating lamp shall be installed in the gate of construction vehicles from public road in order to alert pedestrians and general traffic to the entrance and exit of construction vehicles as needed.
- Priority to pedestrians and general traffic shall be given at the gate, and make effort to prevent traffic accident caused by entrance and exit of construction vehicles.
- Traffic guides shall be arranged at the gate, as needed.



3.2.5 Harmonization with Local Residents

- Effort shall be made to get the understanding of local residents before the commencement of construction.
- The considerations of construction vehicles in going and leaving to/ from school shall be disseminated to All Project Stakeholders, in the case that construction site is located in school zone.

- Effort shall be made to get the understanding of local residents by circulating/ or posting the progress.
- A complaint or an opinion from residents shall be accepted politely, and to take necessary measures, when local residents make a complaint or an opinion during construction.

3.2.6 Traffic Safety out of Construction Site

Workers shall drive safely and carefully, even outside of construction site.



Figure 3.2-9 Explanation to Local Residents

3.3 PROHIBITION OF ENTRY

A notice of the prohibition of entry including the information of the danger shall be indicated at an easily visible location.

Place where entering is prohibited

- The place where dangerous work is carried out with taking care of relevant person.
- The place where workers might be endangered by entering of person except for relevant person entering.
- The harmful place where person's health might be endangered by entering without protective equipment.



Figure 3.3-1 No Unauthorized Entry

3.4 ARRANGEMENT OF WATCHMAN AND GUIDE

3.4.1 Arrangement of Watchman and Guide

- Watchman and guide shall be arranged as needed depending on the site condition and the work method, in construction project.
- The site condition, the hazard prevention, etc. shall be fully disseminated to watchman and guide.



Figure 3.4-1 Watchman and Guide

3.4.2 Unification of Signs and Signals

- Signs and signals shall be unified so that worker and watchman/guide can communicate regarding following items effectively and quickly, especially in the site where a number of subcontractors are working.
- 1) Unification of signs for crane works

- 2) Unification of warnings
- 3) Unification of training methods of evacuation
- 4) Other necessary items

- A transmission method suitable for site condition shall be adopted. (such as a number of mobile receiver or transceiver)

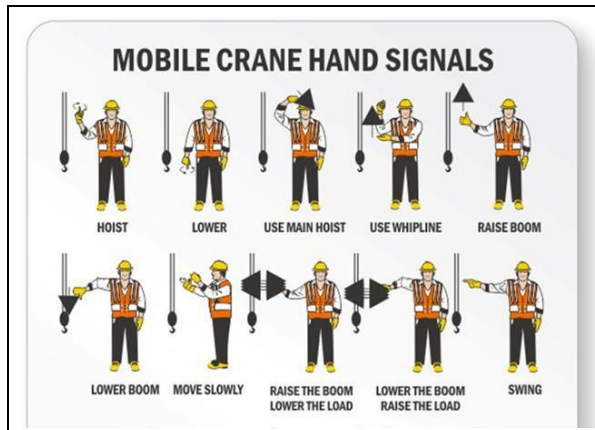


Figure 3.4-2 Signal (example1)

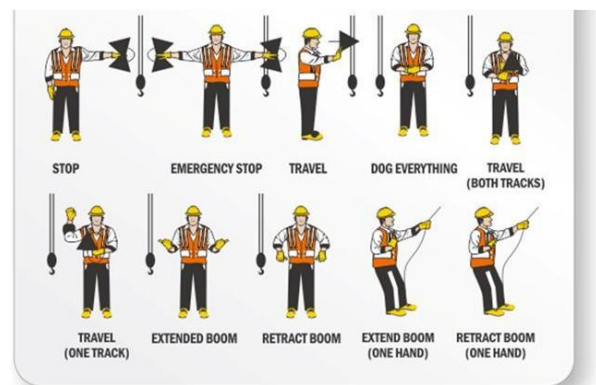


Figure 3.4-3 Signal (example2)

3.4.3 Full dissemination of Signs and Signals to all workers

- New entrants shall be educated about signs/ signals applied to their work.
- Specified signs/ signals shall be reconfirmed before starting work every day.
- The signboard of various standard signs/ signals shall be prepared, and posted in the construction site.
- The standard signs/signals shall be disseminated to relevant machinery, etc. by posting its small sized version

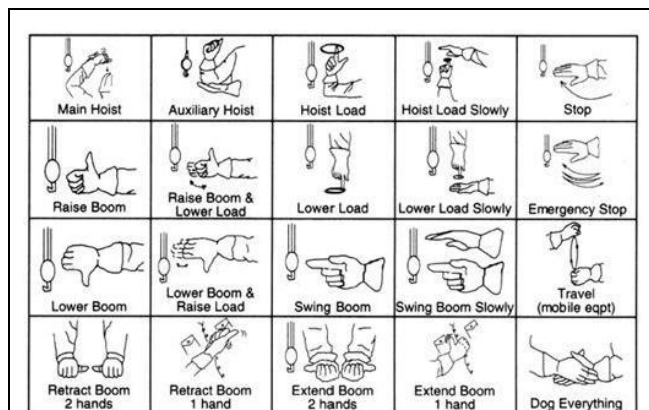


Figure 3.4-4 Signboard of Crane Signal (example)

3.5 FALL PREVENTION

3.5.1 Fall Prevention from Scaffolding

- Safe work platform shall be installed by constructing scaffolding, etc. in case of works at the location with over 2m-high.
- Protective net shall be installed and workers shall use safety belts when it is difficult to install work floor, fence, etc. or when temporarily removing fence, etc. because of work arrangement.
- Main rope, etc. shall be installed so that workers can connect safety belts easily when constructing/ dismantling scaffolding and steel-frame.
- Work platforms such as scaffolding, etc. shall be maintained by the result of daily inspection before starting works and as needed.
- “Safety Passage” shall be displayed at visible place of passage.

- Lighting shall be installed as far as it does not disturb traffic, in case of underground working or night work.
- A surface of passage shall be maintained safely in order to avoid stumbling, slips and treading on a prick, etc.

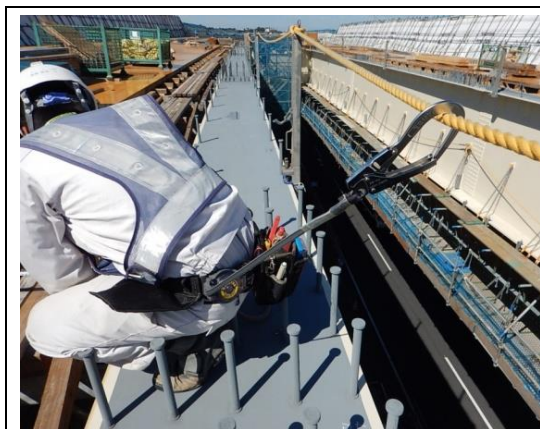


Figure 3.5-1 Safety Belt



Figure 3.5-2 Safety Passage

3.5.2 Fall Prevention from opening of Work Platform and Opening

- Fence, handrail, cover, etc. shall be installed at the end of work platform, the opening, etc.
- Protective net shall be installed, and to force workers to use safety belts if it is difficult to install fence, etc. or when temporarily removing fence, etc. because of work arrangement.
- Not to put materials on the cover of the opening of floor. And to post a notice to that effect.
- Signboard of "No Unauthorized Entry" shall be installed, and watchman shall be arranged, in case of working in the condition of removing fence, cover, etc. unavoidably. And to restore the removed fence, etc. after completing the work.



Figure 3.5-3 Fall Prevention at the end of Work Platform



Figure 3.5-4 Fall Prevention at the Opening



Figure 3.5-5 Signboard of Entry Prohibited

3.5.3 Fall Prevention of Excavation

- Main rope shall be installed, and worker shall be used safety belts, in case of work (such as slope leveling by manpower, etc.) having a risk of fall.
- A safe raising and lowering equipment shall be installed when workers need to go up and down at a slope. And to install main rope, and to have workers use safety belts when it is difficult to install a raising and lowering equipment.
- Fall preventive net, etc. shall be installed when a top of slope is used as a passage.

- A passage shall be installed as needed in case of excavation in retaining wall, timbering, etc. And to prohibit passing on the members (such as strut, waling, etc.) of retaining wall, timbering, etc.



Figure 3.5-6 Main Rope and Safety Belts



Figure 3.5-7 Raising and Lowering Equipment



Figure 3.5-8 Fall Prevention at top of Slope

3.5.4 Fall Prevention Measures for Workers

- Safety education for new entrants shall be implemented regarding dangerous place/work having a risk of falling in advance.
- Worker shall be educated and instructed about prohibition of removing fall protective equipment without permission.
- Worker shall be instructed about maintenance of protective equipment such as safety belt, etc.
- Workers of high-place work shall be arranged in consideration of age, physical strength, etc., especially health status.
- Arrangement of non-expert and aged worker to high-place work shall be avoided.

3.6 FLYING AND FALLING OBJECTS PREVENTION

3.6.1 Protection by Net and Sheet

- Prevention measures of flying and falling objects shall be taken at an entrance located in crossing point of outside scaffolding.
- The removed net, sheet shall be restored after completion of the work in case of removing net, sheet, because of work arrangement.
- Net with certain mesh which is suitable for use shall be applied.

- Damaged net shall not be used.
- Measures shall be taken such as rolling up of sheet, etc. in consideration of an impact of strong wind (especially in a typhoon) for scaffoldings.



Figure 3.6-1 Flying and Falling Objects Prevention at Entrance



Figure 3.6-2 Safety Net between Scaffold Plates

3.6.2 Protection for Flying and Falling Objects

Protective measures shall be taken for flying and falling objects at the construction site close to existing road and private house.

3.6.3 Installation of Dropping Equipment

- Objects shall not be thrown down from more than 3 m high place.
- Dropping equipment shall be installed on an entry prohibited area, and watchman shall be arranged, in case of throwing objects down from more than 3 m high place unavoidably.
- Dropping equipment shall have the structure which prevents dropped objects from scattering.
- Space between tip of a dropping equipment and ground shall be set in consideration of length and incline of the equipment so that dropped objects are not scattered.



Figure 3.6-3 Flying and Falling Objects Prevention at the site close to existing road



Figure 3.6-4 Dropping Equipment and Watchman

3.6.4 Material accumulation near High-place Work and Excavation Work

- Materials shall not be put on high-place (such as scaffolding and steel-frame, etc.) where materials are easy to drop. Objects shall be blinded or put objects in box/ bag, in case of temporary placing of objects to be scattered easily.
- Objects shall be accumulated within 1 m from edge of a work platform, an opening, a top of slope, etc. Falling shall be prevented by baseboard, etc. at an opening of work platform.
- A rolling prevention measure shall be taken such as drag, wedge, etc. in case of accumulating curved surface materials such as pile, concrete pipe, etc.
- Scattering prevention measures shall be taken such as binding materials (plywood panel, etc.) to be scattered easily by rope.



Figure 3.6-5 Not to put materials on scaffolding

3.6.5 Liaison and Coordination in Simultaneous Work at Higher and Lower Levels

- Simultaneous work shall be avoided at higher and lower levels in a same place as much as possible. Operation chiefs of both sides shall coordinate with regarding place, contents, time, etc. adequately in advance, and secure safety, in case of working simultaneously at higher and lower levels in a same place unavoidably.
- Appropriate protective measures shall be taken, and safety shall be secured, because simultaneous work at higher and lower levels is in danger of flying and falling objects.
- Watchman, signal man, etc. shall be arranged as needed when it is difficult to take protective measures.

3.7 MEASURES IN ABNORMAL WEATHER

3.7.1 Establishment of Emergency Contact System

Refer to 1.5.5 Establishment of Emergency Call Network.

3.7.2 Collection of Weather Information and Coping

- Effort shall be made to collect weather information by setting TV and radio, etc. in the office.
- Equipment to contact office, site office and work place shall be prepared as needed, and prepare not only wire telephone line but also mobile communications in order that workers can always communicate with site office or watchman.
- Radio equipment, transceiver, loudspeaker, siren, etc. shall be installed depending on site conditions,

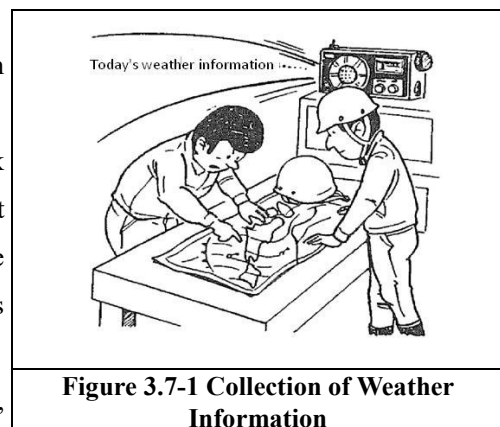


Figure 3.7-1 Collection of Weather Information

in case of communication in the site. And to implement inspection and maintenance of these communication equipment against emergency.

- Manager shall confirm full dissemination to workers surely when communicating in emergency.

3.7.3 Suspension of the Work, Implementation of Caution and Inspection

- A work shall be suspended depending on weather condition.
- Equipment to contact office, site office and work place shall be reviewed a work plan including suspension of a work when abnormal weather is predicted in advance by weather forecast, etc.
- Various emergency equipment (such as life buoy, life jacket, rope, etc.) shall be prepared as needed, when flood is predicted.
- Regular operational check of flash signal, lighting and generator, etc. shall be implemented.
- Manager dispatches patrol team consisting of more than 2 members as needed, and implements patrol inspection.
- Patrol team shall pay attention to sudden change of weather, communicate with manager properly, and make efforts to grasp surrounding conditions.
- Measure of keeping out shall be taken and a notice shall be put on as soon as possible, when a dangerous place is found.
- The existence of dangerous conditions (such as loose state of ground, collapse, etc.), before restarting the work shall be inspected carefully, after the cancel of warning.
- Scaffoldings shall be inspected and repaired when defects are found, before restarting the work on it.

3.7.4 Measures for Heavy Rain

- Working site and surrounding conditions shall be inspected, and measures shall be taken to the following places where disaster prevention is needed. And measure of keeping out shall be taken and a notice shall be put on.
 - 1) The place where landslide or debris flow is expected
 - 2) The place where objects and soil flow out
 - 3) The structure/place that is filled with water by raining, and has a risk of sinking or turning over
 - 4) The place that has a risk of flood by overflow of river
- Outflow prevention measures (such as moving to safe place, etc.) shall be taken for the objects which can cause the outflow.
- Worker shall evacuate to the right place or take fall prevention measure, when there might be the flood, the loose state of ground and the falling down, etc. at the place where heavy machinery is installed.
- Following measures shall be taken, when temporary construction might be covered with water/flowed out;
 - 1) To remove early
 - 2) To prevent from collapse by a difference between inside and outside water levels with calling for water from backside to inside of temporary construction
 - 3) To reinforce, etc.

- Safety measures against debris flow, abnormal flood of the scale which surpasses the assumption shall be established.
- Emergency system shall be established.

3.7.5 Measures for Strong Wind

- Care shall be given to prevention of a falling down and an overrun at stop site of large sized construction machinery such as crane, pile driver, etc., in the case of strong wind.
- Enough distance shall be kept from electric wires not to touch high voltage cables even if they are waved by strong wind.
- Work platform of the passages shall be reinforced in order to prevent accidents of a falling down and an outflow by wave.
- A work shall be temporarily suspended, especially a work at a high place, when unforeseeable strong wind starts blowing.
- Scattering prevention measures shall be taken, when objects might be scattered by strong wind.
- Watchman and range guard shall be arranged in order to secure the safety.
- Patrol team in strong windy condition shall consist of more than 2 members.

3.7.6 Measures for Earthquake and Tsunami

- Workers shall evacuate to safe place when a warning of earthquake or tsunami (tidal wave) is issued.
- Buildings, temporary constructions, materials, construction machineries, electric facilities, condition of ground and slope, etc. shall be inspected in advance before restarting construction after earthquake or tsunami.



Figure 3.7-2 After the Earthquake



Figure 3.7-3 After the Tsunami

3.8 FIRE PREVENTION

3.8.1 Fire Prevention Management System

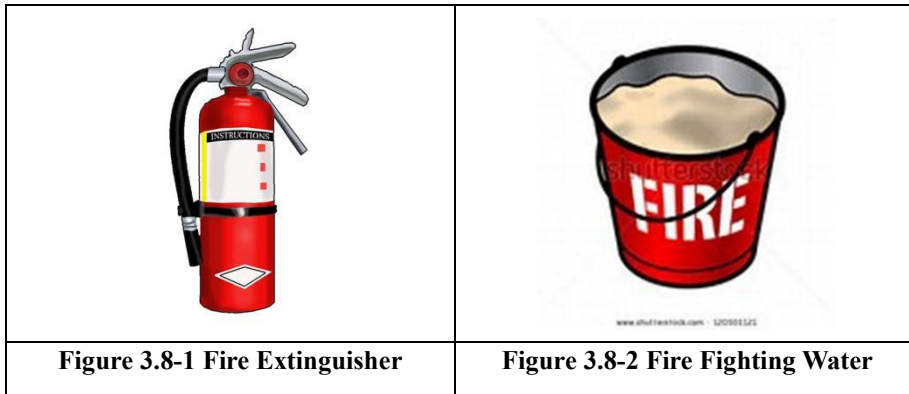
- The fire prevention management system shall be organized for the fire prevention of office, dormitory, etc. in construction site.
- A fire protection manager shall be appointed.
- A fire prevention assistant supervisor shall be appointed for each building of office, dormitory.

3.8.2 Fire Prevention Equipment

- Fireplug, fire extinguisher, firefighting water, etc. shall have the firefighting capability in

consideration of total building area.

- The fire extinguishing equipment shall be installed corresponding to the purpose of use in the place where fire is handled.



3.8.3 Management of Dangerous Materials

- A dangerous material security manager shall be appointed in case of storing/ handling dangerous materials.
- Measure of keeping out shall be taken, and a notice of fire-prohibited shall be posted at a storage place of dangerous materials.
- Work method of handling dangerous materials shall be specified and be disseminated to All Project Stakeholders.
- Dangerous materials shall be stored such as combustible paint, etc. in specified place where direct sunlight exposure is avoided and well ventilated.
 - 1) To lock the storage.
 - 2) To post a notice of "Dangerous materials storage facility", "Paint storage facility", "Caution: Flammable", etc. at the storage facility.
 - 3) To prohibit using a fire around the storage facility.



Figure 3.8-3 Storage of Dangerous Materials

3.8.4 Acetylene gas, Welding work

- Gas cylinder shall be stored in proper place in consideration of ventilation and setting.
- Equipment of gas welding and fusing shall be inspected, and defects shall be repaired or replaced before working.
- The categories of "before use", "using" and "used" shall be specified.
- Protective measures shall be taken adequately against a spark of gas welding and fusing.
- Only qualified workers shall be allowed to implement gas welding and fusing.

3.8.5 Evacuation Facility

- An evacuation route shall be displayed at the suitable place of office and dormitory.

- A slide, slide-pole, evacuation ladder, evacuation rope shall be installed in the building more than 2nd floor.

3.9 SITE MANAGEMENT

3.9.1 Full dissemination of Construction Plan and Chain of Command

Construction plan, chain of command and work procedure, work method, etc. shall be disseminated to worker in advance.

3.9.2 Assignment of Operation Chief

- Qualified worker shall be appointed as operation chief depending on work categories for the work which needs management in order to prevent disaster, and to make the operation chief lead workers.
- The name and responsibility of operation chief shall be displayed at an easily visible location in a site, and to disseminate it to workers.

3.9.3 Assignment of Operation Leader

- Operation leader shall be appointed in case of the work that vehicle type construction machinery is used, and to make the operation leader lead the work based on a work plan.
- Appropriate measures shall be taken as needed in order to make sure whether the work is implemented according to work procedure or not, and whether change of work method is required because of change of condition or not.

3.9.4 Assignment of Qualified Person

Qualified person shall be arranged to the work (such as an operation of crane, a slinging work, etc.) which need qualified workers, and the skill of them shall be confirmed.

3.9.5 Wearing and Using Safety Equipment

Workers shall wear proper equipment as below;

All sites: helmet, shoes, clothes with long sleeves and reflective jacket, etc.

High place: safety belt

Required place: gloves, goggles and mask

3.9.6 Lifesaving Equipment of Work on the Water

- Lifesaving equipment shall be always prepared in case of work on the water.
- Worker shall use lifesaving equipment when the work has a risk of falling underwater.

3.9.7 Emergency Measures

Contact method, emergency measures, etc. shall be disseminated to workers.

3.9.8 Full dissemination of Dangerous Place

Workers shall recognize the danger of overhead facilities, especially high-voltage cables, etc.

3.9.9 Preparation of Working Environment

Material storage place shall be selected in the place suitable for the work, and the place of in front of passage, emergency exit, distribution board and operation board shall be avoided.

CHAPTER 4. UNDERGROUND AND OVERHEAD FACILITIES

4.1 UNDERGROUND FACILITIES

4.1.1 Grasp of Description of work

- Location of underground facilities in a design drawing and document shall be grasped when construction work is planned at the place where there might be underground facilities.
- The existence of underground facilities shall be confirmed by a road inventory and an underground facility inventory, etc., even if underground facility is not mentioned in a design drawing and document.
- Scale and depth of excavation and relative position between excavating position and road shall be grasped.
 - 1) To conduct the same inspection mentioned in above at an area of influence of excavation.
 - 2) To make efforts to grasp a condition of underground facilities.
- Underground facilities shall be confirmed well even if road is located in rural area or mountainous area.

4.1.2 Prior Confirmation

- Underground facilities (type, position (plane position, depth), spec, structure, etc.) shall be confirmed visually by an exploratory excavation, based on an inventory, in advance of construction when construction is planned in the place where underground facility is expected.
- Following items shall be decided by complying with related law and regulation, in consultation with administrator and related authorities, if underground facilities are identified within an area of influence on excavation.
 - 1) Necessary protection measures
 - 2) Protection method
 - 3) Necessity of presence/inspection by administrator and related authority
 - 4) Emergency notification destination
 - 5) Demarcation of implementation of necessary protection measures, etc.
- The information of position of underground facilities, etc. shall be reported to administrators of road and underground facilities, if underground facilities were identified by exploratory excavation.
- Following actions shall be taken if unknown underground facilities were found during construction.
 - 1) To inspect underground facilities again
 - 2) To confirm administrator
 - 3) To request inspection by administrator
 - 4) To take measures after confirmation of security

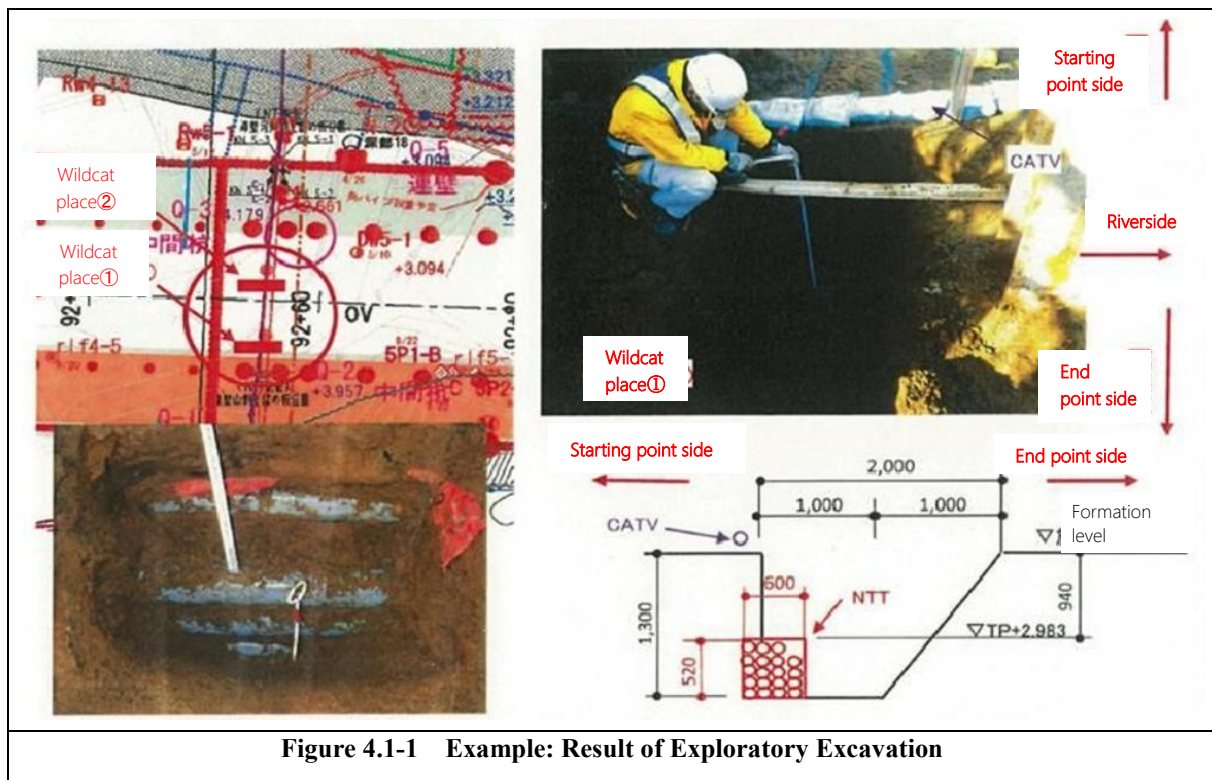




Figure 4.1-1 Example: Result of Exploratory Excavation

4.1.3 Construction Plan

- Construction shall be implemented after selection of construction method by grasping condition of underground facilities well, in case of excavation work. Underground facilities shall be protected in consideration of a series of construction components until restoration of underground facilities.
- Enough period of inspection shall be secured in consideration of difficulty to identify exact position of underground facilities because of number of underground facilities in case of urban construction.
- Details of exploratory excavation, management work, relocation work, etc. shall be grasped in consideration of coordination with road traffic, before the commencement of construction, because underground facilities mainly are located within ROW. In addition, to consult with related authorities about construction schedule in consideration of limitation of working hours in advance.
- Construction plan related to underground facilities shall be prepared based on consultation with underground facilities administrators regarding construction method, protection method and other necessary items.

4.1.4 Site Management

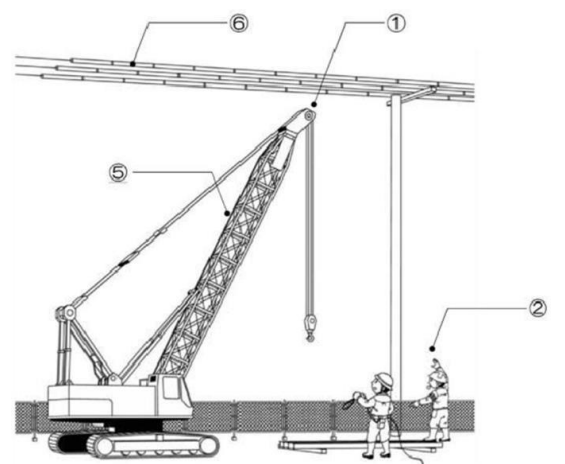

- Underground facilities shall be protected and maintained from the stage of the exploratory excavation to the stage of the final back fill/ restoration of road surface, in case that underground facilities can't be relocated.
- The considerations of position and contents, etc. of underground facilities shall be disseminated to related workers thoroughly before the final back fill/ the restoration of road surface.

	
<p>Figure 4.1-2 Buried Position Marker</p>	<p>Figure 4.1-3 Buried Position Marker (Road Surface)</p>

4.2 OVERHEAD FACILITIES

4.2.1 Prior Confirmation

- Site inspection shall be implemented and overhead facilities (type, position (location, height, etc.), administrator) shall be confirmed in construction site, before construction work.
- Following protection measures shall be taken as needed in case of expecting a risk of contact/cutting by boom of construction machineries and dumping up of dump truck, etc.
 - 1) To install a protective cover to overhead line/ facilities.
 - 2) To install a height limitation device to an entrance/exit, etc. of construction site.
 - 3) To install a caution sign, etc. in order to designate a position of overhead facilities such as overhead line, etc.
 - 4) To set an area of a turning range of boom of construction machineries/ entry prohibition, etc.

	
<p>Figure 4.2-1 Protective Cover</p>	<p>Figure 4.2-2 Height Limitation Device Caution Sign</p>

4.2.2 Construction Plan

Administrators shall be requested to confirm construction method and inspection as needed in case of construction which is close to overhead facilities.

4.2.3 Site Management

- Enough separation between overhead facilities and machineries, tools, materials, etc. shall be secured in case of construction which is close to overhead facilities.
- Construction zone and details of overhead facilities (type, position (location, height, etc.)) shall be informed to operators/drivers of construction machineries, dump trucks, etc.
- Worker shall be fully disseminated the considerations, such as prohibition of movement/ travelling of dump truck in the state of dumping up, an area of a turning range of boom of construction machineries/ entry prohibition, etc.

CHAPTER 5. MACHINERY AND EQUIPMENT

5.1 KEY POINTS FOR WORKS OF CONSTRUCTION MACHINERY

5.1.1 Work Plan and Work Management for Safe Operation

- Work contents, work methods, work range, etc. shall be disseminated.
- Existence of works in dangerous place shall be grasped such as shoulder, top of slope, etc. and works in combination with machinery and manpower in advance. Arrangement of guide/watchman and entry prohibited place shall be defined.
- A guide shall be appointed and arranged in case of work in combination with machinery and manpower unavoidably because of work arrangement. Not only being the way of signal/guide but also blind spot of operator's visibility shall be disseminated to guides and workers.

5.1.2 Checkup of Apparatus carried in

- Following safety apparatus shall be checked;
 - Headlight
 - Warning device
 - Top guard
 - Falling object protective structure (FOPS)
 - Roll-over protective structure (ROPS)
 - Control lever locking device
 - Fall prevention device, etc.
- To check normal operation of headlight, warning device, control lever locking device, etc.
- To check capacity, maintenance situation, etc. of construction machineries.

5.1.3 Checkup before commencing the work

- Inspection shall be implemented before commencing the work.
- Inspection shall be implemented based on check list of machinery.
- Machinery shall not be used until maintenance is completed, when an abnormality was found.
- Operational inspection shall be implemented after confirmation of safety which mean no person/obstacle.

5.1.4 Climb and Downhill of Construction Machinery

- Don't travel more than specified climbing capacity and stability of construction machinery.
- The operation of machinery shall be suspended once, and topography, ground and others shall be inspected when an abnormality of topography, ground and others is detected during operation of machinery.

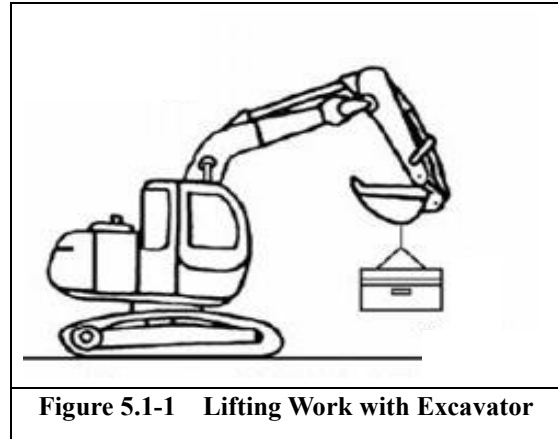
5.1.5 Consideration of leaving the machinery

- Construction machinery shall be stopped at the place where the ground is well and flat. Unexpected movement shall be prevented by lowering a working device of a bucket, etc., on the ground. The wheel locking device shall be put on surely when stopping the machinery on slope unavoidably.
- The engine shall be stopped, the brakes shall be put on surely, and the brake pedal shall be locked.

The operation device shall be locked, and keep the key in specified storage/place.

5.1.6 Restriction on the Use for improper purpose

- Don't use construction machineries for other than its main purpose basically.
- It shall be confirmed that following items are satisfied, when using the construction machinery for other than its main purpose such as lifting work with power shovel, etc., only if it is unavoidable in a construction property.
 - 1) To use apparatus of sling fitting, etc. which has sufficient strength.
 - 2) To prevent suspended objects from falling.
 - 3) To prevent sling fitting from coming out of operation device.



5.2 OPERATION OF CONSTRUCTION MACHINERY

5.2.1 Appropriate Selection and Operation of Construction Machinery

- Construction machineries shall be selected in consideration of safety for space of use, carry in/out work and fall down, etc.
- Construction machineries shall be selected in consideration of condition of operability, vibration, noise, exhaust gas, etc.
- Safety passage shall be set according to location of use in order to secure safety of workers.
- Construction machineries shall be operated by qualified personnel and personnel who received special training.

5.2.2 Operating and Handling Environment

- The necessary lighting shall be secured for hazard prevention at work place.
- Machinery shall be taken measure to protect workers from dust, noise, high/low temperature, etc.
- Workers shall wear protective equipment if it is difficult to apply the measures of machinery.
- Machinery which has a risk of fire by heating, generation of heat, leakage of electricity with the operation, shall be used after sufficient maintenance.
 - 1) To equip fire extinguisher.
 - 2) To stop machinery before refueling.
- Protection measures shall be taken to high voltage cable which has a risk to be touched. A guide shall be arranged when implementing work or moving machinery under high voltage cable which is not protected.
- The minimum distance of 1.2 meters shall be secured between boom and electric cable.
- Safety measures for leakage of electricity shall be taken. Electric equipment shall be installed inside temporary building, etc.
- The contact method and the emergency treatment method shall be displayed at easily visible

location.

- Following actions shall be taken when an abnormality is found in operation of machinery.
 - 1) To stop working immediately.
 - 2) To inspect the cause of abnormality.
 - 3) To repair the machinery.

5.2.3 Safety Training

Operation except for appointed operator shall be prohibited. All appointed operator shall be educated following items before working.

- 1) Danger of the machinery, Capacity, Function, Handling and Emergency stop of machinery and protective equipment
- 2) Function, Capacity and Handling of the safety device
- 3) Work procedure, Operation procedure, Sign/Contact of commencement of operation, and Inspection before commencement of operation
- 4) Stop of operation, Stop of power supply, Procedure of lock of starter and other necessary items
- 5) Emergency measures, Evacuation, Contact in emergency.
- 6) Putting in order and keeping clean, and other necessary items

5.2.4 Person responsible for machinery operation

- Responsible operators shall be appointed, and the person except appointed operators shall be prohibited from using.
- Roles of person responsible for machinery operation shall be specified and conducted.

5.2.5 Safety ensuring in inspection and repairing

- Procedure of stop of operation, stop of power supply, lock of starter and other necessary items shall be implemented.
- Necessary measures shall be taken for fall and fall down prevention.
- Non-authorized person shall be prohibited from entering the place of inspection/ maintenance work.
- Inspection/ maintenance work shall be implemented after stopping construction machineries on flat land.
- Operator shall stop the mortar, put on the brake, lock the turn, etc. of construction machineries.
- Operation device such as attachment, etc. shall be put down on the ground.
- Fall prevention measures shall be taken such as support with prop or block, etc. when inspection/ maintenance needs to be implemented under the boom, bucket, etc. unavoidably.
- Measures shall be taken so that machineries cannot work and move by accident after stopping function of machinery completely, when implementing maintenance work.

5.2.6 Instruction to Operator

- New operators shall be instructed in detail regarding conditions, characteristics, considerations of each construction site by safety education. To implement safety education regularly.

- Close attention shall be taken to the condition of operator's health, and work environment shall be considered so that operators do not become overwork and lack of sleep, etc.
- Don't allow operator whose condition is not suitable (such as drunken, hangover, extreme fatigue, etc.) for operation of work to work.

5.2.7 Inspection and Maintenance of Machineries, Tools and Ropes

- Specified inspection shall be implemented surely.
- Inspection/ oiling/ maintenance in a timely manner (the start of work, the end of work, daily, monthly, yearly) shall be implemented depending on the machineries and its components.
- Appropriate check list for each machinery shall be prepared, filled out it, and kept it for a prescribed period as needed.
- A machinery manager shall be appointed, and have operator or inspector to implement following inspections surely.
 - 1) Pre-operation inspection, Inspection at the end of work, Daily inspection
 - 2) Monthly inspection
 - 3) Annual inspection, Specified self-inspection
- To replace and cut off the wire rope in case of following conditions.
 - 1) More than 10% of wire is fractured in one twist.
 - 2) Reduction of diameter exceeds 7% of nominal diameter.
 - 3) Kink, remarkably loosing shape or corrosion is found.

5.3 TRANSPORTATION OF CONSTRUCTION MACHINERY

5.3.1 Loading and Unloading of Construction Machinery

- The transportation vehicle with the climbing equipment or the specialized device shall be applied when transferring heavy construction machinery by loading to trailer or truck.
- The loading/ unloading place that is level and firm and has enough space for work shall be selected when loading or unloading.
- Operator shall put on the parking brake, and put on the drag to tire of the transportation vehicle when loading or unloading.
- The climbing equipment shall have capacity below;
 - 1) To have strength durable for weight of the machinery, length, width
 - 2) To have the hook to prevent coming-off by rotating of caterpillar or coming-off prevention device.

5.3.2 Fixing after the loading

- Machinery shall be fixed at designated point of the load-carrying platform, and the brake shall be put on and be locked.
- The operation devise such as boom, arm of shovel type construction machinery shall be lower so as not to exceed height limit, and bucket shall be fixed onto platform of trailer.
- It shall be confirmed that the condition of loading and fixing are appropriate.

5.3.3 Transportation by self-propellent

- Attention to collapse of road shoulder, etc. shall be paid when travelling on soft ground in the site.

- Machinery shall pass after confirmation of safety by stopping once when passing unprotected crossing and narrow width place.
- Attention to vertical separation shall be paid when shovel type machinery passes road crossing structure such as overhead line and bridge girder, etc.

5.3.4 Mounting and Removal of Operation device (Attachment)

- An operation device shall be mounted or removed in a state of supporting with prop or block, etc. in order to prevent arm and boom, etc. from moving down and falling down, etc.
- Close attention shall be paid to the nipping prevention by mis operation, excessive operation, etc. when mounting or removing heavy operation device.

5.4 INSTALLED/ STATIONARY MACHINERY

5.4.1 Selection of Installation Location

The installation place shall be selected in consideration of following items.

- 1) Storm, flood damage or landslide, etc.
- 2) Safety against a fall, etc.
- 3) Securing necessary distance between facilities
- 4) Safety in installation and removal

5.4.2 Protection of Devices such as Motor and Revolving shaft, etc.

- Cover, enclosure, sleeve in motor, revolving shaft, gear, etc. shall be installed.
- Flush type to a stud attached to rotating part shall be applied, or a cover shall be installed.

5.5 MOBILE CRANE WORK

5.5.1 Work Plan and Selection of Mobile Crane

- Capacity and type of mobile crane shall be grasped in selecting.
- The type having enough capacity shall be selected by setting operating radius, lifting load, hook weight, and by confirming capacity with performance curve sheet, in selecting mobile crane.
- A work plan shall be prepared in consideration of work environment, etc.
- Work near power distribution cable shall be implemented after confirming protective measures for insulating.
- Safety distance shall be kept strictly when implementing work near power distribution cable without protective measures for insulating.

5.5.2 Arrangement and Installation

- It shall be confirmed that there are no obstacles within a work range of mobile crane. Work plan shall be examined well in advance if obstacle is existing within a work range.
- The ground condition that mobile crane is installed on shall be inspected. Don't operate a mobile crane until the ground reaction corresponding to lifting load is secured by reinforcement such as ground improvement and iron plate, etc., in case of lack of load bearing capacity of ground.
- A mobile crane shall be set horizontally and elongated outrigger completely depending on work load.
- A limit of lifting load and turning range shall be kept by confirming a lifting capacity referring to

a lifting load chart.

- Mobile crane shall be inspected surely before working, by confirming the condition of functions of safety device/ warning device/ brake, etc. in the no-load condition.
- The condition of outrigger shall be inspected after a certain period passed from starting operation. The outrigger shall be corrected in case of abnormality.

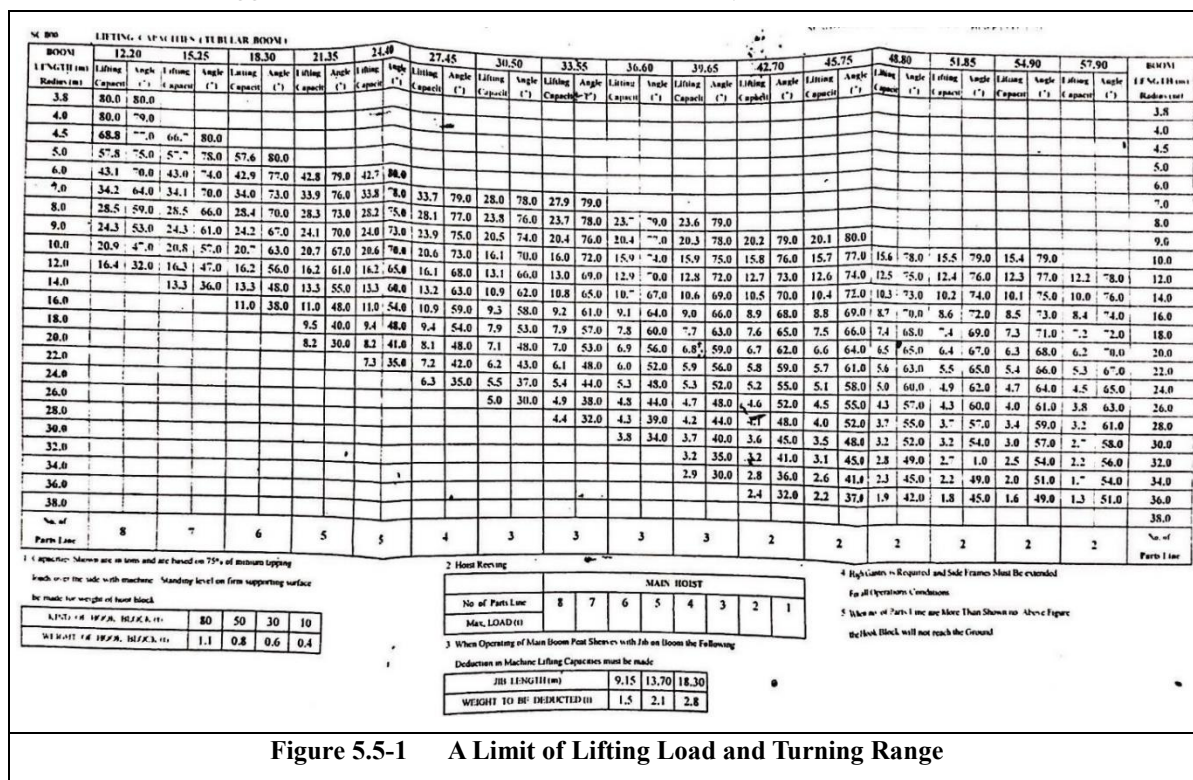


Figure 5.5-1 A Limit of Lifting Load and Turning Range

5.5.3 Guidance and Signal for Mobile Crane

- Signal man shall be dedicated to make signal, and give a signal with a pre-concerted signal.
- Signal man shall give a signal at position where;

Signal man can see suspended load well and,

Signal man can also be seen from operator and,

Out of a work range.

- Communication methods (such as a wireless, etc.) which enable to communication shall be applied surely when signalman gives a signal at invisible location from operator.
- When lifting a load,
 - 1) A guide rope shall be attached to the end of a suspended load.
 - 2) Signalman guides from safety position, when lifting a load.
 - 3) Signal man shall be present.

5.5.4 Operation of Mobile Crane

Operation of mobile crane shall be implemented by an operator having qualifications, depending on lifting load.

- Activate safety device (moment limiting device) shall be installed in mobile crane after setting

the conditions of boom operation and outrigger exactly.

- Working shall be resumed after the following actions when abnormal sound, generation of heat, bad smell, abnormal operation in operation.
 - 1) To suspend the work immediately, and
 - 2) To inspect the cause, and
 - 3) To take necessary measures
- It shall be confirmed that total weight including lifting tools such as suspended load, hook, sling, etc. is less than rated load.

5.5.5 Mobile Crane Work

- When lifting a load,
 - 1) To stop lifting in a state that a load is floating a little from the ground, and
 - 2) To confirm the stability of machinery, the center of gravity of a load and the condition of sling.
- When lifting a load; To set a hook in the position right above the center of gravity of a load.
- When lifting a load; To set a hook in the position a little inside work range in consideration of the deflection because a load shifts to outer direction by deflection of a boom, etc.
- When turning; To confirm that there is no person nor obstacles within a turning range.
- To turn slowly after lifting a load up to safe height.
- Operator shall operate complying with instruction of signalman.
- Operator shall always pay attention to the movement of a top boom and the condition of a load.
- When unloading;
 - 1) Don't land a load on floor instantly.
 - 2) To stop just before landing on floor, and
 - 3) To confirm the condition of landing place and position of a load, and
 - 4) To land a load on floor slowly.
- Operator shall not leave driver's seat in a state of lifting a load.

5.5.6 Measures after the completion of work

- Necessary measures shall be taken such as hoisting a hook up to safe position, etc.
- A securing pin, etc. of each part shall be inserted correctly in case of setting in travel posture.
- A turning brake and winch drum shall be locked when travelling.
- All the operation switches shall be kept "OFF".

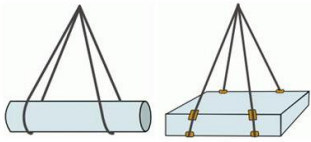
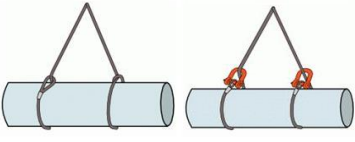

5.5.7 Slings Work

Slings work shall be implemented by a worker having qualifications.

- To prepare/ inspect a slinging apparatus corresponding to a load. To repair/ replace wire rope which has winding/ peculiarity/ twist.
- To store a slinging apparatus in specified storage/ place which can prevent from exposing to rain, dust, etc. To grease a slinging apparatus in case of having a risk of rusting (work in coastal area/ on the sea, etc.).
- To guide a hook of mobile crane to the center of gravity of a load. To make angle between sling

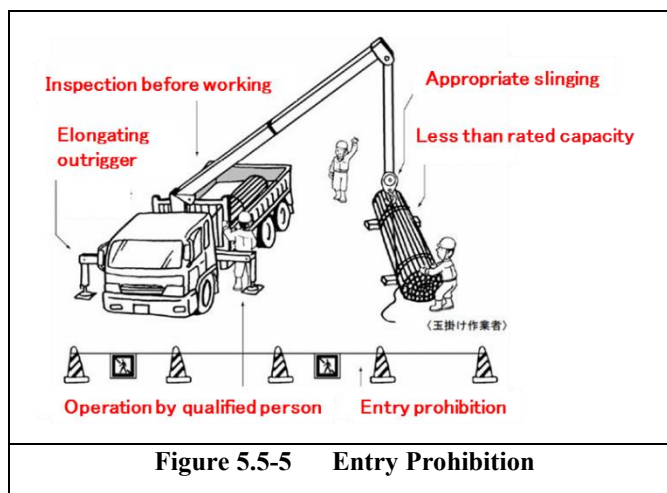
angle and horizontal plane less than 60 degree.

- To confirm the safety in lifting a load in advance by confirming a sling angle which can prevent a load from sliding off, a pad, slinging position, etc.
- To secure the safety by calculating the load to act each rope in advance when lifting an eccentric load, etc. in a special manner.
- To prohibit basically applying half hanging method with 2 ropes/ 4 points and half hanging method to a hook because of a risk of sliding of wire rope.
- To take fall prevention measures by applying hanging methods of winding rope round once or putting rope through the loop of the rope end, etc. when lifting slippery objects such as pipes, etc.
- To take fall-out prevention measures by binding a load with a material except wire rope after sorting components of a load every type and size when lifting members of prefabricated scaffolding, etc.
- To lift small articles such as a clump of single pipe, etc. by using a hanging box.

		
<p>Figure 5.5-2 Half Hanging Method</p>	<p>Figure 5.5-3 Hanging Method of putting rope through the loop of the rope end</p>	<p>Figure 5.5-4 Lifting Small Articles by using Hanging Box</p>

5.5.8 Designation of Place for Prohibition of Entry, Installation of Signs

- Person shall be prevented from entering the place (directly under a load, within moving range of a load) with the danger caused by falling of a load.
- Signboards to entry prohibited place shall be installed. The prohibition of entry shall be disseminated to workers.



5.6 LEASE MACHINERY

5.6.1 Usage of Lease Machinery

- When using a lease machinery; To confirm status of maintenance, qualification of user, etc.
- When using a lease machinery,
 - 1) To disseminate the machine performance to related person.
 - 2) To secure the communication between operators and workers.
- When machinery to be used changes every day;

Status of maintenance of the machinery, equipped safety device, its normal operation shall be appropriately confirmed.

5.6.2 Usage of Lease Machinery with Operator

When using machinery with operator for the work such as crane work, concrete placing work with concrete pumping vehicle, forwarding machinery, transporting work, etc.;

- Work instruction, work meeting, site work conditions, etc. shall be appropriately informed to operators in advance.
- Necessary items shall be confirmed such as work method, etc. when arrived.
- Meeting for confirming work method shall be implemented before commencing work.

CHAPTER 6. TEMPORARY CONSTRUCTION

6.1 GENERAL INFORMATION

6.1.1 Grasp of Description of Work

Necessary matters shall be grasped by implementing field survey of planned construction site as needed.

6.1.2 Grasp of Construction Condition

- Drawing and specification shall be studied and grasped sufficiently, and the result shall be reflected to construction plan.
- It shall be sufficiently considered to reflect site condition of the project to temporary construction plan.
- The relevance with not only the project but also surrounding construction projects shall be sufficiently grasped.
- Refer to 1.3.1 Confirmation of Construction Contents and Conditions, etc.

6.1.3 Surrounding Environmental Survey

Inspection shall be implemented sufficiently, and data shall be organized, in order to grasp influence on land, building, road, structure, etc. and well drying-up, etc. by noise, vibration, ground deformation, etc.

The selection of construction machinery and the construction plan for temporary construction shall be reviewed.

6.1.4 Survey on Underground Facilities

Refer to 4.1.2 Prior Confirmation.

6.1.5 Construction Plan

Refer to 1.4 Construction Plan.

6.1.6 Grasp of Description in Construction Stage

- Components of construction objects shall be sufficiently grasped in each construction stage.
- Temporary construction plan in each construction stage shall be sufficiently considered in safety of temporary construction, quality of construction objects, completed shape, beauty, process, economy, etc.

6.1.7 Grasp Entire Contents of Temporary Work

- Overall temporary construction plan shall be prepared by dividing temporary construction into two types directly used for each construction object (direct temporary construction) and the other one commonly used for construction objects (common temporary construction).
- The relevance with each other between direct temporary construction and common temporary construction shall be sufficiently grasped.

6.1.8 Key points for Preparation of Temporary Work Plan

- The purpose of each temporary structure shall be grasped for temporary construction plan.
- The type, arrangement and maintenance period etc. of temporary structure shall be described in order to construct safely and efficiently. Because type and arrangement plan of temporary

structure are important.

- Safety of construction shall be seriously considered in standard (size, material, strength) of each material for temporary construction.
- The material which does not have abnormality in material and standard, etc. shall be used in case of using lease material.

6.2 EARTH RETAINING/ TIMBERING

6.2.1 General Information

- During excavating works, the condition of excavating place and surrounding condition shall be considered, digging depth, soil quality, groundwater level and earth pressure, etc., shall be examined carefully to make safety plan of earth retaining/ timbering including installation of measurement instruments such as earth pressure gauge, etc. as needed.
- When digging depth is more than 1.5 m, earth retaining construction shall be implemented, except the case that it's capable to excavate securing the excavated surface gradient corresponding to soil quality at surface of cut slope.
- Attention shall be paid not to damage the safety of earth retaining/ timbering by deformation and position gap, and earth retaining/ timbering shall obtain enough strength.
- Earth retaining/ timbering shall secure safety against buried depth, pressure and deformation, to examine boiling and heaving depending on soil quality, and to confirm safety.



Figure 6.2-1 Earth Retaining Construction

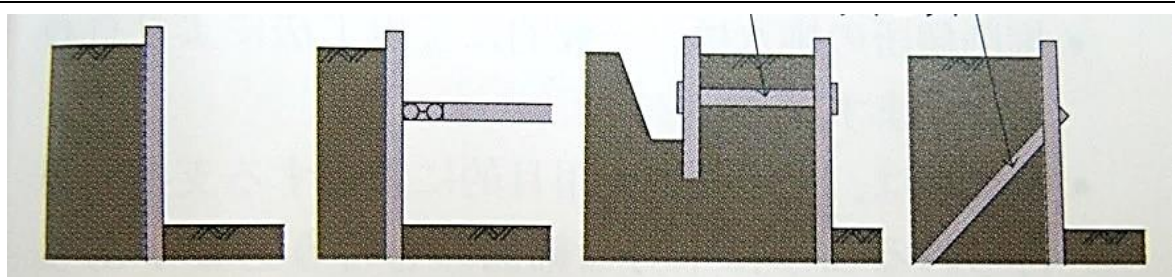
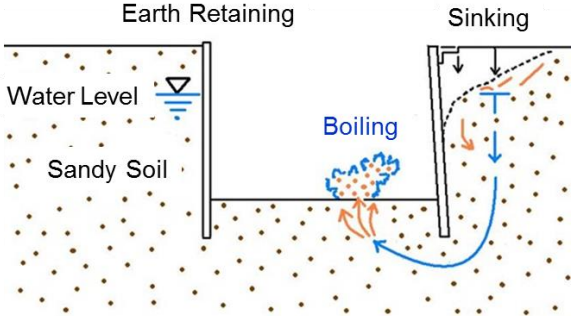
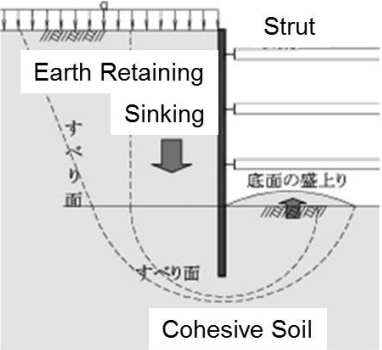


Figure 6.2-2 Example: Excavation in Open-cut with Earth Retaining

	
<p align="center">Figure 6.2-3 Boiling</p>	<p align="center">Figure 6.2-4 Heaving</p>

6.2.2 Safety Control during Construction

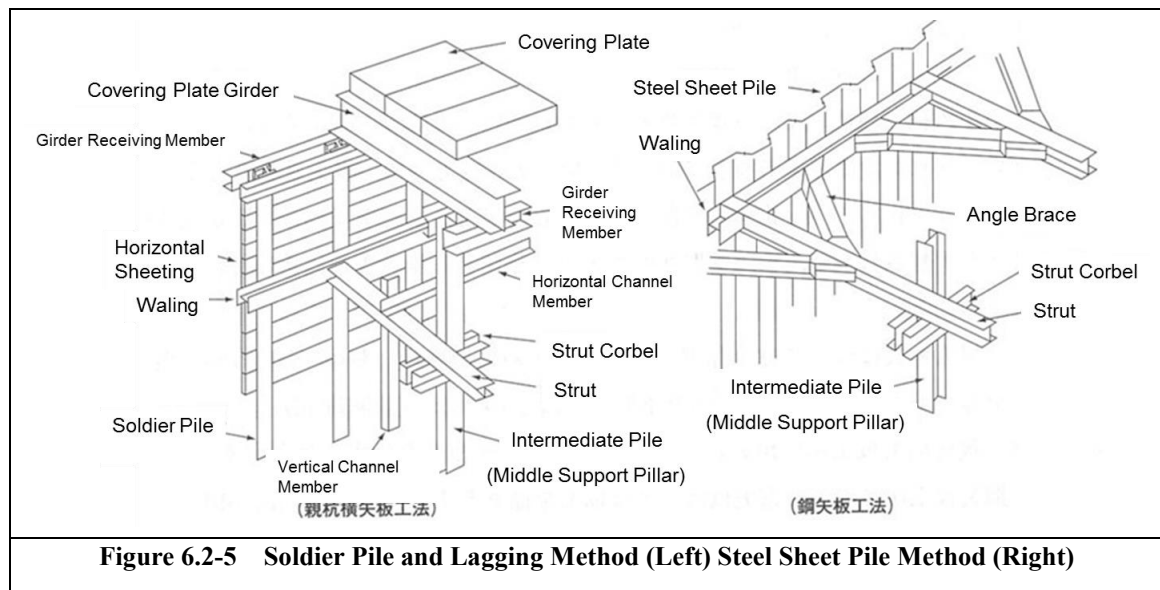
- Persons who understand design condition of earth retaining/support shall supervise construction.
- Do not proceed to next step of excavating before completing attachment of designated members based on construction plan.
- When implementing slender excavation and partial excavation before driving pile and sheet pile etc. about road, to remain working range or depth within working range of driving pile and sheet pile, to fill with earth after driving and to compact in order to remain previous function.
- Board of earth retaining shall be set not having gap to face of excavating after excavating.
- Gap shall be fixed via backfilling and wedge etc. in case of having gap.
- Inspector shall be arranged and inspect regularly during constructing earth retaining. If abnormality such as deformation of material, slack of joint, changing of groundwater level and surrounding earth etc. are discovered, to leave all worker immediately and absolutely, to construct next step after take measure of accident prevention completely.
- Earth pressure and deformation to earth retaining shall be measured via measure tool as needed.
- Changing of groundwater level and earth shall be measured and recorded. If abnormality such as elevation and subsidence of earth etc. occur, the person in charge of underground facilities shall take safety measure, and shall report other relevant persons.

6.2.3 Assembly of Earth Retaining/ Timbering

Assembly of earth retaining/ timbering shall be implemented based on planned procedure. If construction is not implemented based on planned assembly drawing, to check carefully, to arrange and record the reason of it.

6.2.4 Material

Material of earth retaining/ timbering shall be good quality and not have crack, deformation and corrosion, and inspected adequately before using.



6.2.5 Designation of Inspector

- It shall be confirmed that necessary members are safely attached at the designated position before proceeding to next construction step, and then to start working.
- Designated inspector shall always inspect during working. If abnormality is recognized, designated inspector shall make worker evacuate immediately, contact responsible person and take necessary measure.

6.2.6 Installation of Members

- Waling and strut firmly shall be attached by welding, bolt, clamp, and iron wire, etc.
- Butt joint shall be adapted as a joint of compaction material (except angle brace), and make entire member one straight line. When adapting wooden material as compaction material, use more than two attachments in order to joint in straight line.

6.2.7 Raising and Lowering of Materials

When raising and lowering material such as strut, equipment, tool etc., hanging net and hanging bag, etc. shall be used.

6.2.8 Inspection in Abnormal weather

Working shall be resumed after inspecting quickly and confirming safety in the following cases;

- Earthquake over middle level occurs
- Embankment and natural ground may become soften by heavy rain etc.

6.2.9 Daily Inspection and Monitoring

- Earth retaining/timbering shall be inspected especially about following items.

- 1) Friction, bulge and damage of member of sheet pile, horizontal sheeting, waling and strut, etc.
 - 2) Degree of stress of strut
 - 3) Relaxation status of joint and coupler of each member
 - 4) Void status of back side of sheet pile and horizontal sheeting
- Management criteria for safety shall be specified, displacement shall be monitored and recorded as needed

6.2.10 Placing of Soil and Equipment

When putting soil and equipment, etc. on the shoulder of earth retaining/ timbering, to pay attention so as not to fall.

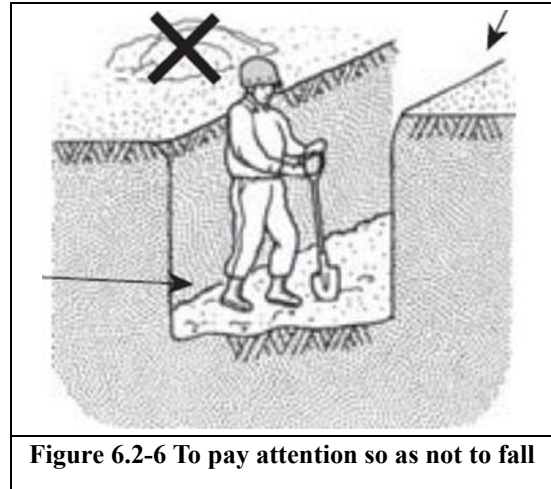


Figure 6.2-6 To pay attention so as not to fall

6.2.11 Key points for Ground Anchor Construction

Before construction, design condition about digging depth shall be grasped in front of earth retaining, height of earth retaining, setting depth, position of ground anchor, and soil composition before construction, ground anchor shall be constructed with confirming that the construction situation corresponds to these design conditions.

6.3 TEMPORARY COFFERDAM CONSTRUCTION

6.3.1 General Information

- When designing and constructing of temporary cofferdam at soft ground, attention shall be paid so as not to occur heaving etc.
- Following items shall be implemented based on construction plan because the condition may be changed by several external conditions in planning temporary cofferdam;
 - 1) Excavating depth
 - 2) Position and number of steps of timbering
 - 3) Installation of reinforced member
 - 4) Connection of bolt, etc.
- Safety plan of temporary cofferdam construction including installation of measuring instruments such as earth pressure gauge, etc. shall be made as needed.
- When constructing with cofferdam, to sufficiently examine and plan so that temporary cofferdam is not collapsed by sudden water level raising, heaving and boiling, etc.
- Measure of collapse prevention shall be taken with settlement of difference of water level by putting water from back side into temporary cofferdam, and to inspect regularly.
- In temporary cofferdam receiving partial earth pressure, stability of whole temporary cofferdam shall be sufficiently examined.
- When retaining cofferdam by strut, stiff structure shall be constructed so that joint parts of strut and waling, etc. doesn't relax by wave, and conduct inspection always.

- When the state change of temporary cofferdam structure and surrounding ground occurs during construction, the responsible person shall have worker evacuate, confirm safety and take safety measure such as reinforcement. After that, working in the temporary cofferdam structure can be commenced.
- Evacuating plan which covers extraordinary natural phenomenon shall be designated, in order to secure safety of relevant persons.

6.3.2 Temporary Cofferdam for River

- Temporary Cofferdam Construction shall be safe against flow of river.
- Movement of streamline shall be considered and change of river depth by scouring.
- Measures against water level, flow speed, amount of flowing water and collision by flood shall be taken.
- Influence on water level raising by weir shall be examined, and to take the measure of that.



Figure 6.3-1 Temporary Cofferdam

- Measures against stones and other obstacles shall be taken.

6.3.3 Temporary Cofferdam near River-mouth and Coast

- Measure shall be taken against tide level and wave height.
- Influence shall be considered on wave and tidal current.
- Measure shall be taken against collision of ships etc.

6.3.4 Use Material

- Steel material which does not have damage such as crack and transformation shall be used for cofferdam.
- Sheet pile shall be generally composed of one plate. When setting joint unavoidably, to use butt welding and spliced plate welding, and to arrange joint position so as not to set at same position.

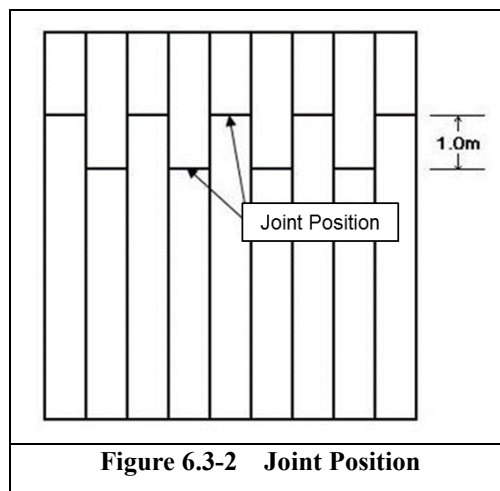


Figure 6.3-2 Joint Position

6.4 SCAFFOLDING

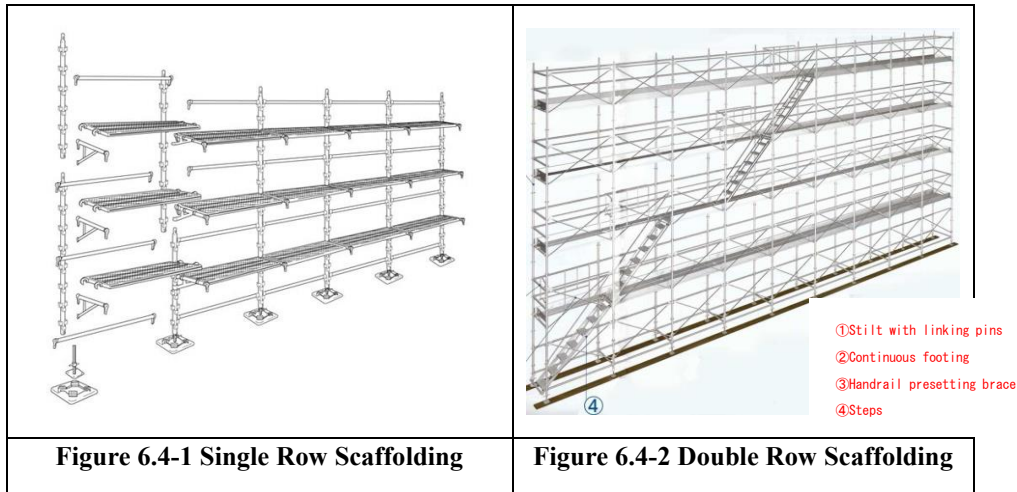
6.4.1 Fall Prevention

Refer to 3.5 Fall Prevention.

6.4.2 Key points for Plan/ Assembly/ Demolition

- Installation of scaffolding, etc. shall be planned in consideration with the load that does not act always, such as wind load, snow load and loading object, etc.
- Type, structure and height of scaffolding shall be indicated to each side.

- Timing of assembling and dismantling scaffolding shall be clarified.
- Fall and collapse prevention shall be examined sufficiently for single row scaffolding, slender board single row scaffolding, and special scaffolding in the geographical condition that double row scaffolding can't be installed.



6.4.3 Installation Work

- Timing of assembling and change, scope and procedure shall be disseminated to workers.
- Workers except relevant workers shall be prohibited from entering work area.
- Scaffold plate, which is more than 40cm width shall be installed, in working such as connecting, removal and handover, etc. and make workers wear safety belt.
- When installing scaffolding near overhead electronic line, electronic line shall be relocated, or attached protective equipment around.
- When Raising and Lowering material, equipment, tool etc., netting and bag shall be used.

6.4.4 Indication of Signs

- Maximum loading capacity of working floor shall be specified according to structure and material, and it shall be indicated on the visible place.
- When working near special high voltage cable, sign shall be indicated on the visible place for keeping appropriate length against electronic line.



Figure 6.4-3 Designation of Maximum Loading Capacity

6.4.5 Inspection

- Defects shall be removed by inspection of material, equipment, and tool.
- Removal and fall of crossing brace, bar, baseboard, handrail frame, handrail, middle bar, etc. shall be inspected before commencement of work. It shall be repaired immediately in case of discovering abnormality.

6.4.6 Restriction on Employment

Equipment shall be operated by qualified person, in case of working with high elevation work vehicle.
Persons appointed by the responsible person can only operate.

6.5 PASSAGE/ RAISING AND LOWERING EQUIPMENT/ JETTY, ETC.

6.5.1 Setting of Safe Passage

- Safety passage for workers shall be installed at the place to working place and in working place.
- Safety raising and lowering equipment shall be installed at the place where height or depth is more than 1.5m.

6.5.2 Emergency Exit/ Evacuation Passage

- At least 2 entrances shall be provided at working place handling dangerous, explosion, ignite objects and at emergency floor (having an entrance/ exit which leads to the ground directly) of the building including that place. Doors of entrance shall be pulling door or outward swing door.
- One of direct stairs and slopes shall be installed outdoor except the case that emergency equipment such as slide, emergency stair, gangway, etc. is installed.
- Equipment for alarm shall be installed such as automatic warning equipment, emergency bell or mobile loudspeaker, manual siren for emergency case at dangerous working place.

6.5.3 Prohibition of Entry to Dangerous Place

- Refer to 3.3 Prohibition of Entry.
- When working near special high-pressure electronic line, signs shall be indicated on the visible place for keeping appropriate separation against electronic line.

6.5.4 Inspection

Refer to 6.4.5 Inspection.

6.5.5 Assembly/ Demolition/ Removal of Jetty/ Ascending Jetty

- Scaffold plate, which is more than 20cm width shall be installed for work such as connecting, removal and handover, and to make workers wear safety belt.
- When Raising and Lowering material, equipment, tool etc., netting and bag shall be used.
- Maximum loading capacity shall be specified and disseminated to workers
- Scope and procedure of dismantling and removal to workers shall be disseminated.

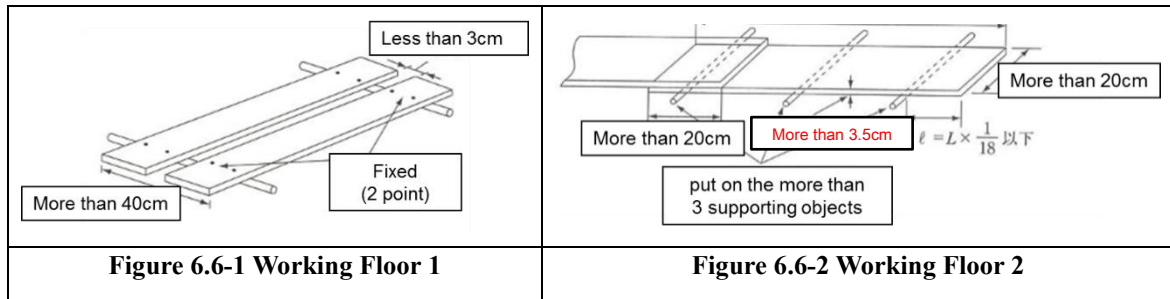
6.6 WORKING FLOOR, WORKING PLATFORM

6.6.1 Working Floor

- When working at the place where height is more than 2m and on the roof, such as straight and floor plate etc., working floor shall be installed.
- Floor material which has enough strength shall be used. Width is more than 40cm, opening space between floor materials is less than 3 cm and opening space between floor material and ground is less than 12 cm. To connect floor material to supporting objects at more than 2 points, in order to prevent falling and dropping.
- When moving floor material according to work, the more than 3 supporting objects shall be put on and length of overhang shall be secured part from supporting point more than 10 cm, and less

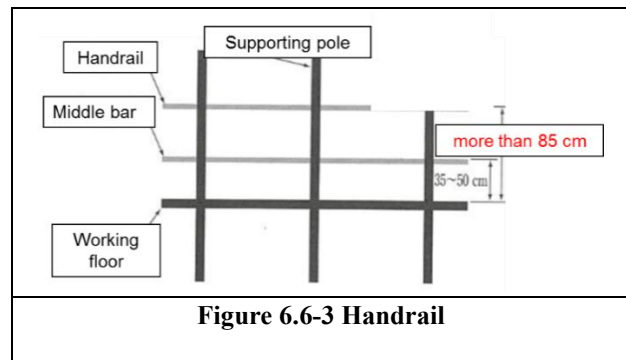
than 1 by 18 of length of scaffolding plate.

- When stacking scaffolding plate in long direction, scaffolding plate shall be stacked on the supporting point and secure more than 20cm length of stacking.
- Maximum loading capacity shall be specified and be disseminate to workers



6.6.2 Handrail

- Handrail shall be installed at the dangerous place of fall and to use materials which does not have damage and deterioration.
- Handrail shall be more than 85 cm height or have function equivalent to that and set middle bar, etc.



6.6.3 Fence/ Temporary Fence

- Fence/ temporary fence shall be installed and moving fence shall be installed as needed at the following place.
 - 1) The place where third party is prohibited to enter
 - 2) Around the project site
 - 3) Dangerous place
 - 4) The place where scattering of soil, sand, oil and dust is prevented
- Material shall not be damaged and corroded.
- Height of fence is more than 1.2m and pole shall be difficult to move and damage.
- Height of moving fence is 0.8~1.0m and length of it is 1.0~1.5m.
- Height of temporary fence is more than 1.8m and to install pole, horizontal material and reserve.
- To protect projection and end part.
- If there is risk of traffic hindrance by setting up temporary fence, wire netting shall be used for seeing through.

6.6.4 Baseboard/ Felloe Guard/ Car Stop

- Baseboard/ felloe guard/ car stop shall be installed at the place where handrail, fence, temporary fence is installed.
- Height of baseboard is more than 10cm, felloe guard/ car stop shall have enough strength and be

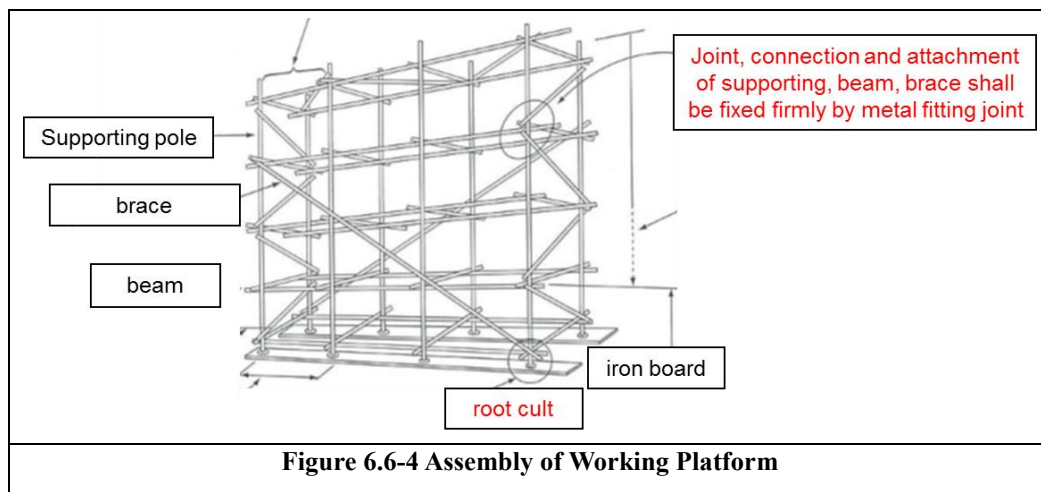
set and fixed absolutely.

6.6.5 Assembly of Working Platform

- Buried depth of platform shall be secured according to ground and to set root cult at the bottom of supporting pole in order to prevent supporting pole from moving and subsidence. To use baseboard as needed.
- Wood and steel as material shall have sufficient strength and not have heavy damage, defamation, and corrosion.
- Joint, connection and attachment of supporting, beam, brace shall be fixed firmly by metal fitting joint in order to prevent defamation and falling, etc.
- Level of difference shall be eliminated by installing calm slope at the spot facing on existing road, etc.
- When assembling and dismantling, worker shall be disseminated following items.
 - 1) When Raising and Lowering material, equipment, tool etc., to use netting and bag.
 - 2) Fall prevention in temporary lifting, temporary receiving, temporary connection, surplus, reinforcement, brace, wire, etc.
 - 3) Appropriate transportation and temporary setting.
- Maximum loading capacity shall be specified and disseminated to workers

6.6.6 Inspection

Refer to 6.4.5 Inspection.



6.7 TEMPORARY STATIONARY MACHINERY

6.7.1 Machinery

- Machinery shall be installed, assembled and dismantled under operation chief.
- Machinery shall be installed on the level basement. Base plate, etc. shall be used so as not to sink, as needed. When installing on the structure, to reinforce the structure appropriately in consideration with condition of the structure.
- Cover/ fence shall be installed around dangerous objects in touching, such as gear, belt, chain,

flywheel, etc.

- Enough lighting shall be secured on the installation place of machinery.
- Limited load, etc. shall be indicated on the machinery such as crane, derrick, and winch.

6.7.2 Operation

- The responsible person of machinery operation shall be designated, and that name shall be indicated on the visible place.
- Designated sign and signal shall be disseminated to workers.
- Non-authorized person shall be prohibited from entering the place during operation.
- Operator shall stop operation and implement inspection, when abnormality is found in operation, vibration, smell, thermometer, etc. Do not use machinery inappropriately.
- Grinding wheel of specified size shall be used and inspected before handling.
- Worker shall use protective glass absolutely, and use dust proof mask as needed, during operating grinder.
- Inspection and maintenance about following items shall be implemented before operating.
 - 1) Condition of cleaning and refueling
 - 2) Abrasion and Damage of rotating parts
 - 3) Thorough installation of safety device
 - 4) Abnormal sound and vibration, etc.
 - 5) Function of brake and clutch, etc.
 - 6) Grounding condition
 - 7) Abnormality of switch and wiring, etc.
 - 8) Condition of operation of warning buzzer or flashing lamp
 - 9) Arrangement and Cleaning of surrounding



Figure 6.7-1 Display the name of responsible person



Figure 6.7-2 Entry Prohibition

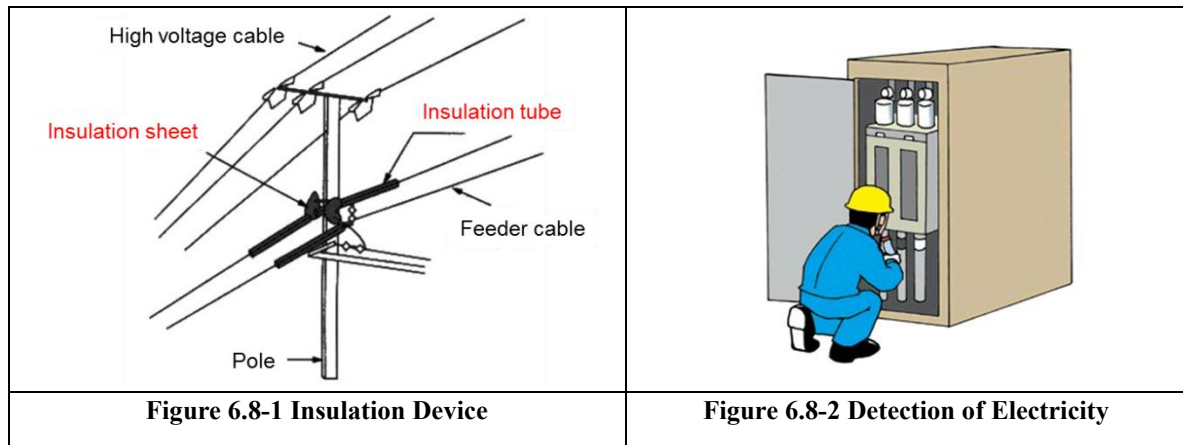
6.8 TEMPORARY ELECTRICAL FACILITY

6.8.1 General Maintenance

Following measures shall be taken, in case that construction work is close to overhead electric line or charging electric circuit for electrical equipment.

- To stop power supply before working.
- To confirm that insulation device was equipped.

- To detect electricity.
- To confirm safety by measuring insulation resistance and ground resistance regularly.
- To assign registered electricians for all electrical works.
- To secure proper earth connection.



6.8.2 Installation/ Relocation/ Removal

- Electric facilities for construction shall be installed/ reinstalled based on technical standards of electric facilities. And, to specify the following items during implementation of the work;
 - 1) Work method and procedure
 - 2) Work place, location, allowable strength of ground
 - 3) Arrangement of work equipment and vehicle
 - 4) Temporary placing and fall prevention of devices
- It shall be confirmed that insulation device was equipped after stopping power supply.
 - 1) To detect electricity.
 - 2) To take measures such as temporary hanging, temporary receiving, temporary tightening, temporary bracing, etc.

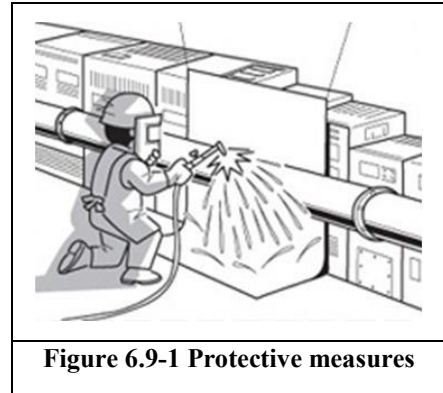
6.9 WELDING WORK

6.9.1 Electric Welding

- Frame of welding machine certainly shall be earthed when implementing electric welding work. The earth connecting shall be confirmed certainly before using welding machine.
- Damage of cover of wire shall be checked and repaired if damaged before welding work.
- Worker shall use protective equipment such as face shield, protective glove, apron, etc. To instruct other workers not to see arc with the unaided eye.
- Electrode holder shall be checked before working and set to prescribed sack whenever work is stopped.
- Automatic electric shock prevention device for AC arc welding machine shall be used.
- Don't wear moist grove and shoes in welding work. To pay attention to welding work especially in rain or after rain.

6.9.2 Acetylene Welding

- Acetylene welding etc. shall be implemented by qualified worker.
- Appropriate fire extinguishing equipment or fire extinguisher shall be installed near the welding work place.
- Welding work shall be started after removing inflammables.
- Not fire but soapy water shall be used for inspection of a gas leak.
- Blowpipe, hose, reducing valve shall be inspected in advance when working.
- Don't put on the place to get wet with rain or the humid place.
- Worker shall wear safety goggles, working glove, apron, etc. during working.
- Attention to a gas leak shall be paid especially when working in the poorly ventilated narrow room, etc.
- Temperature of cylinder shall be kept less than 40 °C.



CHAPTER 7. TRANSPORTATION

7.1 GENERAL INFORMATION

7.1.1 Grasp of Description of work

Refer to 6.1.1 and 6.1.2.

7.1.2 Common items for Preliminary Survey

Refer to 1.3 and 6.1.3.

7.1.3 Key points for Preliminary Survey

- Soil (rock, gravel, sand, etc.) of ground, area and topography, etc. shall be surveyed in order to plan a transportation route and to select a machinery.
- Width, slope, curve, height limit, weight limit, overhead facility, etc. of transport route to construction site shall be surveyed, in order to decide an adequate transport method.
- Traffic volume, traffic condition, etc. of transportation route to construction site shall be surveyed, in order to transport safely and promptly.
- Influence (noise, vibration, etc.) on surrounding environment caused by transportation shall be surveyed, in order to plan environmental measures.
- Transportation route to construction site shall be planned, before the transportation of special large material (trailer, etc.).

7.1.4 Common items for Construction Plan

Refer to 1.4 Construction Plan.

7.1.5 Key points for Construction Plan

- Transportation plan considering safety and efficiency shall be examined adequately, because transportation plan influences on construction schedule, carry-in plan of materials, select of other specific machineries (loading machinery, excavating machinery, etc.).
- Operation management shall be planned in order to prevent automobile accident in construction site.

7.1.6 Site Management of Transportation

Refer to 1.4 and 3.9.

7.2 TRACK AND TRAILER

7.2.1 Transportation Route and Equipment

- Transportation Route shall be maintained in construction site so as to run safely.
- Speed limit sign shall be installed at necessary spots in construction site, and caution sign shall be installed at curve, intersection, dangerous spots (shoulder, edge of slope, etc.), etc. as well.
- Dedicated road, which is operated as one-way traffic if possible, shall be installed, and passing-place shall be installed as needed, in case of large-scale construction site.
- Security lighting which is approx. 1 m height and has a luminous intensity (person can visually recognize from 150 m ahead in night time) shall be installed.
- Warning flare to vehicles shall be installed, and method of using shall be disseminated to operators.

- Attention to fire especially in garage, etc. shall be paid and to install a fire extinguisher surely.
- A fire extinguisher, a warning device, etc. shall be installed near storage area, in case of storing a large quantity of fuel, lubricating oil, etc. in construction site.



Figure 7.2-1 Transportation Route in Construction Site



Figure 7.2-2 Speed Limit Sign/ Caution Sign



Figure 7.2-3 Dedicated Road/ One-way Traffic

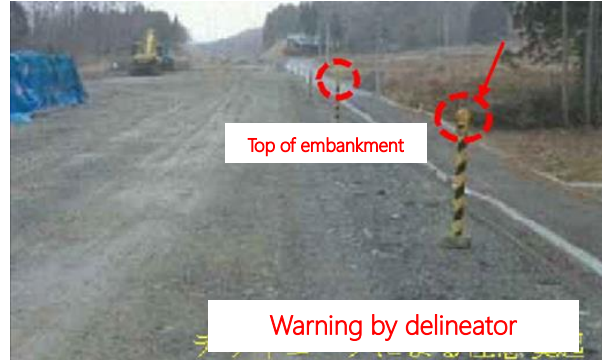


Figure 7.2-4 Security Lighting

7.2.2 Transportation

- Vehicle which passes public road must conform to traffic laws.
- Don't cause a load collapse in a loading.
- A guide shall be arranged in following places.
 - 1) Place of loading
 - 2) Disposal area
 - 3) Edge of slope
 - 4) Place with poor visibility
 - 5) Intersection with public road
 - 6) Place close to other work place
- Driver shall comply with sign of a guide when backing. Vehicle shall install a back buzzer as needed.
- Guide shall conduct operator, with wearing showy clothes, by specified signal with whistle and flag, at safe and easily visible place from operator.
- Vehicle shall be parked at specified place with applying a parking brake, and using a drag as

needed.

- Accident of slipping, etc. shall be prevented by decreasing slope angle as far as possible in loading mobile work machinery onto trailer.
- Shaking and collapse of load shall be prevented by binding material on cargo bed and machinery on trailer tightly. And anchoring wire shall be inspected.
- In case of carrying a long object, to put on a red flag or a lump to tip of the object.
- Attention to surroundings shall be paid adequately, especially based on signal and instruction, etc. when unloading.
- Special equipped vehicle shall be operated by operator having license, qualification, etc.

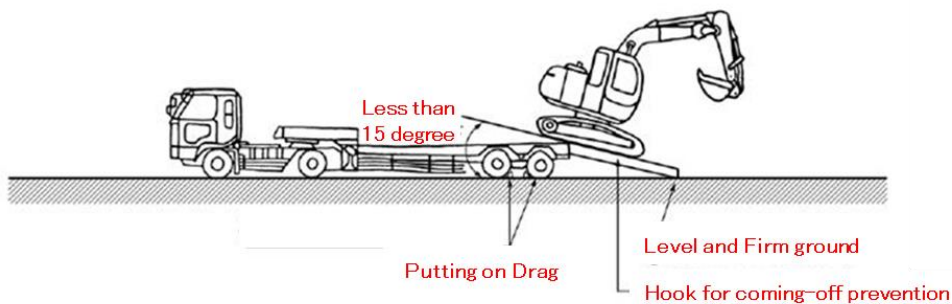


Figure 7.2-5 Transportation Vehicle with Climbing Equipment



Figure 7.2-6 Carrying Long Objects

7.2.3 Inspection

- Refer to 5.1.2, 5.1.3 and 5.2.7.
- Pre-operation check list for each machinery shall be prepared, pre-operation inspection shall be implemented.
- Operator/ Inspector shall implement inspection before commencing work, and record the result. And accident and repair shall also be recorded.

7.2.4 Maintenance

When abnormalities are found by inspection, abnormalities shall be repaired or other necessary measures shall be taken instantly.

CHAPTER 8. BRIDGE FOUNDATION

8.1 GENERAL INFORMATION

8.1.1 Grasp of Description of work

Refer to 6.1.1 and 6.1.2.

8.1.2 Common items for Preliminary Survey

Refer to 1.3.

8.1.3 Common items for Construction Plan

Refer to 1.4.

8.1.4 Key points for Construction Plan

- Plan shall be made for protection and relocation of surrounding house and construction.
- Plan shall be made for protective facility for prevention of damaging to the third party.
- Plan shall be made for protection and relocation of underground and overhead facility.

8.1.5 Site Management of Bridge Foundation Construction

Refer to 1.5 and 3.9.

8.1.6 Attendance of Relevant Person in protection of Underground Facilities

When working close to underground, overhead and railway facility etc., each relevant administrator shall be contacted and requested to be presence.

8.1.7 Key points for Operation of Machinery

Refer to 5.2.

8.1.8 Fall Prevention for Pile Hole

After driving/ extracting pile, fall prevention measure for pile hole shall be certainly taken.

8.2 PRECAST PILE FOUNDATION

8.2.1 Assignment of Operation Leader

Machine shall be certainly set, assembled, moved and dismantled according to instruction of operation leader.

8.2.2 Installation of Machinery

- Stable place shall be selected, machinery shall be installed on iron plate, square timber, and rail, etc. which are laid horizontally as needed, in order to secure stability of machinery.
- Drainage in the place where machinery is installed shall be kept in good condition.
- When installing on the soft ground, strength of ground shall be checked, ground shall be improved as needed, risk of sliding and fall etc. shall be eliminated by using iron plate and square timber, etc.



Figure 8.1-1 Fall Prevention for Pile Hole

8.2.3 Carrying in Piles

- Refer to 7.1.3, 7.1.5, 7.1.6 and 7.2.2.
- When carrying in and out long span object, approach and storage shall be designated, it shall be handled without danger.

8.2.4 Prohibition of Leaving the Operating Position

When stopping work temporarily during hanging load, the wheel locking device shall be certainly put on. Don't leave from operating seat.

8.2.5 Wire Rope

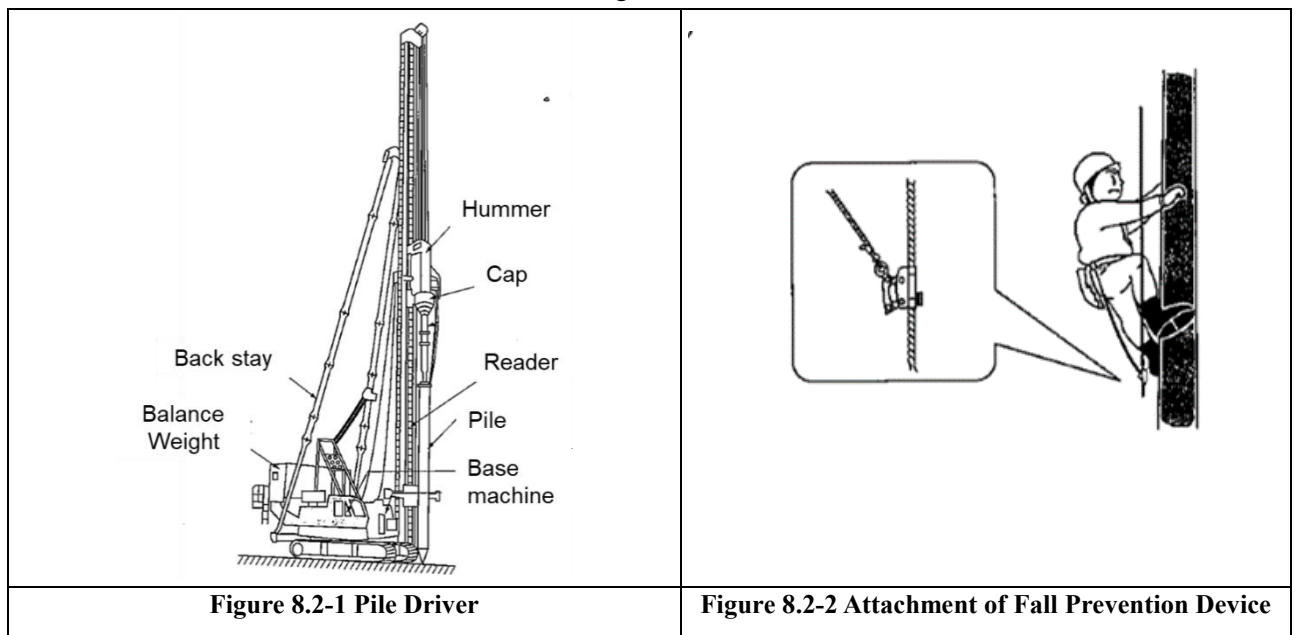
- Don't use wire rope for winding and hanging metal fitting, etc. which contains deformation, crack, and damage.
- Wire rope for winding shall be marked in order to prevent over-winding.

8.2.6 Slings Work

- Refer to 5.5.7 and 5.5.8.
- Wire rope for winding shall be implemented within rated load, to leave to safety place quickly after completion of slinging work.

8.2.7 Key points for Pile Driving Work

- Regular pile's cap shall be used and attached to hammer certainly when driving pile.
- When crane can't be used, current condition of site shall be examined adequately and work shall be implemented carefully.
- When climbing up reader, main lope shall be set, safety belt with fall prevention device shall be used.
- When constructing by hollow trench pressing fit technique, preventive measure of scattering shall be taken because there is a risk of scattering of removed soil.



8.2.8 Key points for Pile Extracting Work

- When extracting pile, machinery bearing area shall be secured widely, iron plate, square timber, etc. shall be used so as not to damage underground facility.
- Hole shall be backfilled elaborately after extracting pile so as not to occur void.
- Before extracting pile, safety of facility and pile shall be inspected sufficiently so that they can endure maximum load of initial extracting.

8.2.9 Inspection

- Member, wire rope, attachment, etc. to operate shall be always inspected after replacing and repairing defects.
- Hanging apparatus, etc. shall be inspected regularly. Don't use hanging apparatus which has crack and damage, etc.

8.3 CAST-IN-PLACE PILE FOUNDATION

8.3.1 Key points for All Casing Method

- When moving machine by pulling or jack, work shall be implemented according to signal or whistle of signal man.
- Equipment such as jack and pulley shall be maintained.
- Wire rope which fulfills specified safety rate shall be used.
- When operating hummer grab, worker shall not approach digging machine. Worker shall approach digging machine, after hummer grab enters inside of casing and stops, if necessary.
- Changing of band shall comply with designated working procedure.
- When entering inside of casing, casing shall be ventilated in advance or it shall be confirmed that there is no risk by measuring toxic gas, etc.

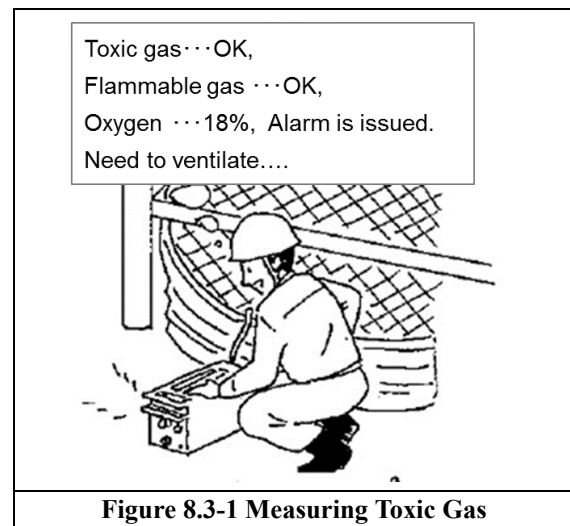
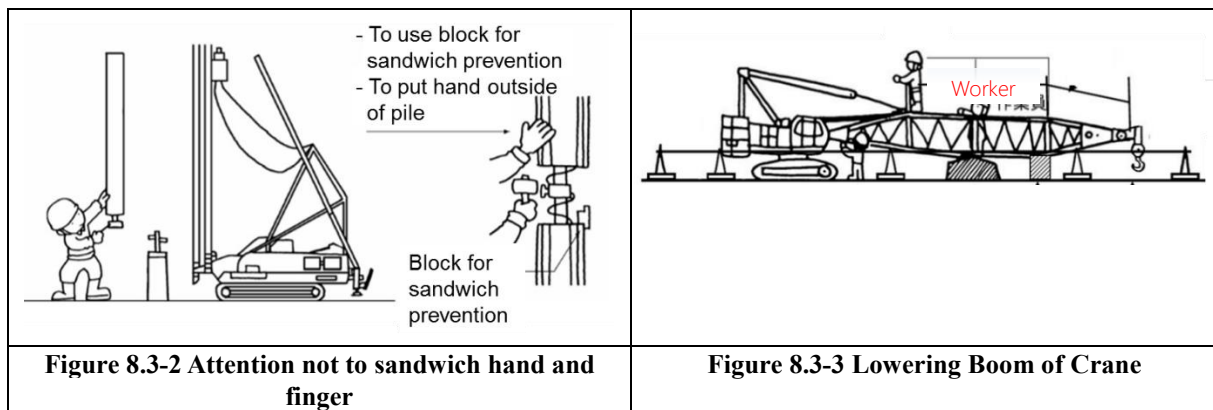


Figure 8.3-1 Measuring Toxic Gas

8.3.2 Key points for Reverse Circulation Drilling Method

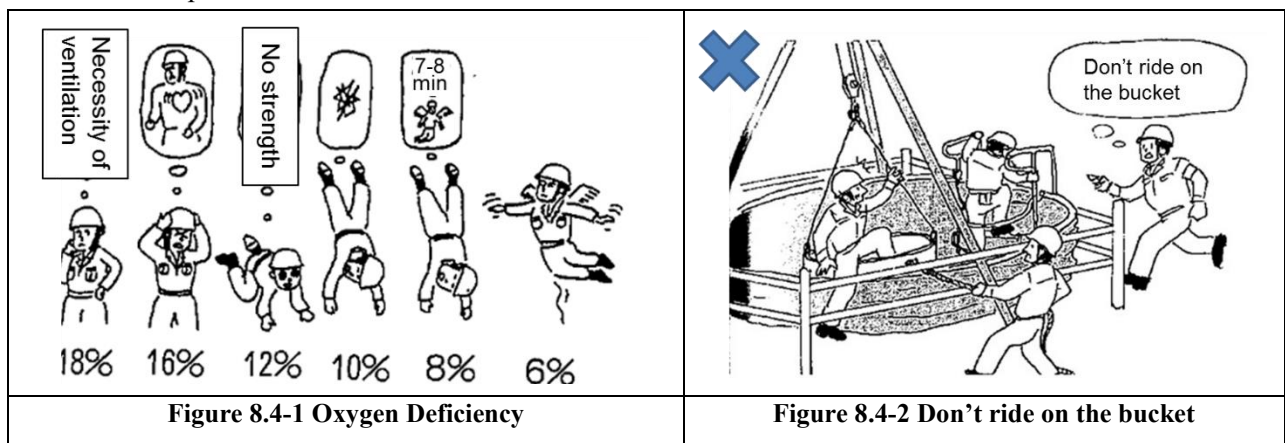
- Tower shall be assembled, dismantled and moved under working leader's direct instruction.
- Wire ropes shall be always arranged on the working platform of tower.
- Non- authorized person except necessary workers shall be prevented from getting closer to tower during driving and extracting casing.
- Don't pull casing, etc. horizontally.
- When working of rod's attach or removal, to be careful not to sandwich hand and finger.
- Work of entering steel pipe and iron cage by crane shall be implemented according to certain sing, after operator of crane, slinging worker and signer shall designate method of sign.
- In case of strong wind, measure of fall prevention shall be taken such as laying boom of crane and connecting tower and casing.



8.4 OPEN-CAISSON FOUNDATION, DEEP FOUNDATION CONSTRUCTION METHOD, AND OTHERS

8.4.1 General Information

- Soil quality, etc. shall be regularly checked during excavating, appropriate measure shall be taken in case of changing of soil quality.
- Apparatuses such as gas detector, oxygen density measure and others shall be regularly arranged.
- Ventilation facility shall be installed in case of the caisson which has a risk of toxic gas, etc. (include oxygen deficiency) or the caisson depth of which exceeds 20m.
- Existence of toxic gas and oxygen deficiency shall be measured before entering pile. Measurement shall be implemented by designated person. (Measurement in the work having a risk of oxygen deficiency shall be implemented by operation chief)
- Don't bring a match and a lighter, etc. into the pile, when entering pile which have a risk of occurrence of flammable gas.
- Worker shall evacuate to outside of the pile, when recognizing occurrence of toxic gas and oxygen deficiency.
- When going in and out pile, raising and lowering equipment shall be used, person shall not ride on the bucket.
- Emergency signal, sign and evacuation method shall be designated in advance.
- In trouble of machinery, defect of electricity, short circuit, etc., you can't use it before completion of repair.



8.4.2 Key points for Open-Caisson Foundation Construction

- Excavation shall be implemented gradually.
- When excavating around cutter face, worker shall comply with instruction of operation chief.
- When signing about sinking, worker shall evacuate to designated place, and sink after confirmation of evacuation.

8.4.3 Key points for Deep Foundation Construction

- When casting concrete, steel pipe or shoot shall be generally used.
- Abnormality of wall and liner plate shall be inspected before working.
- Worker of pile entrance shall not leave pile entrance when worker of pile inner is inside of pile.
- Worker of pile inner shall let their body come near inner wall and evacuate during raising and lowering of bucket.
- Raising and lowering equipment such as ladder, etc. shall be installed, and emergency ladder shall be installed. It's shall be confirmed that ladder doesn't contain damage, deformation and corrosion, etc.
- When excavating below groundwater level, drainage facility, etc. shall be used to proceed working after establishing measure of spring water, etc.

CHAPTER 9. CONCRETE STRUCTURE

9.1 GENERAL INFORMATION

9.1.1 Grasp of Description of work

Refer to 6.1.2.

9.1.2 Common items for Preliminary Survey

Refer to 1.3.

9.1.3 Common items for Construction Plan

Refer to 1.4.

9.1.4 Site Management of Concrete Work

Refer to 1.6 and 3.9.

9.1.5 Full dissemination of Dangerous Place

When casting concrete via cable crane, to disseminate workers cautious item such as not entering below bucket.

9.2 REINFORCING BAR WORK

9.2.1 Preparation of Tools

Material and tools shall be always arranged in order in the project site.

9.2.2 Checkup before Commencing the Work

Process about machine of reinforced bar and tools shall be inspected before working, to use adequate tools and not to use defective.

9.2.3 Transportation

- Long span object shall be brought by more than 2 persons and not be transported by force. To bundle object singly and be transported.
- Front and rear shall be taken caution against so as not to touch other object during transportation. Bent long span iron bar, etc. shall be taken special caution against.



Figure 9.2-1 Transportation of Long Span Object

9.2.4 Installation of Working Floor

When implementing assembling work at high place, to install safety working floor.

In case of being difficult to install working floor, safety belt shall be absolutely used or protective net shall be secured.

9.2.5 Secure Passage

At the place of assembling reinforced bar, safety passage such as setting board shall be secured for walking on the reinforced bar.



9.3 FORMWORK

9.3.1 Structure of Form Support

- Form support shall be firm structure based on method of casting concrete, and be assembled according to drawing for assembling. Drawing for assembling shall be made based on design calculation of material.
- Form support shall be taken measure of prevention from falling.

9.3.2 Material

Material shall not have damage, deformation, and corrosion.

Material shall be covered, where necessary, to prevent worker from being injured.

9.3.3 Assignment of Operation Chief

Assembling and dismantling of form support shall be implemented by direct instruction of operation chief who finish technical seminar.

9.3.4 Stoppage of the Work in Bad Weather

When risk of implementing work is expected by bad weather such as strong wind and heavy rain, to stop working.

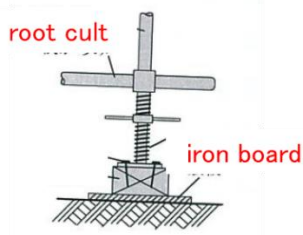

9.3.5 Usage of Standardized Products

- Standardized or regulated products for support, beam, main metal part of beam supporting, and pipe support shall be used.
- Form support shall be firm structure based on shape of it and method of casting concrete.

9.3.6 Measures for Form Support

- For preventing from subsidence and slide of support, usage of cover sand and iron board, casting basement of concrete, driving pile, and attaching root cult, etc. shall be implemented.

- Joint of support shall be butted or inserted, metal shall be connected via bolt and cramp etc.
- When form is curved surface, to take measure of prevention from floating of form such as attachment of surplus.
- Support on the center of sleeper shall be installed, so as not to occur eccentric load on support.
- Horizontal joint shall be installed on the two directions every less than 2m, and steel pipe support shall be firmed.
- More than 3 pipe supports shall not be connected. When connecting pipe support, to use more than 4 bolts or exclusive metal fitting.
- Bracing shall be installed between steel pipe frame.

	
<p>Figure 9.3-1 Prevention of Subsidence and Slide of Support 1</p>	<p>Figure 9.3-2 Prevention of Subsidence and Slide of Support 2</p>

9.3.7 Form Assembling/ Disassembling Work

- Scaffolding shall be appropriate for working.
- When hanging up and down, slinging work shall be certainly implemented so as material not to fall.
- Removed form from high place shall be lowered via rope, etc. so as not to damage form, and not be thrown and dropped.
- Needle of form shall be removed immediately.
- No relevant workers shall be prohibited from entering the area where worker assemble and dismantle.
- When raising and lowering material and tool, hanging net and hanging bag shall be used.

9.4 CONCRETE WORK

9.4.1 Concrete Mixer

- Work chief for assembling plant shall be designated, and work shall be implemented according to assembly drawing. Plant shall be used after trial.
- Guide shall be arranged at the entrance of plant based on situation.
- Safety passage shall be installed, enough light shall be secured.
- Scaling room etc. shall be installed ventilation as needed, and to use mask against dust in the scaling room.
- Person shall be prohibited from entering inside stock pile of aggregate.
- When putting oil or cleaning machine, machine shall be stopped.

9.4.2 Concrete Placing Facility

Below measure shall be taken based on each concrete placing facilities.

Bucket	Pump vehicle	Chute
<ul style="list-style-type: none"> -When using cable crane, 9.1.5 shall be referred, entrance shall be closed so as concrete not leak from bucket. - Worker shall be prohibited from entering under bucket and inside line of banker. - When using shifting crane, 5.5 Prior Confirmation shall be referred. 	<ul style="list-style-type: none"> -When using concrete pump, pipe shall be retained firm, attachment and removal of pipe shall be implemented carefully. -Boom vehicle shall certainly set outrigger, to clarify sign with top of pipe, and to prevent from falling and hose's shaking horizontally. -When moving concrete inside pipe via water and air on the end of casting, to fix top of pipe via chain etc. 	<ul style="list-style-type: none"> -Chute shall be arranged to in consideration with quality, throwing method, shape of chute, gradient and connection so as concrete not overflow.

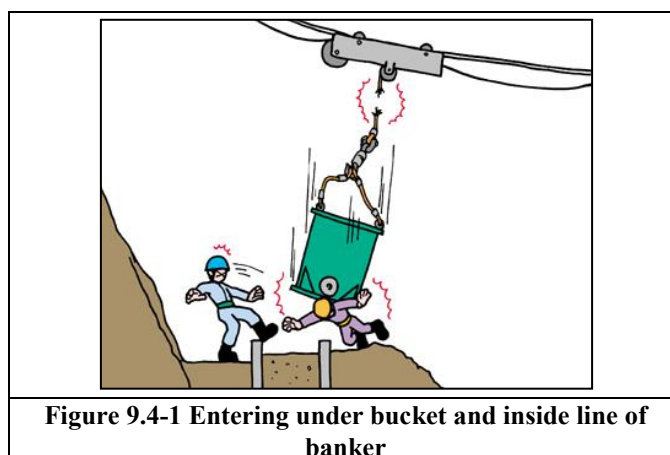


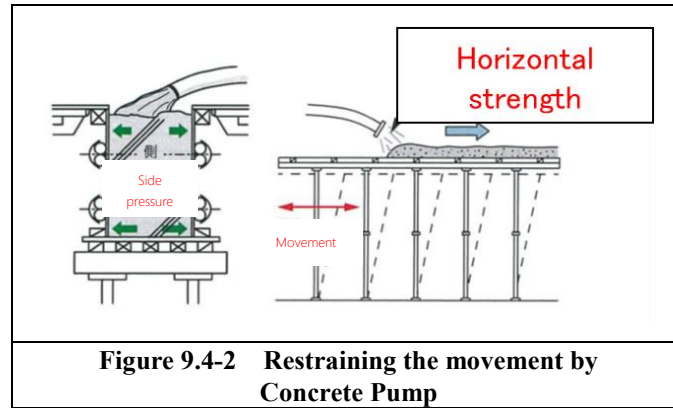
Figure 9.4-1 Entering under bucket and inside line of banker

9.4.3 Concrete Placing Work

- Step, form support, form before working shall be inspected, and wrong part shall be repaired before working. When recognizing abnormality, to stop working and to take appropriate measure.
- Gradient and attachment of hopper and chute shall be inspected.
- Method sign and communication about commence and cancel etc. shall be designated, and sing shall be certainly implemented.
- When there is risk of falling at high place, to take countermeasure against falling and dropping such as usage of safety belt, installation of handrail and protective fence etc.
- Procedure of casting and height of daily casting shall be designated and concrete shall be casted averagely so as not to occur oblique load to form support etc.
- Measure of prohibition from entering shall be taken at the part where there is risk of concrete

overflow against worker.

- Condition of form, form support, chute, hopper etc. shall be regularly inspected, and to confirm safety.
- Instrument of concrete pump car shall be driven by licensed person.
- When using concrete pump, counterforce occurs on the top of pipe. Therefore, work shall be arranged on the top of pipe for restraining the movement.



9.4.4 Usage of Machinery with Operator

Refer to 5.6.2.

CHAPTER 10. BRIDGE CONSTRUCTION (BRIDGE ERECTION)

10.1 GENERAL INFORMATION

10.1.1 Scope

This chapter shall be mainly applied for erection construction of superstructure. Construction of substructure, slab construction, and pavement construction, etc. shall be referred to relevant chapter of each construction.

10.1.2 Grasp of Construction Contents

Refer to 6.1.2.

10.1.3 Key points for Preliminary Survey

- Refer to 1.3.
- Not only assumed condition of weather and sea during construction but also site condition such as traffic and environment shall be sufficiently surveyed.
- In case of erection work over the open road, countermeasure of traffic shall be sufficiently surveyed in advance.
- Water depth, speed of flow and tide level, etc. shall be sufficiently surveyed in advance in case of river, sea, coast, lake, etc.
- Existence of sufficient ground durability on the point of bent' foundation, iron tower' foundation, anchor' installation shall be surveyed.

10.1.4 Key points for Construction Plan

- Refer to 1.4.
- It shall be confirmed that temporary facility and erection machine for erecting have scale and strength for securing safety during construction.
- Stability of girder, etc. during working shall be inspected, and detailed plan for working shall be made.
- Machine which is suitable to concerned construction method shall be selected.
- When implementing lowering work of girder over the open road, necessary measure for traffic shall be taken according to instruction and discussion of road operator and jurisdiction police.
- When implementing method and procedure which is different from considered ones in design time, pressure and deformation in erection time shall be examined, safety of structure during erecting shall be confirmed.

10.1.5 Site Management of Bridge Construction

Refer to 1.5 and 3.9.

10.2 EQUIPMENT OF STEEL BRIDGE ERECTION

10.2.1 Use of Newly Developed Equipment for Erection

When using newly developed/improved equipment for erection, safety and effectiveness of work shall be confirmed in advance.

10.2.2 Machinery such as Crane of Handling Heavy Material

- Machine handling heavy object such as crane shall be always endeavored to maintain and inspect.
- Ability of machine handling heavy object such as crane shall be indicated and disseminated all worker.

10.2.3 Safety Factor of Machine, Tool, Rope

Machine, tool, rope, material of bent and saddle, etc. shall be normal and have appropriate safety level against weight.

10.2.4 Installation of Cable Crane and Steel Tower for Cable Erection

- Material and structure shall have appropriate safety level against weight.
- Cable Crane and Steel Tower for Cable Erection shall be installed on the firm foundation, and be prevented from slipping and sinking.
- Angle between rope and horizontal face shall be generally within 60-degree.

10.2.5 Installation of Anchor

- Anchor which have sufficient durability based on construction plan shall be installed.
- When adapting rock anchor, necessary durability by durability test against pulling shall be confirmed.

10.2.6 Cable Crane Sag

Track cable shall be stretched as designated sag. When attaching bridge member, and occurring working of pulling horizontally while hanging cargo, safety rate of track cable against horizontal weight shall be checked.

10.2.7 Wire Rope of Cable Crane

- Don't use wire rope which connects track cable or rope for boom.
- Don't generally use wire rope which connects rope of running or winch. If necessary, wire rope shall be maintained sufficiently before bringing site.

10.2.8 Arrangement and Maintenance of Equipment and Member

- Material shall be divided and arranged in the putting place based on plan so as to be convenient for conveying, and to endeavor to maintain it.
- Facility such as power, light and communication shall be installed based on plan, and to endeavor to maintain it.

10.2.9 Preparation of Fire Extinguisher

Fire extinguisher shall be prepared on the site where worker handle machine and fire.

Fire extinguisher shall apply for assumed fire status.

10.2.10 Storage of Dangerous Substance

Flammable object such as gasoline, oil, fat, paint and plastic shall be amount designated by class, and be stored on the safety site for work.

10.3 ERECTION OF STEEL BRIDGE

10.3.1 Erection

Each work shall be implemented based on construction plan. When changing plan, construction plan to make shall be changed and work shall be implemented based on it.

10.3.2 Chain of Command

- Instruction, chain of command, work procedure, role of worker and arrangement of person for each work shall be clarified.
- When implementing work close to other work, Chain of Command shall be sufficiently contacted and arranged between works.

10.3.3 Installation and Inspection of Erection Machinery

- Machine for erection such as crane, moving crane, delivery device shall be installed based on construction plan.
- Existence of abnormality about facility for erection such as bent, cable crane, delivery device shall be inspected before erecting.

10.3.4 Crane Work

- Moving crane shall be installed horizontally. Ground on the site where outrigger is installed shall be inspected, and measure shall be taken for preventing from subsidence such as set iron plate as needed.
- Worker shall be prohibited from entering under hanged baggage during winching up and down material of bridge.
- Don't enter inside of wire rope for winch and slide during cable crane.

10.3.5 Temporary Placing of Steel Member

Steel member shall be placed on the firm wood and at designated point in consideration with procedure of assembly work.

10.3.6 Assembly Work at Ground

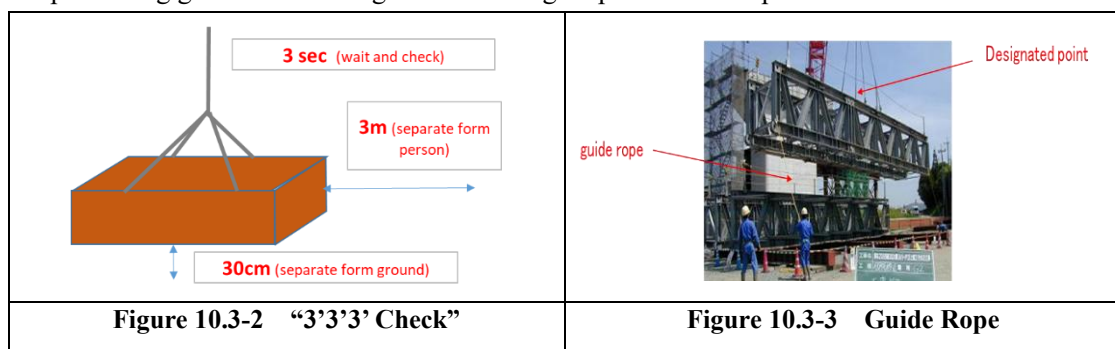
- Assembly work at ground shall be implemented on the arranged place, firm supporting member for preventing member from falling shall be installed.
- When assembly member is unstable during assembly work at ground, facility for preventing from falling shall be installed.



Figure 10.3-1 Assembly Work at Ground

10.3.7 Assembly Work of Bridge Member

- While bridge member is separated from ground, existence of abnormality about slinging rope, balance, outrigger, etc. shall be inspected before proceeding working.
- “3’3’3’ Check” is recommended.
- “3’3’3’ Check” means; 3 seconds (wait and check), 3 meters (distance secured from person), 30 cm (height secured from the ground).
- When hanging block of bridge which is assembled at ground, designated point in advance shall be hanged.
- When hanging heavy and long object, guide rope shall be used for preventing girders from swinging and touching other structure.
- When hanging long bridge member such as box girder, possibility that boom of crane touch bridge member shall be sufficiently checked in advance, and to be careful during work.
- While hanging girder, attachment condition of block and direction of wire rope’ tension shall be confirmed before commencing working.
- Don’t pull temporary bolt and drift pin before finishing fastening bolt of vacant hole.
- When handling girder which is curved or high center of gravity, measure for preventing from falling shall be taken.
- When implementing work which move girder horizontally or lower girder by jack, measure of preventing girder from falling such as setting surplus of wire rope shall be taken.



10.3.8 Ventilation inside Box Girder and Steel Pier

When implementing welding and painting work inside box girder and steel pier, to sufficiently ventilate, and to have worker use protective equipment for breezing,

10.3.9 Prevention of Parallel Work of High and Low Place

When erecting girder of truss or arch, schedule for preventing from parallel work of high and low place shall be arranged as possible.

10.3.10 Installation of Receiving Pedestal

- Receiving pedestal shall have necessary durability against vertical load, horizontal load and no average load.
- When using saddle member as receiving pedestal, to assemble such as crib retaining, and to fix mutually via bolt.

10.3.11 Installation of Jack

- Jack shall have necessary capacity against vertical, horizontal and no average weight at each erection step. Installation of jack pedestal shall be complied with installation of receiving pedestal. Pressure of erection shall be calculated in advance, and safety about attachment place of girder's jack shall be confirmed.
- When installing simple girder, jack at appropriate place shall be installed so as not to occur partial buckling of bridge member.
- When using jack, not to lower both end of girder concurrently.
- When lowering girder on the top of several pier, to control jack everyone pier, to remain other pier supported by receiving pedestal.
- When lowering girder via some jack on the top of one pier, to make lowering speed same.

10.3.12 Installation of Rail Beam

Rail beam shall be installed accurately, while paying attention to place, height, and average speed between rail beams.

10.3.13 Shifting of Bridge Girder

- When shifting girder horizontally via cart, facility for preventing from escaping such as wire shall be installed.
- When shifting girder, work shall be implemented while confirming amount of shift, shifting speed and direction.
- When stopping cart for shifting member, to fix cart.

10.3.14 Limitation of Loading during Temporary Tightening Condition

- When implementing overhang erection, heavy object such as erection machine shall not be loaded during temporary tightening condition.
- Don't leave long time during temporary tightening condition.

10.3.15 Installation of Crane on Bridge Girder

When installing shifting crane on the girder which is already erected, weight of crane, installed place and condition shall be confirmed.

10.3.16 Protection of Temporary Construction within River Area

When installing temporary construction such as bent, working platform, raising and lowering facility within river, temporary construction shall be protected so as to prepare abnormal water, sailing of ship, etc.

10.3.17 Mooring Facility

Safe mooring facility such as working ship or barge shall be used sufficiently.

10.3.18 Watching during Work on the Water

- Sailing ship shall be monitored.
- Water depth, speed of flow, tide and depth of sailing ship, barge shall be monitored.
- Standby the rescue boat.
- When underwater work is implemented, measures such as below shall be taken;

Assign watchman to check the diver location.

Check the oxygen prior to start of underwater cutting.

Check the condition of oxygen hose and under water gear.

10.4 EQUIPMENT OF PC BRIDGE ERECTION

10.4.1 Maintenance and Inspection of Tools

Necessary tools such as jack, bracket and bolt for receiving jack, chain block, and wire rope shall be inspected and arranged.

10.4.2 Jack, Bracket, Bolt for Receiving Jack

- Durability of bracket and bolt for receiving jack shall be examined. When burying bolt into girder, attachment to concrete shall be examined.
- When deciding point attached bracket for receiving jack, the center of gravity shall be considered.
- Jack shall have sufficient capacity against weight.
- Point attached jack have sufficient capacity against weight.

10.4.3 Slide Erection Equipment

- Slide erection equipment have sufficient durability.
- Pulling power and method of control shall be examined, and appropriate operating facility such as block, jack shall be selected.
- Attached point have sufficient durability against weight.
- Method of fixing which can secure stability shall be examined in case of fixing machine temporary.

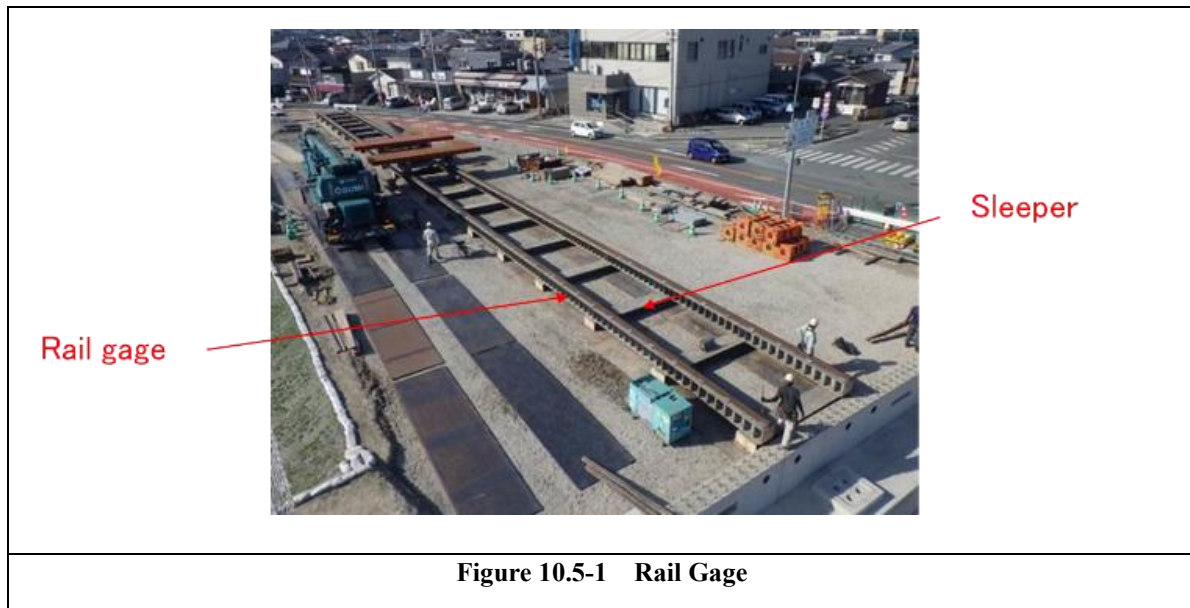
10.4.4 Heavy Load Trolley

- Heavy load trolley shall have sufficient durability against loading weight.
- Pulling power and method of control shall be examined, and appropriate operating facility such as winch shall be selected.
- Moving heavy load trolley shall have appropriate operating ability.
- Rail shall have equipment which prevent girder from escaping.

10.5 ERECTION OF PC BRIDGE

10.5.1 Installation of Rail

- Appropriate rail gage shall be selected, and sleeper which support rail at appropriate span shall be arranged.
- Rail shall be accurately installed, while paying attention direction, height, and average speed between rails.
- Joint of rail not having gap shall be installed.



10.5.2 Temporary Placing and Transportation of PC Girder

- PC girder shall be temporary placed at designated place and on the firm spread wood according to procedure of erection.
- When handling PC girder which have gravity at high point, measure for fall prevention shall be taken.
- When using current road for transportation, road condition and limitation of traffic low shall be examined.

10.5.3 Prestressing of PC tendon

- No one shall be permitted to stand within the full length of the tendon.
- Barricade the working areas during stressing operation.

10.5.4 Fall Prevention of PC Girder

When erecting PC girder especially T girder, measure for fall prevention shall be taken since finishing tightening horizontally or connecting.

10.5.5 Checking of Installation of Crane

When installing and using shifting crane on the girder, pressure of girder shall be examined by outrigger's weight.

10.5.6 Delivery Work of Erection Beam Equipment

- When implementing deliver work, amount and speed of delivery, procedure and scheduled time of work etc. shall be disseminated to all relevant person.
- It shall be confirmed that cargo, roller, deliver equipment are normal.
- Deliver work shall be commenced, after confirming locking device such as wire rope and stopper.
- When changing and stopping wire rope etc., to fix deliver facility.



Figure 10.5-2 Delivery Work

10.5.7 Slide Erection Work

- When implementing slide erection work, it shall be confirmed bearing capacity and condition of earth which machine and equipment are installed, and to take necessary measure.
- Sufficient measure for fall prevention shall be taken.
- Escape prevention such as wire shall be taken.

10.5.8 Lifting and Descent by Jack

- Both side of bridge girder shall not be lifted and descent at same time.
- Additional packing attaching below face of girder shall be put during lifting and decent of PC girder.

CHAPTER 11. DEMOLITION WORK OF STRUCTURE

11.1 GENERAL INFORMATION

11.1.1 Grasping of construction contents

- Refer to 6.1.1.
- Construction method, examination items, problems etc. about previous similar construction shall be grasped.

11.1.2 Common items about presurvey

Refer to 1.3.

11.1.3 Key points about presurvey

- Structure strength, scale, shape, face of member, interior and exterior, instrument of equipment etc. shall be inspected.
- Structure or damage, wear, corrosion, deterioration of its member, etc. shall be inspected.
- Surrounding environmental of demolished construction (control condition of topography, soil, surrounding construction, house, railway, road, underground facility etc.) shall be inspected.
- Possibility of fire usage such as welding, fuse, gunpowder, etc. shall be checked.
- Influence of structure changing against construction shall be considered during demolishing.
- Receiving place of by product, condition of facility for reuse (company obtaining concrete and asphalt recycle plant, plant capacity, etc.) and conveying route shall be surveyed.

11.1.4 Construction Plan

- Refer to 1.4.
- Countermeasure against surrounding construction, environmental (dust, noise, vibration, flying stone, underground facility, electronic line, delivery entrance, etc.) shall be taken.
- Plan against disposal of waste shall be made.



Figure 11.1-1 Countermeasure



Figure 11.1-2 Countermeasure

11.1.5 Site management of demolition work

- Refer to 1.5 and 3.9.
- When raising and lowering material and tool, to use hanging net and hanging bag.
- Following measure shall be taken for preventing damage against the third party.
 - 1) Measure firm protective metal net, fence, etc.
 - 2) Measure such as pulling wire for controlling fall and checking sing in case of falling

- 3) Installation preventive supporting of member's fall and preventive mat against explosion
- 4) Measure and indication prohibition of entering dangerous place
- When using fire and gas, etc. to prepare fire extinguisher etc., to take protective measure so as not to influence surrounding and to inspect fire extinguishment after work.

11.2 DEMOLITION WORK

11.2.1 Necessary measure of pressure machine, cutting machine of steel bar and big breaker

- Measure of prohibiting from entering radius of machine working shall be taken.
- Stability of machine's base shall be confirmed.
- Surrounding environment against noise, vibration and dust shall be considered.
- Breaker shall be driven by licensed persons. They shall drive only vehicles indicated by responsible persons.

11.2.2 Necessary measure of falling method

- To divide small span and to construct.
- Pulling wire, etc. shall be installed for stability and construction control.
- Trimming shall be implemented in accordance with plan.
- Sign shall be designated before working and disseminated.
- Falling work shall be continuous absolutely, and working shall be finished for one day and not to leave as trimming.

11.2.3 Necessary measure of cutter method

- Rolling equipment shall be maintained certainly, water for cooling heated part shall be secured.
- Cut member become big, to need temporary hanging and convening by crane.

11.2.4 Necessary measure of wire soring method

- Necessary tension shall be kept so as not to occur relaxation of wire sore.
- Attention shall be paid against fuse of wire sore.
- Protective cover shall be certainly installed.

11.2.5 Necessary measure of abrasive water jet method

- Protective cover shall be used for low noise.
- Slurry shall be disposed.

11.2.6 Necessary measure of demolish work by explosion

- Worker who does not engage in explosion shall be prohibited from entering workplace.
- After explosion, worker shall be prohibited from entering workplace until safety is confirmed.
- Time of explosion, method of evacuation, place of evacuation and sing of fire, etc. shall be disseminated to worker.
- Concrete crush method and controlled blasting shall be expected enough effectiveness, and material shall be certainly filled up.
- Measure shall be taken against flying stone.
- Appropriate amount of material shall be used to demolish condition.

Appendices

Appendix 1 – Accident Report Form

SF 01

Accident Report

() Report

【Form-1】

«Accident in yyyy(year)»

(time) xx:xx (day)xx/(month)xx/(year)xxxx

1. Organization	Construction Unit		No.	Office		(Reporter)	Name/Position
2. Project Name	xx Bridge Construction Project						
3. Date, Time, Weather	dd	/	mm	/	yyyy	() AM/PM	hr : min (weather)
4. Place	xx Bridge, P x Pier						
(Address, IC, KP, etc.)							
5. Project Outline							
(1) Section/ Contractor	xx Co., Ltd.			(Address)			
(2) Contract Period	dd	/	mm	/	yyyy	-	dd / mm / yyyy (Progress : %)
(3) Contract Amount				Kyat	As of month/year		
6. Description of Accident	<div style="border: 1px solid black; height: 100px; width: 100%;"></div>						
7. Status of Accident (In case of public accident, Person relevant to the cause shall be noted)							
Classification Public, Worker, etc	Name	Sex Age	Classification Career	Career of the Site	Address of Victim Company name, Relation with Constact		Damage Severity
xx	xx	Male/Female xx	xx (Worker, etc) xx year	xx year xx month	Subcontractor xx Co.,Ltd.		
(Status of Object damage)							
<div style="border: 1px solid black; height: 100px; width: 100%;"></div>							
8. Comments on Accident (Cause, Comments of Police/Authority, etc.)							
<div style="border: 1px solid black; height: 100px; width: 100%;"></div>							
9. Measures to be taken after the accident							
(Victim)							
(Construction Site)							
10. Interview/ News							
<div style="border: 1px solid black; height: 100px; width: 100%;"></div>							
(Accident status of the Project)							
Total:		0 accident,		Death:		0 accident,	
				Serious injury:		0 accident,	
				Others		0 accident	

※ Location map, Drawings for explanation of accident status, Photo, etc. shall be attached

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Prevention Initiative List « Accident in xx(year) »

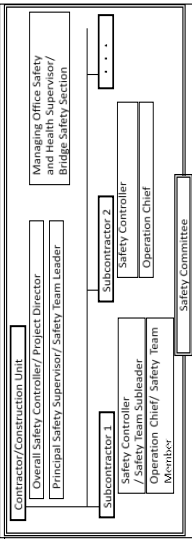
【Form - 3】

No.	Cause of Accident	Countermeasure	Monitoring of Accident Prevention		
			3 months after	6 month after	1 year after

Appendix 2 – (Example) Check List for Each Work Item

SF 04

GENERAL SAFETY MEASURE			
CH 1~3	Construction site	Date of inspection	Inspector
Main work on today			
No.	Item	Check Point	Answer
			Picture for reference
1	Worker	Is worker put necessary equipment (such as helmet, appropriate shoes, safety belt)?	Picture-1
2	Construction Plan	Is Construction Plan prepared?	Picture-2
3	Safety committee	Is Safety committee organized?	Picture-3
4	Consideration of Work Environment	Is necessary measure taken according to work environmental (such as noise, dust)?	Picture-4
5	Entry Prevention Facility of Construction Zone	Is Entry Prevention Facility of Construction Zone installed?	Picture-5
6	Traffic Accident prevention	Is Signboards installed at visible place?	Picture-6
7	No Unauthorized Entry	Is Traffic Accident prevention taken near Gate of Site?	Picture-7
8	Arrangement of Watchman and Guide	Is prohibition of entry installed ?	Picture-8
9		Is notice of the prohibition of entry posted at an easily visible location?	Picture-9
10		Are Watchman and Guide arranged?	Picture-10
11		Are signs and signals unified and disseminated?	Picture-11
12	Fall Prevention	Is safe work platform installed at more than 2 m high place?	Picture-12
13		Is measure of fall prevention (such as fence, handrail, cover) taken?	Picture-13
14	Protection for Flying and Falling objects	Is Protection for Flying and Falling objects installed?	Picture-14
15	Measures in Abnormal Weather	Is Weather Information checked?	Picture-15
16		Is necessary measure taken in case of Abnormal Weather?	Picture-16
17	Fire Prevention	Is fire prevention equipment installed?	Picture-17
18	Emergency Measures	For case of emergency, is contact method and emergency measures disseminated to workers?	Picture-18
Comments			



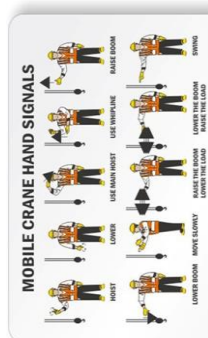
Picture-1



Picture-3



Picture-5



Picture-7

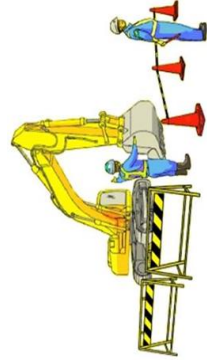


Picture-9

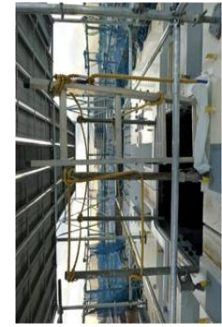
Picture-2



Picture-4



Picture-6



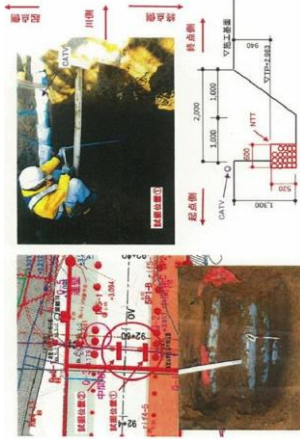
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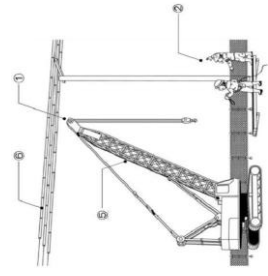
Picture-10

CH 4.5.7		UNDERGROUND AND OVERHEAD FACILITIES / MACHINERY AND EQUIPMENT / TRANSPORTATION				
Construction site		Date of inspection		Inspector		
Main work on today						
No.	Item	Check Point	Answer	Picture for reference	Manual for reference	Guidance for improvement
1	Underground Facilities	Is the existence of underground facilities confirmed by road and underground facility inventory with administrators of facilities?	Yes/No/NA	Picture-1	Clause 4.1	
2		Are underground facilities (type, position) confirmed visually by an exploratory excavation?	Yes/No/NA			
3		Is underground facilities protected and maintained, in case that underground facilities can't be relocated.	Yes/No/NA			
4	Overhead Facilities	Do administrators confirm construction method and inspection in case of construction which is close to overhead facilities?	Yes/No/NA	Picture-2	Clause 4.2	
5		Is protective measure taken?	Yes/No/NA			
6	Operator of construction machinery	Is inspection/ oiling/ maintenance in a timely manner (the start of work, the end of work, daily monthly, yearly) implemented?	Yes/No/NA	Picture-3	Clause 5.2	
7		Is the installation place selected in consideration of necessary items (Safety against a fall, Securing necessary separation between facilities)?	Yes/No/NA			
14		Is transportation route maintained in construction site so as to run safely?	Yes/No/NA	Picture-4		
15	Transportation	Is shaking and collapse of load prevented by binding material on cargo bed and machinery on trailer tightly?	Yes/No/NA	Picture-5	Clause 7.2	
16		After implementing necessary survey, Is transportation route to construction site decided?	Yes/No/NA			
			Yes/No/NA			
Comments						

Picture for reference



Picture-1



Picture-2

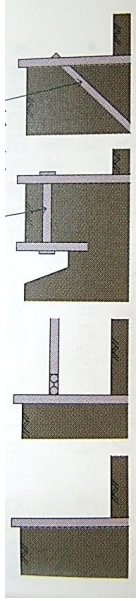


Picture-3



Picture-4

CH 6		TEMPORARY CONSTRUCTION			
		Picture for reference			
Construction site		Date of inspection		Inspector	
Main work on today					
No.	Item	Check Point	Answer	Picture for reference	Manual for reference
1	general information	The type, arrangement and maintenance period etc. of temporary structure shall be described in order to construct safely and efficiently			Clause 6.1
2		When digging depth is more than 1.5 m, Is earth retaining construction implemented in principle?	Yes/No/NA	Picture-1	
3	Earth retaining / timbering	Is daily inspection (including abnormal weather) of Earth retaining/timbering implemented?	Yes/No/NA		Clause 6.2
4		Is assembly of earth retaining/ timbering implemented based on planned procedure?	Yes/No/NA		
5		Is full Prevention complied with?	Yes/No/NA	Picture-2	
6	Scaffolding	Is maximum loading capacity of working floor indicated on the visible place?	Yes/No/NA	Picture-3	
7		Is each part of scaffolding inspected before commencement of work?	Yes/No/NA		
8	Passage	Is safety passage for workers installed?	Yes/No/NA		
9		Is safety raising and lowering equipment installed at the place where height or depth is more than 1.5m?	Yes/No/NA	Picture-4	Clause 6.5
10		When working at the place where height is more than 2m and on the roof, Is working floor installed?	Yes/No/NA		
11	Working floor	Is handrail installed at the dangerous place of fall?	Yes/No/NA		Clause 6.6
13		Is fence/ temporary fence installed such as around the project site?	Yes/No/NA	Picture-5	
			Yes/No/NA		
Comments					



Picture-1



Picture-2




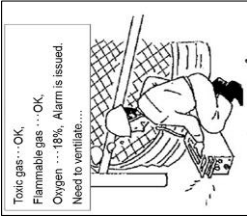




















Picture-3



Picture-4

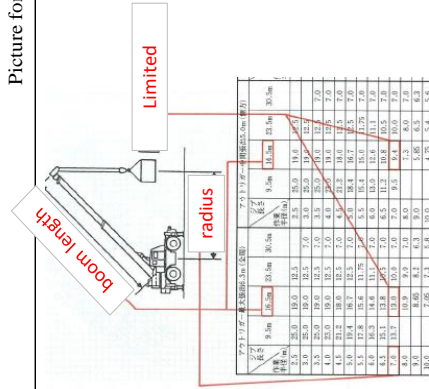


Picture-5

CH 8.9				Bridge Foundation / Concrete Structure				Picture for reference	
Construction site		Date of inspection	Inspector						
Main work on today									
No.	Item	Check Point	Answer	Picture for reference	Manual for reference	Guidance for improvement			
1	general information	Is fall prevention measure for pile hole certainly taken, after driving/ extracting ?	Yes/No/NA	Picture-1	Clause 8.1		 		
2	precast pile foundation	Is Stable place selected for Installation of machinery ?	Yes/No/NA				 		
3		Is Strength of ground checked in case of soft ground ?	Yes/No/NA		Clause 8.2		 		
4	cast in place pile foundation	Is Regular cap of pile used and attached certainly to hammer?	Yes/No/NA	Picture-2	Clause 8.3		 		
5	open caisson foundation etc.	When entering inside of casing, casing shall be ventilated in advance or it shall be confirmed that there is no risk by measuring toxic gas, etc.	Yes/No/NA	Picture-3	Clause 8.4		 		
7	reinforcing bar work	When going in and out pile, raising and lowering equipment shall be used, person shall not ride on the bucket.	Yes/No/NA	Picture-4	Clause 9.2		 		
8		Long span object shall be brought by more than 2 persons and not be transported by force. To bundle object singly and be transported.	Yes/No/NA	Picture-5			 		
9	form work	At the place of assembling reinforced bar, safety passage such as setting board shall be secured for walking on the reinforced bar.	Yes/No/NA	Picture-6			 		
10		For preventing from subsidence and slide of support, usage of cover sand and iron board etc shall be implemented.	Yes/No/NA	Picture-7			 		
11	concrete work	When using concrete pump, pipe shall be retained firm, attachment and removal of pipe shall be implemented carefully.	Yes/No/NA	Picture-8			 		
12		Step, form support, form before working shall be inspected, and wrong part shall be repaired before working. When recognizing abnormality, to stop working and to take appropriate measure.	Yes/No/NA				 		
Comments									

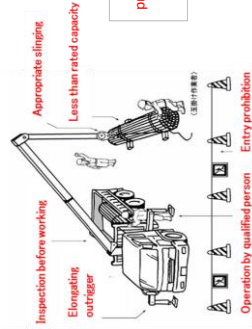
BRIDGE CONSTRUCTION (BRIDGE ERECTION)					Picture for reference	
CH 5.10	Construction site	Date of inspection	Inspector			
Main work on today						
No.	Item	Check Point	Answer	Picture for reference	Manual for reference	Guidance for improvement
1	Mobile crane work	Is the type having enough capacity selected by setting operating radius, lifting load, hook weight?	Yes/No/NA	Picture-1	Clause 5.5	
2		Is the ground condition inspected?	Yes/No/NA	Picture-2		
3		Is a mobile crane set horizontally and elongated outrigger completely?	Yes/No/NA	Picture-3		
4		Are there no obstacles within a work range of mobile crane?	Yes/No/NA			
5		Is one signal man arrangements, and give a signal with a pre-concerted signal?	Yes/No/NA	Picture-3		
6		Is person prevented from entering the place (directly under a load, within moving range of a load) with the danger caused by falling of a load?	Yes/No/NA			
7		Is countermeasure of traffic sufficiently surveyed in advance?	Yes/No/NA			
8	General information	Is existence of sufficient ground durability on the point of bent' foundation, iron tower' foundation, anchor' installation surveyed?	Yes/No/NA	Picture-2	Clause 10.1	
9		Is each erecting work and machinery implemented based on construction plan?	Yes/No/NA			
10	Assembly Work at Ground	Is assembly work at ground implemented on the arranged place with firm supporting member?	Yes/No/NA	Picture-4		
11	Assembly Work of Bridge Member	Is existence of abnormality (about slinging rope, balance, outrigger) inspected before proceeding working, while bridge member is separated from around?	Yes/No/NA	Picture-5		
12		Is guide rope used?	Yes/No/NA	Picture-6		
13	Prevention of Parallel Work	When erecting girder of truss or arch, schedule for preventing from parallel work of high and low place shall be arranged as possible.	Yes/No/NA			
14			Yes/No/NA			
Comments						

Picture for reference



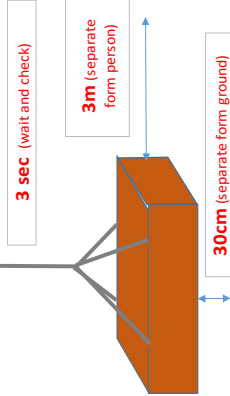
Picture-2

Picture-1



Picture-4

Picture-3



Picture-6

Picture-5