Republic of the Union of Myanmar
Myanma Port Authority

THE PREPARATORY SURVEY
FOR
THE PROJECT FOR
REHABILITATION OF VESSEL TRAFFIC NAVIGATION AID IN YANGON RIVER
IN
THE REPUBLIC OF THE UNION OF MYANMAR
(ADDITIONAL SURVEY)

FINAL REPORT

February 2020

JAPAN INTERNATIONAL COOPERATION AGENCY

NIPPON KOEI CO., LTD.
JAPAN MARINE SCIENCE INC.

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Preface

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to Consortium consist of Nippon Koei Co., Ltd. and Japan Marine Science Inc.

The survey team held a series of discussions with concerned officials of the Government of the Republic of the Union of Myanmar, and conducted a field investigation. As a result of further studies in Japan, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Republic of the Union of Myanmar for their close cooperation extended to the survey team.

February, 2020

Itsu Adachi
Director General,
Infrastructure and Peacebuilding Department
Japan International Cooperation Agency

Summary

(1) Background of the Project

The Government of Myanmar placed the Project of Rehabilitation of Navigation Aids on the Yangon River channel as the priority project and requested to Japanese Government to cooperate for its maintenance for promoting efficient linking in domestic and overseas logistics in Myanmar. Therefore, the objective of the Project for Rehabilitation of Vessel Traffic Navigation Aid in Yangon River (hereinafter referred to as "the Project") is to maintain navigation aids along access channel to Yangon Port and will be conducted by Japanese Grant Aid.

One of the pillars of the Myanmar economic cooperation policy is "support for the development of infrastructure and institutions necessary for sustainable growth". This Project contributes to sustainable economic growth through increased traffic volume of vessels sailing to Yangon Port, and it conforms to this policy. Also, this Project will contribute to the navigational safety of the Yangon River leading to Thilawa SEZ, a priority area of the Japan-Myanmar Cooperation Program "3. Urban Manufacturing Industry Promotion and Industry Promotion" and "4. Transport between Urban Area and Region Infrastructure Development". Japan has supported Myanmar port sector with many projects such as Technical Cooperation "Project for Rehabilitation of Yangon Port and Main Inland Water Transport" (2009~2015), ODA loan "Infrastructure Development Project in Thilawa Area (Phase 1)" (L/A concluded in June 2013) and Grant Aid "Preparatory survey report on the project for the development of port EDI system"(G/A concluded in March 2015).

From July 2017 to Feburay 2019, "Preparatory Survey for the Project for Rehabilitation of Vessel Traffic Navigation Aid in Yangon River (hearinafter referred to as "Previous Preparatory Survey)" which was composed of the survey of navigation aids such as Navigation Buoys, Light Tower and Tide Gauge Station in Yangon River was conducted and the validity of the Project was confrimed. However, the implementation of the Project had been postponed. After that, Japanese side had some good prospect for implementation of the Project in FY2019, it was necessary to conduct "Preparatory Survey for the Project for Rehabilitation of Vessel Traffic Navigation Aid in Yangon River (Additional Survey) (hereinafter "the Additional Survey)" to update site conditions and cost estimate reflecting price escalation.

(2) Outline of the Survey Results and Contents of the Project

(2-1) Outline of the Survey Results

Field survey was conducted in 2019 and the agreement document (Attachment 4) was made with Myanma Port Authority (hereinafter MPA) based on the survey results. After the Previous Preparatory Survey, the executing schedule was postponed for about one year, so the latest condition of the navigation aids was reconfirmed and reacquired the estimates during the additional survey.

Field Survey Schedule

	Period	Work contents
Field Survey	Nov. 8 - Dec. 24 in 2019	Survey of existing conditions of navigation aids Reacquisition of estimation Explanation/discussion of the preparatory survey (additional) report (draft) Agreement of Minutes of Discussions

Source: JICA Study Team

(2-2) Comparison of Initial Request and Conclusion of Procurement of Equipment

The contents of procurement of equipment were examined based on importance and urgency from the safety view of vessels sailing and port efficiency, development status of vessel traffic navigation, and further requests from MPA. Finally, it is decided that navigation buoy (24 sets), navigation buoy (repair) (7 sets), light tower (3 sets), tide gauge (2 sets), data transfer (1 set) and survey equipment for maintenance (2 sets).

Comparison of Procurement of Equipment

Equipment name	Unit	Initial request by MPA	Previous Preparatory Survey	Result of this Additional Survey
Navigation Buoy	Sets	As many as possible	24	24
Navigation Buoy (Repair)	Sets	As many as possible	7	7
Light Tower	Sets	4	3	3
Tide Gauge	Sets	2	2	2
Data Transfer	Sets	1	1	1
Survey equipment for maintenance	Sets	2	2	2

Source: JICA Study Team

(2-3) Summary of Outline Design

The tidal range is wide and tidal current velocity is fast in Yangon River. The channel changes due to erosion and sedimentation every year in Yangon River. A lot of navigation aids were damaged by Cyclone Nargis in 2008. The design policy of navigation aids in the project is summarized as below.

- To endure the severe natural condition
- To secure the continuous operation of navigation aids function
- To secure the height and luminosity of the light tower for the visibility at day and night
- To install automatically meteorological and tide observation with real-time data transfer system

(2-4) Outline of Equipment Planning

(a) List of Equipment

The List of Equipment

Item Number		Name	units	Quantity
1.		Navigation Buoy		
	1-1	3 miles type Navigation Aid Light Buoy with synchronizer	sets	10
	1-2	5 miles type Navigation Buoy (including Monitoring)	sets	12
	1-3	5 miles type Navigation Buoy	sets	2
2.		Navigation Buoy repair		
	2-1	3 miles type Navigation Buoy	sets	1
	2-2	3 miles type Navigation Aid Light Buoy with synchronizer	sets	2
	2-3	5 miles type Navigation Buoy (including Monitoring)	sets	4
3.		Light tower		
	3-1	Sector Light Monkey Point	sets	1
	3-2	Transit Light (Front) Thanlyin Point	sets	1
	3-3	Transit Light (Back) Thanlyin Point	sets	1
4.		Tide Gauge		
	4-1	Tide Gauge (Monkey Point)	sets	1
	4-2	Tide Gauge (Elephant Point)	sets	1
5.		Data Transfer		
	5-1	Data Monitoring at MPA H.Q.	sets	1
	5-2	Data Analysis/Display Software	sets	1
	5-3	Data Transfer at Thilawa Port	sets	1
6.		Survey equipment for maintenance		
	6-1	Survey equipment for maintenance	sets	2

Source: JICA Study Team

(b) Consulting Service and Soft Components

It is to provide guidance knowledge, management and maintenance technology related to detail design, bidding assistant, procurement supervision, vessel traffic navigation as well as technique for deciphering knowledge and observation data related to meteorological and oceanographic phenomena.

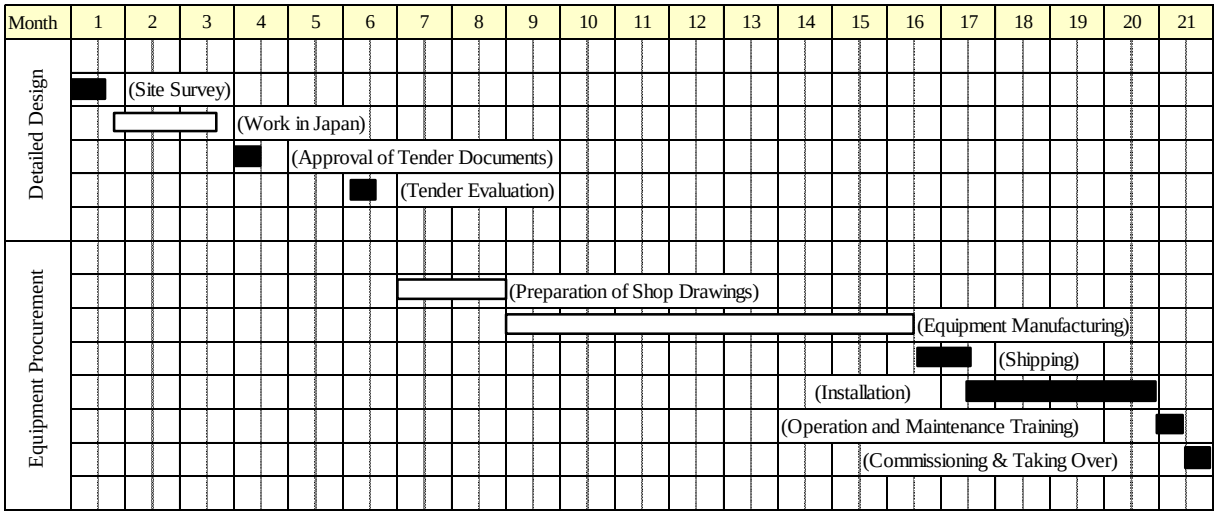
(c) Procurement and Construction Technology

General materials and construction equipment are procured locally and specials which are difficult to get locally are procured from Japan. After navigation aid equipment are fabricated and testing at factories in Japan, the equipment will be transported to Myanmar, and assembled and installed at the site. The shipping cost to Myanmar is born by Japanese side.

(3) Procurement Schedule

Detailed Design stage is scheduled to be six months including detailed design, bidding document preparation and procurement contractor selection. It is expected 9.5 months for manufacturing in Japan, and total 5.5 months for transportation, installation and inspection.

Project Implementation Schedule



Source: JICA Study Team

(4) Project Evaluation

(4-1) Relevance

Yangon Port handles 90% of marine freight cargo in Myanmar and consists of both Yangon Main Port and Thilawa Area Port. The Channel in Yangon River is a route to Yangon Port and has problems such as danger and time constraints. Particularly in recent years, along with the increase in the ship calling numbers, accidents on the route frequently occurred. This Project not only urgently secures the safety of the route connected to Thilawa SEZ, which is being developed as a cooperative project between the two governments of Japan and Myanmar, It also contributes to strengthening bilateral relations from diplomatic point of view. Japan Grant Aid has high relevance to support the implementation of this Project.

Because MPA does not have enough technical capabilities and budget to develop vessel traffic navigation according to international standards, MPA needs Japanese support. By improving vessel traffic navigation, it is possible to make safe and efficient navigation channel and to improve port efficiency.

(4-2) Effectiveness

(a) Quantitative Effect

Because there are many shallow water depths in Yangon River, ships are entering and leaving the port accordingly to the time of high tide. In the Yangon River, there are two times a day of high tide. Ship maneuvering at nighttime is limited by safety issues, the ships enter and leave the port at the time of the high tide during the day, and the ship traffic inevitably concentrates.

Monkey Point and Elephant Point are the difficult areas for ship maneuvering and are not sufficiently developed. When the vessel traffic navigation is developed by this Project, it will increase the timing of entry and leave.

From the data provided by MPA Traffic Department, Yangon Port has the total 2,267 numbers of vessel calling in the year 2017. Currently, vessels enter the port at the same time during one high tide, but if this timing increases to two times, more vessels will be able to enter the port. If the night ship call becomes possible, it is assumed that about half of the current numbers being able to enter the port at night, about 1,100 vessels can be expected to increase due to vessel traffic navigation improvement by the Project. By the consideration of ship calling and container handling volume record and efficiency of the Project, we assume the target values as in below table.

Target Value Assumed After 3 Years of Project Completion

Index name	Reference value (2017 Actual value)	Target value (2025) 【3 years after project completion】
Number of ship calling in Yangon Port (ships/yearly)	2,267	About 3,200
Container handling volume of Yangon Port (TEU/yearly)	1,043,469	About 2,000,000

Source: JICA Study Team

(b) Qualitative Effect

It is obvious that improvement of vessel traffic navigation develops the safety of ship maneuvering. Increasing the timing for the entering and leaving ports has the merit of enabling more effective operation such as increasing the utilization rate of the quay and reducing the waiting time for vessels. This will improve the efficiency of logistics linking Myanmar for domestic and overseas, thereby contributing to sustainable economic growth of Myanmar.

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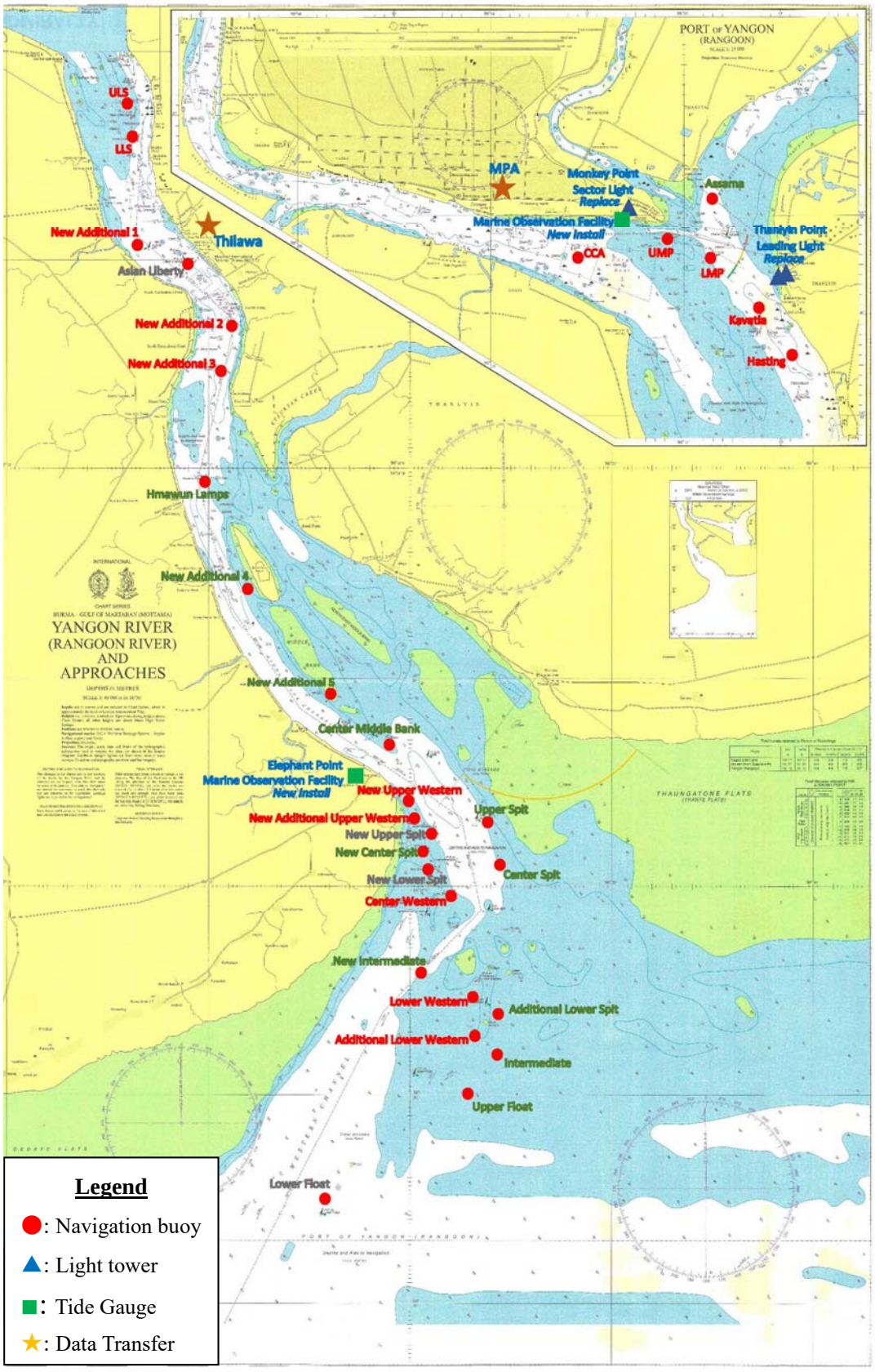
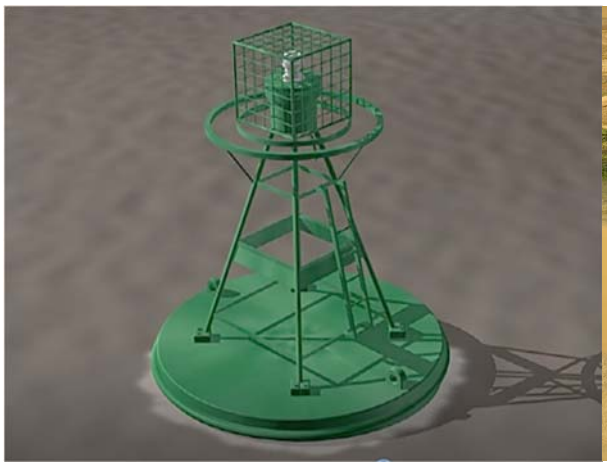
Location Map

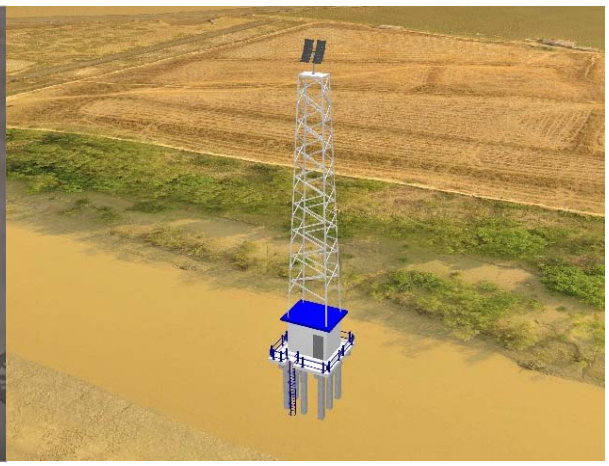


Source: JICA Study Team

Perspective



Navigation Buoy



Tide Gauge Station and Data Transfer

Sector Light

Leading Light

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Abbreviations

A/P:	Authorization to Pay
ADB:	The Asian Development Bank
AIS:	Automatic Identification System
B/A:	Bank Agreement
BOT:	Build Operate Transfer
DMA:	Department of Maritime Authority
EMP:	Environmental Management Plan
E/N:	Exchange of Notes
G/A:	Grant Agreement
GPS:	Global Positioning System
IALA:	International Association of Marine and Lighthouse Authority
IMF:	International Monetary Fund
JICA:	Japan International Cooperation Agency
L/A:	Loan Agreement
LED:	Light Emitting Diode
MITT:	Myanmar International Terminals Thilawa
MONREC	Ministry of Natural Resources and Environmental Conservation
MPA:	Myanma Port Authority
OJT:	On-the-job-training
SFA:	State Fund Account
SOLAS:	International Convention for the Safety of Life at Sea
TEU:	Twenty-foot Equivalent Unit
VTMS:	Vessel Traffic Management System

1. Background of the Project

1. Background of the Project

1.1 Background of the Project

Yangon Port has two areas of "Yangon Main Port" located at the 32 km upstream from the Yangon river mouth and in front of Yangon City Center, and "Thilawa Area Port" located in the middle of the river mouth and the City Center.

The economic growth accompanying with on-going democratization is remarkable in the Republic of the Union of Myanmar (hereinafter referred to as Myanmar). Hence, the cargo handling volume at Yangon Port is also increasing. Especially, the increase of container throughput is notable. The volume of annual container throughput increases from 390,000 TEU in 2011 to 1,043,469 TEU in 2017, which records annual increase ratio as 18%. According to the "The Data Collection Survey for the Development of Yangon Port (2018)", annual cargo handling capacity at Yangon Port is estimated to be 2,600,000 TEU in 2025 based on the infrastructure development in Yangon area and Thilawa area. Yangon Port is expected to play more important roles from now on as a logistics hub of Myanmar.

However, the access to the Yangon Port from the river mouth includes two problems. One problem is the safety risk because of 1) the narrow width channel 2) strong and high tide and 3) undeveloped navigation system. Yangon River has high risk in the navigation safety. Ship stranding accidents often occur. Another problem is that there is no 24-hr navigation system. To access to the Yangon Port, the ships need to pass two shallow points without night navigation system. It is limited only daytime that ship can pass the shallow points. The points are called "Monkey Point or inner bar" and "Elephant Point or outer bar" and are the bottlenecks of the access to the Yangon Port.

The Government of Myanmar placed the improvement project of safety navigation in the Yangon Port as the priority and urgent project in the "Myanmar National Transport Development Master Plan", approved by the cabinet in December 2015. Further, the Government of Myanmar focuses on the port development by including the "development of basic economic infrastructure, such as power, road, and port" as one of the important objectives in the economic policy that was published in July 2016. The objective of the Project for Rehabilitation of Vessel Traffic Navigation Aid in Yangon River (hereinafter referred to as "the Project") is to improve the vessel safety and increase the vessel traffic volume by improving the navigation aids for promoting the efficiency in international and domestic transportation. Thereby contributing to the development of Yangon Port is one of the important targets of the Government of Myanmar.

From July 2017 to February 2019, "Preparatory Survey for the Project for Rehabilitation of Vessel Traffic Navigation Aid in Yangon River (hereinafter referred to as "Previous Preparatory Survey)" which was composed of the survey of navigation aids such as Navigation Buoys, Light Tower and Tide Gauge Station in Yangon River was conducted and the validity of the Project was confirmed. However, the implementation of the Project had been postponed. After that, Japanese side had some good prospect for implementation of the Project in FY2019, it was necessary to conduct "Preparatory Survey for the Project for Rehabilitation of Vessel Traffic Navigation Aid in Yangon River (Additional Survey) (hereinafter "the Additional Survey)" to update site conditions and cost estimate reflecting price escalation.

1.2 Natural Condition Survey

Soil Investigation, Topographic Survey, Bathymetric Survey and Weather Condition Survey were executed at the site in 2017 by the Previous Preparatory Survey. The results of the survey and data collection of past reports are summarized in Table 1.1.

Table 1.1 Summary of Investigations at the Site

Location	Contents	Map
Monkey Point Existing Light Tower	Boring on land: 1 nos Topographic survey: 1,000m2	
Monkey Point Candidate Tide Gauge Point	Boring in river: 1 nos Bathymetric survey: 2,500m2	
Thanlyin Point Existing Light Tower (front and back)	Boring on land: 1 nos Topographic survey: 2,500m2 x 2 area	
Tante Point Existing Light Tower	Boring on land: 1 nos Topographic survey: 7,500m2	
Elephant Point Candidate Tide Gauge Point	Boring in river: 1 nos Bathymetric survey: 2,500m2 Weather Condition Observation: 1 point	

Source: JICA Study Team

Table 1.2 Natural Condition

Item	Source	Natural Condition of Design
Soil condition	Investigation at site	Bearing layer at -30m depth from ground level
Topographic condition	Investigation at site	Confirmed current situation at the site
Bathymetric condition	Investigation at site	Confirmed current situation at the site
Channel Depth	MPA	Confirmed current channel condition
Water Quality	Past study report	Salinity = 0.1%
Current Speed	Past study report	Maximum = 6 knots (=3.1m/s)
Wave	Past study report	Significant wave height (H1/3) = 1.7m Significant wave period (T1/3) = 3.5 seconds
Tide	Past study report	HHWL = +7.10m, HWL = +6.24m, MSL = +3.28m,

Item	Source	Natural Condition of Design
		LWL = +0.33m, CDL = +0.00m
Weather	Investigation at site and Past study report	Temperature: highest 40 degrees C and lowest 10 degrees C Rainfall: 3000mm per year and 100mm per hour Maximum wind speed = 45m/s

Source: JICA Study Team

1.3 Environmental Society Consideration

1.3.1 Environmental Guideline in Japan

According to Guideline for Environmental and Social Consideration (April 2010) issued by JICA, it is necessary to conduct the environmental and social consideration survey which study, predict, and evaluate the possibility of the affection of the Project to environment and local society, and suggest mitigation plan of the affection.

The Project was categorized as “C” for the following considerations: Not located in a sensitive area, nor has its sensitive characteristics, nor falls it into sensitive sectors under the Guidelines, and its potential advance impacts on the environment are not likely to be significant.

1.3.2 Environmental Guideline in Myanmar

According to the Environmental Conservation Guideline by MONREC in Myanmar, MPA as Executing Agency shall submit the EMP (Environmental Management Plan) to MONREC before the starting of construction and installation. Refer to Appendix 7 for the EMP (Environmental Management Plan) including the draft monitoring form and environmental check list.

1.3.3 Resettlement

The site is in the port area and there is no residence and not necessary for land acquisition.

1.4 Main Difference Points from the Condition of Previous Preparatory Survey

1.4.1 Navigation Buoys Condition

26 numbers of Navigation Buoys were evaluated by the Previous Preparatory Survey in October 2018. During this Additional Survey in November 2019, it was confirmed that five numbers of buoy have been lost, and 21 numbers remained. During the Previous Survey, seven numbers of buoy were determined as usable condition by repairing. In this Additional Survey, the seven buoys are confirmed to remain in the same condition. The lost five buoys were determined to need replacement in the result of the previous survey. Therefore, the total numbers of buoys that need replacement in the Project are not changed.

1.4.2 Visual Tide Gauge

Visual Tide Gauge at Monkey Point was collapsed because of being hit by private ship at the end of 2017. MPA installed temporary Tide Gauge at Monkey Point and re-started visual observation in

daytime only from early 2019. However, the necessity of installation of Automatic Tide Gauge by the Project of Grand Aids was confirmed because the facility of Tide Gauge was weaker than the Tide Gauge before the collapse and was not suitable for long-term use.

1.4.3 Anchor Barge

MPA had owned two anchor barges of medium size and small size but the medium-size anchor barge sunk on 12 February 2019 in Rakain State. At present, MPA owns only one small-size anchor barge that is difficult to sail to the open sea. MPA also requested Japanese Government to provide the medium-size Anchor Barge just like the one MPA had owned.

2. Contents of the Project

2. Contents of the Project

2.1 Basic Concept of the Project

2.1.1 Request from Myanmar and Scope of the Project

2.1.1.1 Request from Myanmar

The requests from MPA were as follows: 1) Improvement of navigation aids (navigation buoy, light tower, transit light, survey equipment for maintenance); 2) Installation of tide gauge (including meteorological observation, data transfer and display at the headquarters); and 3) Holding trainings to MPA officials on navigation aids.

2.1.1.2 Scope of the Project

The scope of the Project was examined by importance/urgency in terms of vessel safe navigation and port operation efficiency. The contents of the Project scope are as shown in the Table 2.1.

Priority of the Navigation Buoys were evaluated by the area of importance, existing buoys conditions and MPA's request, which are summarized as shown in the Table 2.2.

Table 2.1 List of Equipment

Item Number		Name	Units	Quantity
1.		Navigation Buoy		
	1-1	3 miles type Navigation Aid Light Buoy with synchronizer	sets	10
	1-2	5 miles type Navigation Buoy (including Monitoring)	sets	12
	1-3	5 miles type Navigation Buoy	sets	2
2.		Navigation Buoy repair		
	2-1	3 miles type Navigation Buoy	sets	1
	2-2	3 miles type Navigation Aid Light Buoy with synchronizer	sets	2
	2-3	5 miles type Navigation Buoy (including Monitoring)	sets	4
3.		Light tower		
	3-1	Sector Light Monkey Point	sets	1
	3-2	Transit Light (Front) Thanlyin Point	sets	1
	3-3	Transit Light (Back) Thanlyin Point	sets	1
4.		Tide Gauge		
	4-1	Tide Gauge (Monkey Point)	sets	1
	4-2	Tide Gauge (Elephant Point)	sets	1
5.		Data Transfer		
	5-1	Data Monitoring at MPA H.Q.	sets	1
	5-2	Data Analysis/Display Software	sets	1
	5-3	Data Transfer at Thilawa Port	sets	1
6.		Survey equipment for maintenance		
	6-1	Survey equipment for maintenance	sets	2

Source: JICA Study Team

Table 2.2 Priority List of Navigation Buoy

Area			Name of Buoy	Evalaution Result			
Area No.	Area Name	Area Important		Existing Condition	Priority by MPA	Evaluation	Repair or Replace or New Additional
①	West in Yangon Main Port	C	Navigation Buoy 1	-	not need	D	none
			Navigation Buoy 2	-	not need	D	
②	Around Monkey Point	A	CCA	1	-	A	Repair = 2 Replace = 6
			UMP	1	-	A	
			LMP	2	-	C	
			Assama	1	-	A	
			Kavatia	missing	high	A	
			Hasting	1	high	A	
			ULS	1	high	A	
			LLS	2	-	C	
③	Around Thilawa Area (LLS～Human Lamps)	A	New Additional Buoy	none	-	A	Replace = 1 New = 3
			Aisian Liberty	missing	high	A	
			New Additional Buoy	none	-	A	
			New Additional Buoy	none	-	A	
④	Around Sand Bar Area	A	Hmawum Lumps	2	high	C	Repair = 2 New = 2
			New Additional Buoy	none	high	A	
			New Additional Buoy	none	high	A	
			CMB	2	high	C	
⑤	Around Elephant Point	A	Center Western	missing	high	A	Repiar = 3 Replace = 9
			Upper Spit	1	-	A	
			Center Spit(conical)	missing	-	A	
			Add Lower Spit	1	high	A	
			Lower Western	2	-	C	
			Add Lower Western	2	high	C	
			New Upper Spit	1	-	A	
			New Center Spit	missing	-	A	
			New Lower Spit (conical)	1	-	A	
			New Upper Western	1	-	A	
			New Intermadiate	1	-	A	
			New Add Upper Western	2	-	C	
⑥	Offshore Area	B	Intermediate	1	high	B	Replace = 3
			Upper Float	1	high	B	
			Lower Float	1	high	B	
Total							Repiar = 7 Replace = 19 New = 5

Existing Condition
1: not good, to be replaced
2: not bad, can be used by repair

Evaluation
A: Highest Priority (need to replace or add)
B: High Priority (need to replace or add)
C: Middle Priority (need to repair)
D: Low Priority (not need in the Projecgt)

2.2 Outline Design of the Japanese Assistance

2.2.1 Design Policy

(1) Design Standards in Myanmar

MPA has the responsibility of the installation and operation of navigation aids, such as light towers and buoys in the coastal areas in Myanmar based on the Myanmar Lighthouse Act in 1973. However, the regulations and guidelines for the technical requirements, performance requirements and design standards of navigation aids facilities and equipment are not yet systematized in Myanmar. Therefore, guidelines of International Association of Marine and Lighthouse Authorities (hereinafter referred to as "IALA") was referred for installation and operation of navigation aids.

Also, Myanmar follows overseas standards of port infrastructure design because the official port design standards are not published in Myanmar. Since Japanese standards is adopted as one of the foreign standards, Japanese standards were applied in the Project.

(2) Design Policy

The tidal range is wide and tidal current velocity is fast in Yangon River. Tidal current velocity becomes 6 knots under ebb tide of spring tide. In addition, the channel route has been changing due to topographical change by erosion and sedimentation. A lot of navigation aids were damaged by Cyclone Nargis in 2008.

The design policy of the Project is summarized below.

(1) Possible to endure the severe natural condition
(2) To secure the continuous operation of navigation aids function
(3) To secure the height and luminosity of the light tower for the visibility at day and night
(4) Installing the real-time surveillance facility that automatically observes the tide and meteorological conditions at the most important navigation points, i.e. Monkey Point and Elephant Point.

2.2.2 Equipment Design and Procurement Plan

(1) Navigation Buoy

The design of the navigation aids in this project is based on the policy below.

I. Possible to endure the severe natural condition

- The buoy is leaned by the strong tidal current, and in case it swings, the visibility is deteriorated by the light moving. In order to reduce this influence, the buoy was adopted the swift current type and large lantern with high vertical angle.
- The channel needs to be changed due to due to the sedimentation, erosion and the dredging operation. Therefore, the buoy shall be relocatable easily.
- Currently, there are small FRP buoys at Monkey Point. Such buoys do not have enough durability against the contact of ship and cannot secure enough visible distance of the light because the focal point (height between sea surface and light) is low. It is needed to ensure enough luminous intensity and visible distance of light by replacing to larger steel buoy.

- Simple buoys (marker buoys) around Monkey Point shall be replaced to the normal buoys since they are poor visibility and without light.

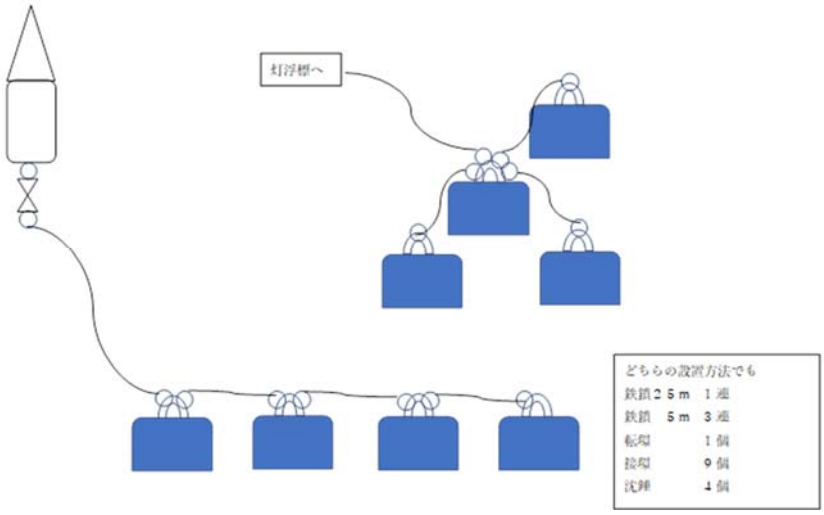
II. To secure the continuous operation of navigation aids function

- The light and the color (right side of the channel: green, left side of the channel: red) of all buoys shall follow the global standard of IALA, and they have to be equipped with the top marker and radar reflector.
- The power source of the light shall be solar battery system and the light shall be maintenance free by LED.
- The light of the buoys at Monkey Point known as one of the most difficult points to navigate should be blinking simultaneously in order to understand easily the channel route, enhance navigation safety and enable navigation at night. The time information necessary for simultaneous blinking can be obtained from the GPS equipment installed on the buoy.
- The buoys at Elephant Point known as another difficult point to navigate and around the month of Yangon River shall function properly all the time. However, it is difficult to confirm frequently the condition of buoys (location, condition of the light and solar battery etc.) because they are located far from Yangon City Center. Therefore, it AIS equipment shall be installed on these buoys and a system shall be established in order to monitor them from MPA building.

Table 2.3 Specification of Navigation Buoy of the Project

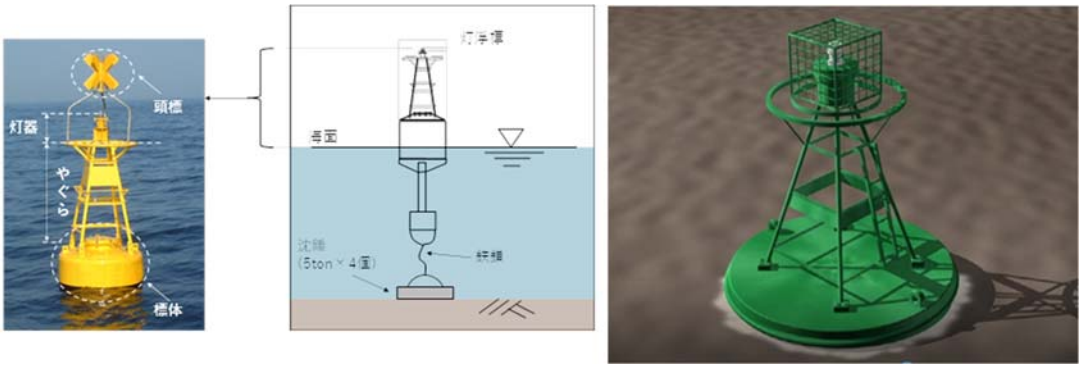
Floating body diameter	Diameter	3.0 ~ 3.5m
	Material	Steel
	Color	Conform to IALA
Light device	Type	LED
	Color	Conform to IALA
	Power source	Solar battery
Accessories	Radar reflector	
	GPS (only for the special buoys with simultaneous blinking light)	
	AIS (only for the special buoys that require remote monitoring)	

Source: JICA Study Team



Source: JICA Study Team

Figure 2-1 Image of Navigation Buoy and Sinker



Source: JICA Study Team

Figure 2-2 Overview of Navigation Buoy

- As countermeasures against theft of the buoy equipment such as the light, solar panel and battery, the special nuts shall be adopted and a cage shall be installed.
- The ability of power generation will be reduced when the panel surface becomes dirty. Especially, at offshore, it is often stained by bird's dropping. Since it is difficult to conduct inspection and maintenance frequently for the buoys around the river mouth, the bird's dropping prevention wire shall be installed at top of the cage.

(2) Light Tower (Monkey Point Sector light, Thanlyin Point Leading light)

The sector light at Monkey Point is the essential navigation aids for keeping the safe navigation for the ships that are sailing at narrow channel. However, it is difficult to see the green light that shows the dangerous area according to the nighttime survey due to the trees growing. For that reason, the height of the sector light at Monkey Point was designed higher than the existing light. In addition, the luminous intensity shall be increased.

Although the light function of the leading light in Thanlyin Point works and the light visibility is acceptable at the night, the structure stability of the tower has risk of collapse. Since this leading light is essential for safe navigation at night, it shall be improved in the Project.

Source: JICA Study Team

Figure 2-3 Image of the Light Tower

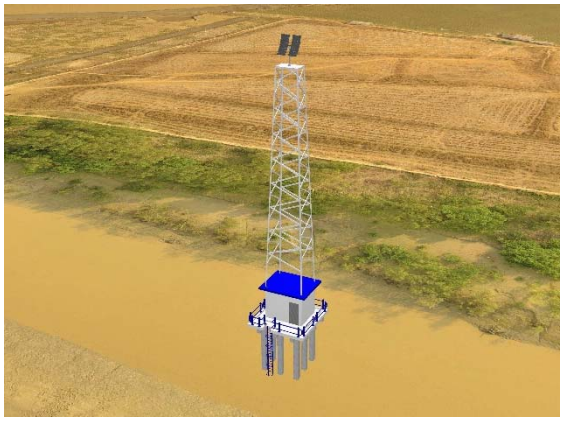
(3) Tide Gauge

Some candidates locations of tide gauge station in Yangon Port Area from the river mouth to Yangon Main Port were examined by the the effectiveness, construction cost and operation and maintenance. The tide gauge station observe not only tide but also meteorology. Based on the discussion with MPA, two sites of Monkey Point and Elephant Point were decided as the most appropriate sites to install the tide gauge.

MPA installed visual tide gauge around the collapsed tide gauge in early 2019 and started the observation in daytime. However, the necessity of Automatic Tide Gauge by this Project is confrmed during this Additional Survey because the facility of visual tide gauge was weaker than the collapsed tide gauge before the collapse and was not suitable for long-tem use.

The below mentioned items which is generally required in port area are observed automatically. Also by the radio transmission system, the observed real-time data can be monitored in the MPA Headquarters.

(1) Meteorological data: temperature, precipitation, humidity, wind direction and velocity, and sunlight hours
(2) Oceanographic data: tide level



Source: JICA Study Team

Figure 2-4 Image of Tide Gauge Station

(4) Spare Parts and Consumables

In case of Japan Coast Guard, one set spare part for each device with same specification is required to keep at each office. So that the navigation aids can be immediately recovered when accident happen. Therefore, one light for each of the navigation buoy and light tower will be prepared in the Project.

2.2.3 Outline Design Drawing

Refer to Appendix.

2.2.4 Implementation plan

2.2.4.1 Implementation Policy

1) Since the equipment/systems procured in this project are not manufactured in Myanmar, they are procured in Japan. If it is difficult to be procured in Japan, the procurement in third country will be adopted.

2) There is no skilled contractor for installation of the navigation buoy in Myanmar. Therefore, the specialist should be dispatched from the equipment manufacturing company of Japan or third countries for the installation, adjustment, testing and operation/maintenance training of the equipment.

3) The equipment manufacturing company will instruct and supervise the local contractor and the contractor carry out the instllation works such as connection, equipment fixation, etc. for the installation of the equipment,

4) The specialist dispatched from the equipment manufacturing company should be responsible for the adjustment/testing of the equipment and OJT regarding the operation of the equipment for the maintenance staff of MPA

5) MPA is the responsible organization in procurement of Myanmar side as executing agency.

2.2.4.2 Implementation Conditions

There are no regional characteristics or legal specificities peculiar to Myanmar which may affect the equipment/systems procured for this project.

Installation of equipment shall not interrupt the port operation and not affect the navigation of Yangon River. It is necessary for that to carry out the construction work while continuing operation of the existing equipment and/or outside the service hours of Yangon River channel

2.2.4.3 Scope of Works

Table 2.4 shows the demarcation of the scope of works between the Japanese and the Myanmar sides.

Table 2.4 Projects to be covered by Japanese Side and Myanmar Side

Projects to be covered by Japanese Side	Projects to be covered by Myanmar Side
1. Procurement, installation and adjustment of the construction of equipment (1) Navigation Buoys (2) Light Tower (3) Tide Gauge (4) Data Transfer 2. Removal and transport of existing facilities 3. Operation and maintenance guidance of equipment 4. Marine and inland transportation of equipment 5. Implementation of soft components	1. Provision of information (1) Latest location map and situation of navigation aids 2. Coordination and application procedure of stakeholder (1) Tax exemption and customs procedures (2) Application procedure for using radio. (3) Permission of construction execution at site 3. Storing, recycling and disposing of removed material 4. Assignment of counterpart member 5. Participation in adjustment construction, trial operation and completion inspection

Source: JICA Study Team

2.2.4.4 Consultant Supervision

The consultant will carry out supervision services on the quality, schedule, safety control, and others, for manufacturing transportation, installation, adjustment and testing of the manufactured equipment in accordance with the contract of the Project. The major scope of works of the consultant services is described as below.

(1) Review and Approval of Specification, Drawing and Work Plan

The contractor shall submit equipment specifications, shop drawings and work plans to the consultant prior the start of manufacturing. The consultant will review and approve the submission.

(2) Test and Inspection of Manufactured Equipment

The consultant will inspect the manufactured equipment in accordance with the contract through witnessing factory tests or inspecting test reports and other related documents submitted by the contractor after the manufacturing is completed.

(3) Prior Confirmation and Coordination for Equipment Storage Yard

The consultant will confirm the status of each site and coordinate with MPA on the preparations for an equipment/material storage yard. Before the equipment arrives in the site, the consultant will secure the equipment/material storage yard.

(4) Installation Supervision

The consultant will supervise the quality, safety, schedule, and control for the equipment installation works including transportation by the manufacturer and local contractor.

(5) Test and Inspection of Equipment Installation

The consultant will witness tests and approve the equipment installation condition of the manufacturer and will conduct the inspection of test data.

(6) Inspection Tests on Completion and Issuance of Taking Over Certificate

The consultant will reconfirm the result of the product inspection in a factory and the final examination inspection at site and prepare report if the tests conducted passes upon completion. For handing over the equipment, the consultant will coordinate with MPA for Myanmar side approval on the completion test.

(7) Scope of Work for Consultant's Members

The scope of work of each member assigned in the supervision is shown in Table 2.5.

Table 2.5 Scope of Work for Consultant's Members

Member	Scope of Work
Team Leader	• Commissioning and issuing of taking over certificate
Resident Engineer	• Management of overall process • Negotiation with Myanmar side • Quality control • Supervision of installation, adjustment and test trial of equipment • Inspection of equipment at site • Witness of initial operation and operation guidance by manufacturer • Witness of inspection before the expiration of manufacturer insurance period
Inspector in Japan	• Checking of shop drawing • Product inspection at the manufacturing factory • Arrangement of pre-shipment equipment inspection

Source: JICA Study Team

2.2.4.5 Quality Control Plan

(1) Compliance with IALA Standards

Specifications of color and top mark of navigation aids shall be compliance to IALA.

(2) Approval of Shop Drawing and Work Plan

The contractor will be required to prepare and submit equipment specifications, shop drawing and manufacturing schedule and construction plan. The consultant will review, approve and ensure that equipment performance and installation complying with the contract.

(3) Inspection in the factory

The consultant will conduct a witness test and check the manufacture's test data in the factory or request to submit the manufacture's test data and check the result. The consultant will ensure that the manufacturer has performed the prescribed specifications and will approve the shipment.

(4) Pre-shipment Equipment Inspection

The third-party organization commissioned by the consultant will conduct inspection before shipment in the presence of the contractor.

(5) Final Inspection

The consultant will conduct the final inspection of each installed and adjusted equipment in the presence of the contractor. During the final inspection, the consultant will get test data required for inspection through operation by manufacturer's engineer and check the equipment, specifications in the interconnection operation and the quantity of equipment.

(6) Navigation Check

With the attendance of the consultant and person in charge of MPA, the test will be conducted by an inspection agency that is procured by MPA to ensure that the performance meets the required specification.

(7) Inspection/Hand-over

After the initial operating inspection, the contractor, consultant, and MPA will ensure manufacturer's test, final test data and inspection results conducted in the site. Hand-over is completed at this stage.

2.2.4.6 Procurement Plan

Estimated transportation period of equipment is approximately one month, including shipping period and custom clearance.

(1) Transportation Route

Transportation of equipment from Japan to the site in Myanmar will be conducted by Japanese side. Transportation route is as follows in principle:

(1) Shipping: A Main Port in Japan ~ Yangon Port
(2) Domestic Transport: Yangon Port ~ Assembly or Installation location in Yangon

(2) Customs Clearance

The duration of customs clearance is estimated about one week.

2.2.4.7 Operational Guidance Plan

The procured equipment in the Project fundamentally has the same performance with the existing equipment but it is needed to demonstrate the operation and maintenance procedures and initial operating instruction of the newly added functions. MPA will receive on-the-job training on the initial operating for several days, supervised by the engineer dispatched by the manufacturer from Japan or from the manufacturer's country. The engineer in charge of instruction shall be the one who conducts the adjustment examination of the system/equipment concerned.

2.2.4.8 Soft Component (Technical Assistance) Plan

(1) Back Ground of Soft Component

About 60km of the navigational channel to the Yangon Port from the estuary of Yangon River in the Republic of the Union of Myanmar (hereinafter referred to as Myanmar) is a narrow passage, and sandbank and shallow water existing in the vicinity. Because of this, the area has risk of navigation and marine incident such as collision and grounding occurred frequently. In addition, accessing to Yangon Port is limited once a day of daytime with high tide, because (i) vessels needs to pass two shallow water, (ii) navigational aids are poor quality and quantity. This limitation is bottleneck of the port operation.

Under these circumstances, to promote efficient domestic and international logistics, the Government of Myanmar placed the project of rehabilitation of navigational aids along Yangon River Channel as important task and requested Japanese Government to cooperate with these maintenances. To respond to the request, Japanese Government decided Grant Aid and planned "The Project for Rehabilitation of Vessel Traffic Navigation Aid in Yangon River in The Republic of the Union of Myanmar" (hereinafter referred to as "the Project") for rehabilitation of navigational aids along access channel to Yangon Port.

However, MPA has responsibility of managing navigational aids and had not organized and provided staff training plans, because of difficulty of staffing experts for navigational aids. Also, the IALA (International Route Traffic Association) had not provided as well. Therefore, the maintenance and operation had conducted by staffs who were trained by OJT. For this reason, the staffs who assigned navigational aids maintenances doesn't know the importance of transmitting information from navigational aids such as lamp color, light quality, light intensity and light reach distance. Also, importance of maintaining these transmitting information same condition as notified to the public was not known. Furthermore, their maintenance skill was insufficient. Several navigation aids were operated in a state where the lighting quality, paint color and head mark were different from noticed information.

It is necessary to implement soft component as start-up support to improve the technical capabilities of MPA staff in order that navigation aids maintained by Japanese Grant aid kept functions normally such as light quality and are operated sustainably and properly. Specifically, improvement of management and maintenance technological ability to properly manage navigation aids, formulation of operational guidelines such as inspection and maintenance manual for smooth and effective implementation of navigation aids, maintenance of suitable system against accidents such as extinction of the lights, improvement of capability for the rearrangement of navigation aids due to changing of navigational passage caused by sedimentation, and improvement of utilization techniques of acquisition of meteorological and hydrographic observation technology and collected data of maritime traffic safety measure. Furthermore, it is expected to create the environment such as implementation of training program and promotion of self-help efforts towards implementation since the importance of personnel development is recognized by MPA. Therefore, it is necessary to implement soft components.

(2) Activity of Soft Component

Action plan of Soft Component is stated in Table 2.6.

Table 2.6 Plan of Soft Component

Expected achievement by introducing soft component	
(1) Acquiring knowledge of navigation aids and maintenance/administration technique and operating properly administrated navigation aids. (2) Acquiring knowledge of meteorology and hydrography and decoding technique of observation data and utilizing properly navigation aids work and sailing safety work. (3) Developing human resources who are familiar with navigation aids and meteorology and hydrography.	
1. Activities that lead to expected achievements	
Necessary technique/industry type	■Japanese side Teaching technique and knowledge needed for conducting navigation aids work and meteorological and hydrographic observation. Formulating curriculum for it and conducting training. (Outline of the training supposed at this time are stated in “3 training”.) ■Myanmar side Dispatching 25 navigation aids trainees. (Breakdown of trainee are stated in “3 training”.)
The present technical standards /Technical standards to be required	■Current situation Lacking knowledge about navigation aids such as role, function, arrangement and international standard and maintenance/administration technique. Therefore, navigation aids are not maintained properly. (Several navigation aids are operated in the undesirable state such as those which the paint color cannot be identified by breaking form or peeling paint due not to recognize necessity and importance for keeping function of navigation aids and the light quality is different from notification matter.) ■Plan Recognizing contribution of channel safety of vessel including ocean going vessel by understanding basic knowledge regarding navigation aids. Furthermore, expecting decrease of incident situation rate and extension of durability year of navigation aids introduced at this project by understanding importance of maintenance regularly and basic of maintenance technique. In addition, expecting budget reduction by planned supply by understanding necessity of future plan and basic knowledge of channel plan.
Subject	■Subject: navigation aids personnel of MPA 25 persons (Working level) ■Breakdown: Light House Officer (1 person), Light House Engineer (4 persons), Light House Department (5 persons), Survey Department (5 persons), Relevant Buoy Tender Personnel (Crew 5 persons, Mooring Officer 5 persons) *Assuming participation of all 25 persons. However, deciding by discussing with MPA in case of requesting participation of specific field. Plan for making time to exchange the views and discuss with training participants and identifying understanding level of training participants. Furthermore, trainee with lacking understanding and trainee without participation is followed by internal training held by Public Assistance Administrators because Light House officer participate. ■Requirement from the other party 25 persons expect participation from MPA. The organization of them and administration are difficult as above. Therefore, requested to give consideration not to obstruct work during training by MPA.

2. Implemental method ⇒ Outdoor practical training such as lecture and sign inspection.	
Implemental resource	■Japanese side burden matter: Japanese engineer 3 persons (The person who is familiar with the field of navigation aids and meteorology and hydrography) 5MM in total 1. Domestic work Breakdown of 2.5MM are stated below. (1) Technique (Equipment, Buoy, Maintenance) Information gathering Information gathering from Japan Coast Guard (central government office) (3 charges) 3 days Information gathering from Japan Coast Guard (office) (2 place) 2 days Information gathering from Japan Coast Guard (base of buoy) 1 day Information gathering from maker (2 companies) 2 days Information gathering by Internet 1 day Preparation of teaching materials 200pages 20 days 29 days in total 1.45MM (2) Plan, Operation, Rule Information gathering Information gathering to Japan Coast Guard (central government office) 2 days Information gathering to Japan Coast Guard (headquarters) 1 day Information gathering to Japan Coast Guard (office) (2 place) 2 days Information gathering by Internet 2 days Preparation of teaching materials 50 pages 5 days 12 days in total 0.6 MM (3) Meteorology and hydrography Information gathering to Meteorological Agency 2 days Information gathering to Japan Coast Guard (Hydrographic and Oceanographic Department) 1 day Information gathering by Internet 1 day Preparation of teaching materials 50 pages 5 days Total 9 days 0.45 MM 2. Breakdown of 2.5MM field work are stated in schedule ■Myanmar side burden matter：Providing the training facility and equipment
Deliverables	■Japanese side Resume of training text, the duties reference materials of administrated navigation aids manuals and guideline.

3. Training	
General	The contents of soft component is based on IALA E-141(Model Course for Navigation Aids Training) which IALA (International Association of Marine and Lighthouse Authority) recommends as a guidance for personnel development since knowledge and technology are required to appropriately manage the navigation aids as qualification requirements of the Navigation Aids personnel. In the recommendation, the fields of training are classified according to a module as follows. Most of navigation aids administrated by MPA are installed in the Yangon River and operated under the severe natural condition of forceful tide current. Therefore, the practical training corresponding to the actual situation is planned as setup support. The purpose of this training is that trainees acquire knowledge and the technology of the Navigation Aids and reach the level of worker who can properly manage and operate Navigation buoys and perform duties related to the meteorological and hydrographic observation by proper methods and procedures.
Training field	Field plan of the training is stated as follows. In addition, the underlined items show a training item to carry out priority depending on actual circumstance of navigation aids administrated by MPA. (1) The technical training of navigation aids (lecture, training) ● Module 1: Introduction of navigation aids (Navigation Aids knowledge), classification of the navigation aids, use form/use range depending on the ship, communication tools (quality of installation, painting, light color and quality), SOLAS agreement and international rule of the marine buoy ● Module 2: Source of light (power supply), solar battery system ● Module 3: A light and light device, the characteristic of the emphasis style buoy, deterioration of the visibility and countermeasure by circulation of the light, wide emission angle type light device ● Module 4: Painting and coating, necessity of frequent maintenance of buoy by the deterioration of painting, abrasion of the chain ● Module 5: Vessel of Navigation Aids (Buoy tending vessels, patrol vessel) ● Module 6: Radar beacon ● Module 7: AIS ● Module 8: Radio signal and satellite navigation system, GPS navigation, GPS system with synchronizer ● Module 9: Remote monitoring/control, remote monitoring system of Navigation Aids by the AIS ● Module 10: Structure, materials and maintenance (2) The backup system for effective and efficient navigation aids duties to accomplishment (including the technology succession and the personnel training), the way of the organization (group work and discussion). (3) Navigation aids hand book, preparation for development of duty guidance such as checking maintenance manuals (group work and discussion) (4) Basic knowledge of the meteorology and hydrography and analysis of an observation technology and observation data and utilization (relations of a tide level, tide prediction, atmospheric pressure and the weather)

Source: JICA Study Team

(3) Soft-components Time Schedule

Soft-components time schedule is stated in Table 2.7.

Table 2.7 Soft-components Time Schedule

		1	2	3	4	5
1	Instruction of Technique (Equipment, Buoy, Maintenance)	Japan 1.45MM		Myanmar 1.50MM		
2	Instruction of Plan, Operation, Rule		Japan 0.60MM		Myanmar 0.50MM	
3	Instruction of Meteorology and hydrography		Japan 0.45MM		Myanmar 0.50MM	
	Work in Myanmar				2.0months	

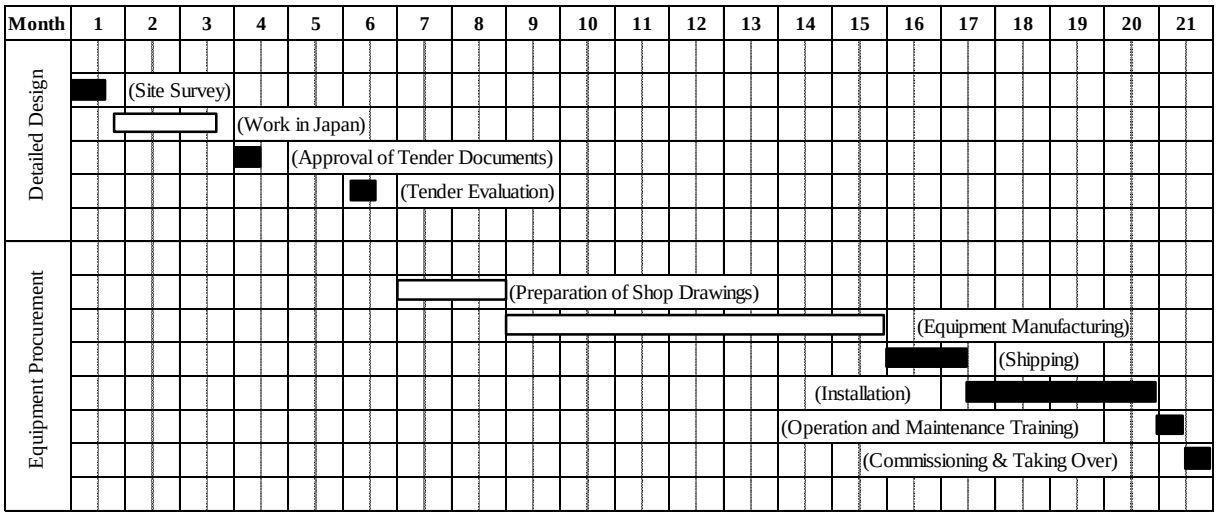
Work in Japan ■ Work in Myanmar

Source: JICA Study Team

2.2.4.9 Implementation Schedule

Implementation Schedule is stated in Table 2.8.

Table 2.8 Implementation Schedule



Source: JICA Study Team

2.3 Obligation of Recipient Country

2.3.1 General Obligation of Myanmar

(1) Bank Agreement (B/A), Authorization to Pay (A/P) and other related procedures/ commission

MPA promptly needs to draw up an arrangement with a bank in Japan to open a special account into which the funds granted by the Government of Japan will be deposited and from which payments will be made to the Japanese contractor. MPA also needs to issue an authorization to pay (A/P) that will be needed for the Japanese contractor to receive the payments. MPA shall bear commissions to Japanese bank for banking services based on the B/A.

(2) To Provide the Latest Information

MPA provides information of the latest navigation map and situation.

(3) Tax Exemption on the Imported Equipment

The Government of Myanmar shall ensure that the customs duties and taxes which may be imposed with respect to the import of the equipment and materials be exempted.

(4) Tax Exemption on the Taxes in Myanmar Concerning to Procurement of Materials and Services

Myanmar taxes exemption on procurement of materials and services necessity for the implementation of this project in Myanmar is based on the E/N between Government of Japan and Government of Myanmar, and confirmation by JICA and the Myanmar Government.

(5) Permission for Entrance to the Site and Works at the Site

MPA shall obtain or issue permissions necessary for entrance to the site and execution of the works at the site.

(6) Application Procedure for Radio Use

MPA shall arrange the application for the radio use for transmitting and receiving the navigation AIS monitoring device and meteorological and tide observation data.

(7) Temporary Installation and Removal of Existing Equipment for Securing New Equipment Installation Space

Temporary installation, removal and disposal of existing equipment required for securing the installation space of new equipment is shall be conducted by MPA.

(8) Securing Temporary Construction Site for Materials and Equipment

At each site, MPA shall allocate the space necessary for temporary placement of materials and equipment and provides it free of charge to the procurement supplier.

(9) Securing Electric Power on the Site

MPA shall provide electric power that is required for adjustment of procurement equipment, commissioning, initial operation and maintenance training, acceptance and operation after procurement of the equipment. In this Project, it is necessary only in the MPA headquarters, and the facilities outside the headquarters will use solar power.

(10) Allocating a Counterpart

MPA shall allocate a counterpart in order to proceed this project smoothly. MPA shall also participate in the adjustment work, commissioning, initial operation instruction, operation guidance, acceptance, delivery etc.

(11) Submission of Environmental Management Plan (EMP)

MPA shall finalize and submit Environmental Management Plan (EMP) to Ministry of Natural Resources and Environmental Conservation (MONREC).

(12) Budgetary Arrangement

It is necessary for disbursement of the Grant as well as for implementation of undertakings by the Myanmar side by the beginning of each fiscal year.

2.3.2 Obligations Items of Myanmar Side Regarding with Installation

Table 2.9 shows the list of specific obligations of the Myanmar side regarding with installation.

Table 2.9 Myanmar Side Obligations on Each Equipment of This Project

Equipment name	Obligation of MPA
Buoy and Light Tower	・ Permission to enter the installation area and to perform installation work ・ Ensuring and obtaining permits of radio frequency required for operation of the navigation aids and AIS monitoring device ・ Securing temporary storage for removal and maintenance buoys and obtaining building permits of temporary structures for materials storage ・ Dissemination of safety information to the sailing vessels at the time of installation and removal of navigation buoys

Equipment name	Obligation of MPA
	・ Removing old buoys
Tide Gauge and Data Transfer	・ Permission to enter the installation area and to perform installation work ・ Ensuring and obtaining permits of Radio frequency required for transmitting observation data ・ Keeping the recorded observation data ・ Securing location to display observation data display location of MPA headquarters ・ Securing power supply for displaying device and receiving data device for data transfer in the MPA Headquarters.

Source: JICA Study Team

2.4 Project Operation Plan

In Myanmar, MPA conducts management and maintenance of navigation aids. Light House officer of the Marine Department of the MPA is responsible for the management and maintenance of the navigation aids. Chief Surveyor of Civil Engineering department regularly conduct surveying of channel. Chief Engineer of Civil Engineering Department and Master Attendant of the Marine Department decide the position of the navigation buoy on the channel. The deteriorated and damaged navigation buoy are repaired by Mechanical Engineering Department. Chief Surveyor of Civil Engineering Department is conducting oceanographic observations. The number of total persons involved in the management and maintenance of each department is as follows:

(1) Total persons in Marine Department: Officer 8 people, Staff 64 people
(2) Total persons in Civil Engineer Department: Officer 3 people, Staff 27 people
(3) Total persons in Mechanical Engineer Department: Officer 3 people, Staff 14 people

Navy also supports MPA in the collection of the lost buoys in case the buoys drift away from the limit beyond the MPA's capability-to collect the lost buoys.

(1) Navigation Buoy and Light Tower

A total of 212 repairs were carried out for the navigation buoy from 2015 to 2018. Those repairs are: 32 times of body damage, 25 times of position change, 36 times of electronic circuit defect Repair, 31 times of battery defect repair, 36 times of light defect repair, and others. As for the light tower, replacement of the light part of the light tower at the Monkey Point and the Thanlyin Point were conducted in 2016. Tide gauge for visual observation was not repaired since it collapsed at the end of 2017. A temporary tide gauge pole was installed from the beginning of 2019 for temporary tidal observation.

The number of equipment will be increased by this Project, but the frequency of maintenance will be reduced because of the improvements of the quality. Therefore, the increase of maintenance workforce is not necessary.

MPA owned two anchor vessels until February 2019 and maintained the Navigation Buoys. However, MPA has only one vessel now. Therefore, if MPA cannot maintain sufficiently, MPA will get support from Navy and Private Company. When Navy finds the drafted Buoys, Navy have inform MPA and MPA will either rent a boat from Private Company or request Navy to pick up the Buoys.

(2) Tide Gauge and Data Transfer System

The observation data will be transferred automatically and continually from Tide Gauge installed by the Project. If any accidents happen, the data will not reach and repairing will be needed. MPA will maintain Tide Gauge Station and Data Transfer System regularly and occasionally in accordance with instruction by the Consultant and the Manufactures. MPA can repair the simple failures because there are electrical engineers in MPA, but MPA needs service of the Manufactures and/or local repairing shop for the serious failures.

2.5 Project Cost Estimation

2.5.1 Initial Cost Estimation

2.5.1.1 Initial Cost Estimation

The estimated project cost to be borne by the Japanese side is discussed in the main report of the preparatory survey of the project.

Total cost by Myanmar	183,000 USD (about 20 million JPY)
a) Removal of various equipment	170,000 USD (about 19 million JPY)
b) Banking commission	13,000 USD (about 1 million JPY)

2.5.1.2 Conditions for the Cost Estimates

(1) Base Year and Month used in Cost Estimate

The base year and month for the estimation is November 2019.

(2) Exchange Rate

The three-month average rate was adopted from August 1, 2019 to October 31, 2019.

1USD = 108.30 JPY (average from August 2018 to October 2018)

(source: Tokyo-Mitsubishi UFJ bank)

2.5.2 Operation and Maintenance Cost

The procurement of equipment maintained in this project is roughly divided into four types.

a) Navigation buoy
b) Light Tower
c) Tide Gauge
d) Data Transfer

The navigation buoys and light towers have been operated and maintained by MPA until now. Budget has been secured in the category for management and maintenance in the annual budget of MPA. Since the maintenance frequency decreases, the budget for the navigation buoy and light tower will be sufficient in the future. In addition, for tide gauge and data transfer, operation and maintenance costs are hardly incurred. The budget for management and maintenance is not clearly determined, and the annual budget for each of the relevant departments is as follows and is disbursed as necessary. For reference, budget of related department in Fiscal 2016 is shown in the below table.

Table 2.10 Budget of Related Department (FY 2016)

Department	Amount (million Kyats)
Marine Department	180
Civil Engineering Department	320
Mechanical Engineering Department	30
Total	**530**

Source: MPA

2.6 Change of the main project contents from Previous Preparatory Survey

2.6.1 Change of the main component

It was confirmed that the number of necessary navigation buoy does not change in the Project although 5 deteriorated navigation buoys which were determined to be replaced in Previous Preparatory Survey were lost. It was also confirmed that deterioration condition of light tower and 7 navigation buoys which were determined to be repaired in the Previous Preparatory Survey does not significantly change. Regarding the tide gauge, MPA established tide gauge in early 2019. However, necessity of establishment of tide gauge were confirmed because MPA's tide gauge is considered not to be suitable for long-term use. It was also confirmed that condition and request of data transfer and survey equipment for maintenance do not change.

2.6.2 Change of the management and maintenance system

MPA will not be able to manage and maintain navigation buoys sufficiently for the time being because MPA has only one anchor barge now after having lost one of their two anchor barges. Therefore, MPA requires further cooperation from third party such as Navy and Private Company. MPA requires collecting buoys by chartered local vessels as well as their own vessel or asks Navy to collect them. It was confirmed that management and maintenance system other than the above does not change.

3. Project Evaluation

3. Project Evaluation

3.1 Preconditions

N/A.

3.2 Necessary Inputs by Recipient Country

Refer to the Chapter 2.3.

3.3 Important Assumptions

N/A.

3.4 Project Evaluation

3.4.1 Relevance

Yangon Port handles 90% of marine freight cargo in Myanmar and consists of both Yangon Main Port and Thilawa Area Port. The Channel in Yangon River is a route to Yangon Port and has problems such as danger and time constraints. Particularly in recent years, along with the increase in the ship calling numbers, accidents on the route frequently occurred. This Project not only urgently secures the safety of the route connected to Thilawa SEZ, which is being developed as a cooperative project between the two governments of Japan and Myanmar, It also contributes to strengthening bilateral relations from diplomatic point of view. Japan Grant Aid has high relevance to support the implementation of this Project.

Because MPA does not have enough technical capabilities and budget to develop vessel traffic navigation according to international standards, MPA needs Japanese support. By improving vessel traffic navigation, it is possible to make safe and efficient navigation channel and to improve port efficiency.

3.4.2 Effectiveness

3.4.2.1 Quantitative Effect

Because there are many shallow water depths in Yangon River, ships are entering and leaving the port accordingly to the time of high tide. In the Yangon River, there are two times a day of high tide. Ship maneuvering at nighttime is limited by safety issues, the ships enter and leave the port at the time of the high tide during the day, and the ship traffic inevitably concentrates.

Monkey Point and Elephant Point are the difficult areas for ship maneuvering and are not sufficiently developed. When the vessel traffic navigation is developed by this Project, it will increase the timing of entry and leave.

From the data provided by MPA Traffic Department, Yangon Port has the total 2,267 numbers of vessel calling in the year 2017. Currently, vessels enter the port at the same time during one high tide, but if this timing increases to two times, more vessels will be able to enter the port. If the night ship call becomes possible, it is assumed that about half of the current numbers being able to enter the port at night, about 1,100 vessels can be expected to increase due to vessel traffic navigation improvement by

the Project. By the consideration of ship calling and container handling volume record and efficiency of the Project, we assume the target values as in below table.

Table 3.1 Value Assumed After 3 Years of Project Completion

Index name	Reference value (2017 Actual value)	Target value (2025) 【3 years after project completion】
Number of vessels entering to Yangon Port (ships/yearly)	2,267	About 3,200
Container handling volume of Yangon Port (TEU/yearly)	1,026,216	About 2,000,000

Source: JICA Study Team

3.4.2.2 Qualitative Effect

It is obvious that improvement of vessel traffic navigation develops the safety of ship maneuvering. Increasing the timing for the entering and leaving ports has the merit of enabling more effective operation such as increasing the utilization rate of the quay and reducing the waiting time for vessels. This will improve the efficiency of logistics linking Myanmar for domestic and overseas, thereby contributing to sustainable economic growth of Myanmar.

From the above, this Project is judged that it has high relevance and effectiveness.

Attachment 1

Member List of the Study Team of Additional Survey

Name	Position	Organization
Hajime Matsuoka	JICA Leader	Japan International Cooperation Agency Myanmar Office
Shinji Yasui	JICA Coordinator	Japan International Cooperation Agency Myanmar Office
Kazuhisa Iwami	Team Leader/Navigation Channel Planner	Nippon Koei Co., Ltd.
Shingo Fujita	Navigation Aids Arrangement Planner/Designer	Japan Marine Science Inc.
Kentaro Kimura	Navigation Aids Procurement/ Cost Estimator	Nippon Koei Co., Ltd.
Kengo Kinoshita	Equipment Installation Planner/Designer	Nippon Koei Co., Ltd.

Source: JICA Study Team

Attachment 2

Study Schedule

Additional Field Survey				Team Leader/Navigation Channel Planner	Navigation aids procurer/ Cost Estimator	Installation Equipment Planner/Designer
No.	Month	Day	Date	Kazuhisa Iwami	Kentaro Kimura	Kengo Kinoshita
1	11	12	Tue		Departure Date (Tokyo to Yangon)	
2	11	13	Wed		Pre-Meeting with MPA for the Project explanation and request for site survey	
3	11	14	Thu		Explanation to MPA of the Project	
4	11	15	Fri		Request for quotation and arrangement of site survey	
5	11	16	Sat		ditto	
6	11	17	Sun		Arrival to Japan	Departure Date (Tokyo to Yangon)
7	11	18	Mon			Site survey of buoy by boat
8	11	19	Tue			Site survey at Elephant Point
9	11	20	Wed	Meeting with JICA Expert and EOJ		Collection of quotation
10	11	21	Thu	Collection of quotation		Site survey at Monkey Point and Thanlyin Point
11	11	22	Fri	Meeting with MPA and JICA Myanmar Office		Preparation of Field Survey Report
12	12	2	Mon	Pre-explanation for DFR with MPA and meeting with JICA Myanmar Office		
13	12	3	Tue	Meeting with MPA for DFR		
14	12	6	Fri	Meeting with MPA for Minutes of Discussion		
15	12	11	Wed		Meeting with MPA for additional data collection	
16	12	12	Thu		FR Preparation	
17	12	13	Fri		Meeting with MPA for additional data collection	

Attachment 3

List of Parties Concerned in the Recipient Country of Additional Survey

Name	Position	Organization
Mr. Ni Aung	Managing Director	Myanma Port Authority
Mr. Zaw Tun Lwin	General Manager	
Mr. Aung Kyaw Htoo	Master Attendant, Marine Department	
Mr. Nay Myo Nyunt	Chief Civil Engineer, Civil Engineering Department	
Mr. Than Htut Aung	Chief Mechanical Engineer, Mechanical Engineering Department	
Mr. Aung Soe	Chief Accountant, Account Department	
Mr. Wai Zun Aung	Chief Surveyor, Survey Department	
Mr. Aye Lwin	Light House Officer, Marine Department	
Mr. Hajime Matsuoka	Senior Representative	JICA Myanmar Office
Mr. Shinji YASUI	Representative	
Mr. Takeshi Okuda	Transport Policy Advisor	JICA Expert for MOTC and MPA
Mr. Naoki Takigawa	First Secretary (Economic and Development Assistance Section)	Embassy of Japan

Minutes of Discussions
on the Preparatory Survey for the Project for
Rehabilitation of Vessel Traffic Navigation Aid in Yangon River
(Additional Survey)
Explanation on Draft Preparatory Survey Report

With reference to the minutes of discussions signed between the Myanma Port Authority (hereinafter referred to as "MPA"), the Ministry of Transport and Communications (hereinafter referred to as "MOTC"), the Government of Myanmar (hereinafter referred to as "Myanmar") and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on 1 September, 2017 and 20 Decemeber 2018 and in response to the request from Myanmar dated 10 January 2018, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for Rehabilitation of Vessel Traffic Navigation Aid in Yangon River (hereinafter referred to as "the Project").

As a result of the discussions, both sides agreed on the main items described in the attached sheets.

Yangon, 6 December, 2019

Hajime Matsuoka
Senior Representative

Japan International Cooperation Agency
Myanmar Office

U Ni Aung
Managing Director
Myanma Port Authority
Ministry of Transport and Communications
Republic of the Union of Myanmar

ATTACHEMENT

1. Objective of the Project, Title of the Preparatory Survey, Project site, Procedures and Basic Principles of Japanese Grant, and Environmental and Social Considerations
   Both sides confirmed the above-captioned subjects unchanged from those agreed in the Minutes of Discussions signed on 1 September 2017 and 20 Decemeber 2018.

2. Contents of the Draft Report
   After the explanation of the contents of the Draft Report by the Team, the Myanmar side agreed to its contents.

3. Cost estimate
   Both sides confirmed that the cost estimate including the contingency explained by the Team is provisional and will be examined further by the Government of Japan for its approval. The contingency would cover the additional cost against natural disaster, unexpected natural conditions, etc.

4. Confidentiality of the cost estimate and technical specifications
   Both sides confirmed that the cost estimate and technical specifications of the Project should never be disclosed to any third parties until all the contracts under the Project are concluded. The Preparatory Survey Report from which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey.

5. Timeline for the project implementation
   The Team explained to the Myanmar side that the expected timeline for the project implementation is as attached in Annex 1. The Team also explained to the Myanmer side that the timeline is tentative and the project will be started after the approval by the Japanese Cabinet and conclusion of E/N and G/A.

6. Expected outcomes and indicators
   Both sides agreed that key indicators for expected outcomes are as follows. The Myanmar side will be responsible for the achievement of agreed key indicators targeted in year 2025 and shall monitor the progress based on those indicators.

[Quantitative indicators]

Indicators	Baseline Value (Year 2017)	Target Value (Year 2025) 3 years after completion of the Project
Ship calls in Yangon port (ship/year)	2,267	3,200
Handling volume of contenarized cargo in Yangon port (TEU/year)	1,043,469	2,000,000

[Qualitative indicators]

- Invigoration of trade
- Securing the safty of navigation to Yangon Port
- Improving the efficiency of logistics

7. Technical assistance ("Soft Component" of the Project)

Considering the sustainable operation and maintenance of the products and services granted through the Project, following technical assistance is planned under the Project. The Myanmar side confirmed to deploy necessary number of counterparts who are appropriate and competent in terms of its purpose of the technical assistance as described in the Draft Report.

1) Technical training (theoretical study and practical training) on Aids to Navigation
2) Group work and/or discussion on organizaition and back up system for effective and efficient implementation of Aids to Navigation provision service
3) Support to develop "Aids to Navigation manuals" and "Check and Maintenance manual"
4) Training on the hydrographic or meteorological observation

8. Undertakings of the Project

Both sides confirmed that the undertakings of the Project as described in Annex 2. With regard to exemption of customs duties, internal taxes and other fiscal levies as stipulated in (2)-6 of Annex 2, both sides confirmed that such customs duties, internal taxes and other fiscal levies include commercial tax, income tax and corporate tax, which shall be clarified in the bid documents by MPA with the prior approval of MOPF in accordance with the existing taxation laws, Customs Acts and the relevant Rules, Regulations and Notifications of MOPF during the implementation stage of

the Project.

The Myanmar side assured to take the necessary measures and coordination including allocation of the necessary budget which are preconditions of implementation of the Project. It is further agreed that the costs are indicative, i.e. at Outline Design level. More accurate costs will be calculated at the Detailed Design stage.

Both sides also confirmed that the Annex 2 will be used as an attachment of G/A.

9. Monitoring during the implementation

The Project will be monitored by the Executing Agency (MPA) and reported to JICA by using the form of Project Monitoring Report (PMR) attached as Annex 3. The timing of submission of the PMR is described in Annex 2.

10. Project completion

Both sides confirmed that the Project completes when all the equipment procured and installed properly by the grant are in operation, and planned support activities are completed. The completion of the Project will be reported to JICA promptly, but in any event not later than six (6) months after completion of the Project.

11. Ex-Post Evaluation

JICA will conduct ex-post evaluation after three (3) years from the project completion, in principle, with respect to five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact, Sustainability). The result of the evaluation will be publicized. The Myanmar side is required to provide necessary support for the data collection.

12. Schedule of the Study

Myanmar side agreed that further comments on the Draft Report will be submitted in written form to JICA Myanmar Office no later than 15th of January, 2020. The Team will finalize the Preparatory Survey Report by incorporating the further comments submitted. The report will be sent to the Myanmar side in March 2020.

13. Other Relevant Issues

13-1. Disclosure of Information

Both sides confirmed that the Preparatory Survey Report from which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey. The comprehensive report including the project cost will be disclosed to the public after all the contracts under the Project are concluded.

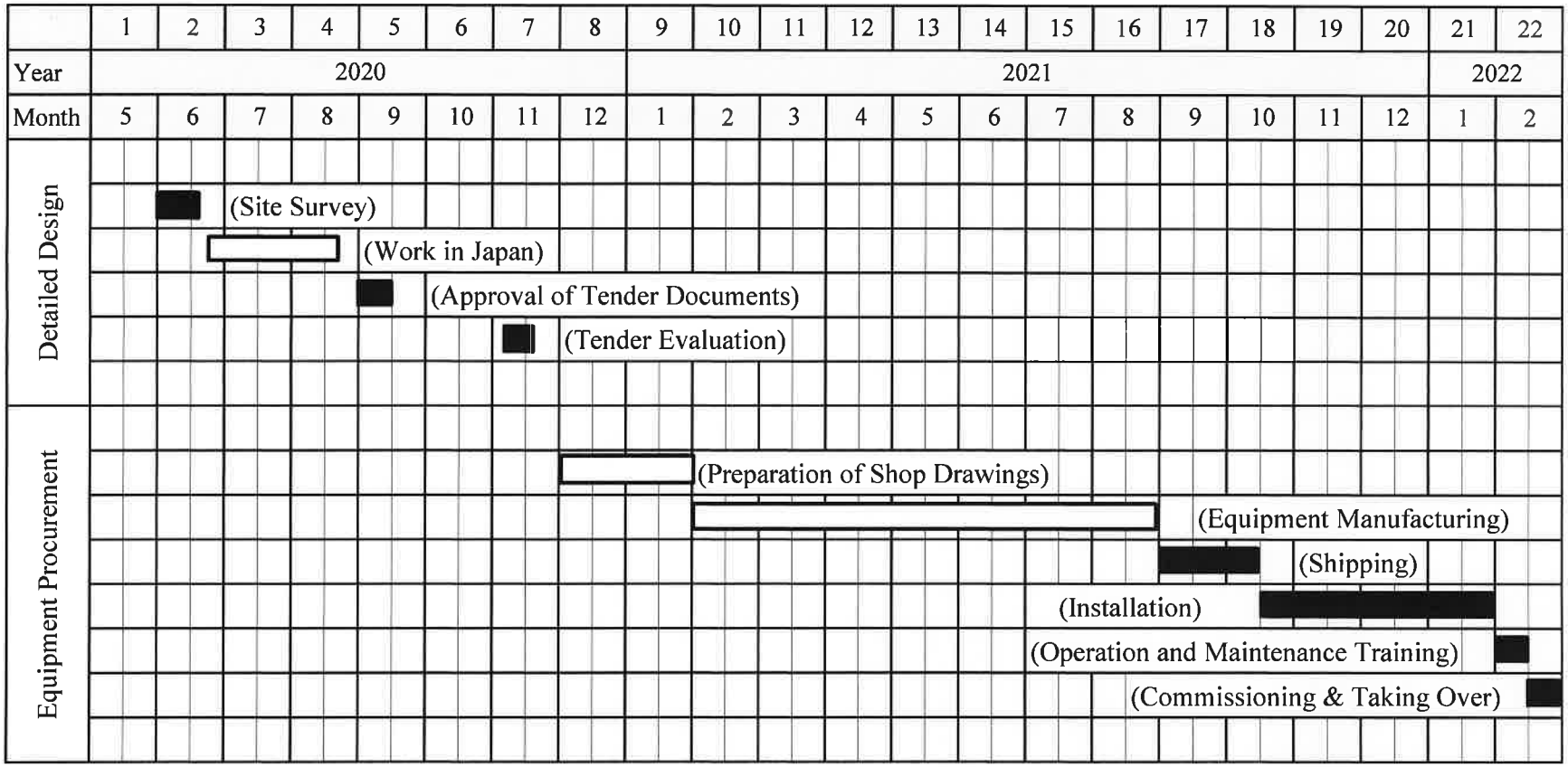
Annex 1 Project Implementation Schedule

Annex 2 Major Undertakings to be taken by the Government of Myanmer.

Annex 3 Project Monitoring Report (template)

Annex-1

Project Implementation Schedule



Annex-2

Major Undertakings to be taken by the Government of Myanmar

1. Specific obligations of the Government of Myanmar which will not be funded with the Grant

(1) Before the Tender

NO	Items	Deadline	In charge	Estimated Cost (Thousand USD)	Ref.
1	To open bank account (B/A)	within 1 month after the signing of the G/A	Ministry of Planning and Finance (MOPF)	-	
2	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the consultant	within 1 month after the signing of the contract	Myanmar Port Authority (MPA)	-	
3	To provide the latest information about the navigation aids 1) location maps of the navigation aids 2) situation of the navigation aids	within 1 month after the signing of the contract	MPA	-	
4	To secure and clear the following lands project sites 1) project sites to construct and install new equipment 2) temporary storage near the project site	before notice of the bidding document	MPA	180	
5	To obtain the entering and constructing permission in the project site	before notice of the bidding document	MPA	-	
6	To submit Project Monitoring Report (with the result of Detail Design)	before preparation of bidding documents	MPA	-	
7	To assign the necessary staffs to the project team for smooth implementation of installation, adjustment, commissioning, initial operation instruction, operation guidance, acceptance, delivery, training, etc.	By the signing of the contract(s) to the Supplier(s)	MPA	-	
8	To make budgetary arrangement necessary for disbursement of the Grant as well as for implementation of undertakings by the Myanmar side	By the beginning of fiscal year 2019/2020	MPA		

(B/A: Banking Arrangement, A/P: Authorization to pay)

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost (Thousand USD)	Ref.
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the Supplier(s)	within 1 month after the signing of the contract(s)	MPA	-	
2	To bear the following commissions to a bank in Japan for the banking services based upon the B/A			-	
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	MPA	-	
	2) Payment commission for A/P	every payment	MPA	13	
3	To make budgetary arrangement necessary for disbursement of the Grant as well as for implementation of undertakings by the Myanmar side	By the beginning of each fiscal year	MPA		
4	To ensure prompt unloading and customs clearance at ports of disembarkation in recipient country and to assist the Supplier(s) with internal transportation therein	during the Project	MPA	-	
5	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	MPA	-	
6	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted	during the Project	MOPF	-	
7	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project, except for the responsibility under the contract of the contractor / equipment supplier.	during the Project	MPA	-	
8	To obtain the permission and allow the Supplier(s) to enter, construct and install equipment in the project site	during the Project	MPA	-	
9	To obtain the permission and allow the Supplier(s) to construct temporary structure for the storage for buoys and materials	during the Project	MPA	-	
10	To submit Environmental Management Plan (EMP) to Ministry of Natural Recourses and Environmental Conservation (MONREC)	before start of the construction/ installation	MPA	-	
11	To relocate and/or remove the existing equipment to clear the following lands project sites 1) project sites to construct and install new equipment 2) temporary storage near the project site	before start of the construction/ installation	MPA	-	
12	To provide facilities for distribution of electricity required for installation, adjustment and acceptance inspection of equipment and training	before start of the construction/ installation	MPA	-	
13	To secure a radio frequency band and obtain the permission required for transmission and reception of the AIS data of navigation aids and observation data of the meteorological and oceanographic observation stations	before start of the construction/ installation	MPA	-	
14	To secure the display place for the meteorological and oceanographic observation data in the headquarters of MPA	before start of the construction/ installation	MPA	-	
15	To take necessary measure for safety construction and installation 1) Traffic control 2) Rope off 3) Dissemination of the safety information to the sailing vessels during the installation and removal of buoys	during the construction/ installation	MPA	-	

16	To dispose replaced navigation aids after installation of new navigation aids	during the construction/ installation	MPA	-	
17	1) To submit Project Monitoring Report after each work under the contract(s) such as shipping, hand over, installation and operational training	within one month after completion of each work	MPA	-	
	2) To submit Project Monitoring Report (final)	within one month after signing of Certificate of Completion for the works under the contract(s)	MPA	-	
18	To submit a report concerning completion of the Project	within six months after completion of the Project	MPA	-	

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost (Thousand USD)	Ref.
1	To maintain, and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection 4) Power supply for maintenance and operation of equipment	After completion of the construction	MPA		
2	To store the meteorological and oceanographic data	After completion of the construction	MPA		

2. Other obligations of the Government of Myanmar funded with the Grant

NO	Items	Deadline	Amount (Million Japanese Yen)*
1	To construct facility and provide equipment 1) To conduct the following transportation a) Marin (Air) transportation of the products from Japan to the recipient country b) Internal transportation from the port of disembarkation to the project site	This Page is closed due to the confidentiality.	
	2) To provide equipment with installation and commissioning the equipment		
2	To implement detailed design, bidding support and procurement supervision (Consulting Service)		
3	Contingencies		
	Total		

*The Amount is provisional. This is subject to the approval of the Government of Japan.

Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXX

20XX, Month

Organizational Information

Signer of the G/A (Recipient)	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:
Executing Agency	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:
Line Ministry	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:

General Information:

Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

1: Project Description

1-1 Project Objective

1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

1-3 Indicators for measurement of "Effectiveness"

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr)	Target (Yr)
Qualitative indicators to measure the attainment of project objectives		

2: Details of the Project

2-1 Location

Components	Original *(proposed in the outline design)*	Actual
1.		

2-2 Scope of the work

Components	Original* *(proposed in the outline design)*	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

2-3 Implementation Schedule

Items	Original		Actual
	(proposed in the outline design)	*(at the time of signing the Grant Agreement)*	

Reasons for any changes of the schedule, and their effects on the project (if any)

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations

See Attachment 2.

2-4-2 Activities

See Attachment 3.

2-4-3 Report on RD

See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant(Confidential until the Bidding)

Components			Cost (Million Yen)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

Components			Cost (1,000 Taka)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original *(at the time of outline design)* name: role: financial situation: institutional and organizational arrangement (organogram): human resources (number and ability of staff):
Actual *(PMR)*

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

Original *(at the time of outline design)*
Actual *(PMR)*

3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

Original *(at the time of outline design)*

Actual *(PMR)*

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks (*at the time of outline design*)

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:

	Contingency Plan (if applicable):
Actual Situation and Countermeasures	
(PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Specific obligations of the Recipient which will not be funded with the Grant
3. Monthly Report submitted by the Consultant

Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
- Contractor's Main Staff List

4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final)only)
8. Pictures (by JPEG style by CD-R) (PMR (final)only)
9. Equipment List (PMR (final)only)
10. Drawing (PMR (final)only)
11. Report on RD (After project)

Attachment 6

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

	Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
						Price (Decreased) E=C−D	Price (Increased) F=C+D
1	Item 1	●●t	●	●	●	●	●
2	Item 2	●●t	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

	Items of Specified Materials	1st ●month, 2015	2nd ●month, 2015	3rd ●month, 2015	4th	5th	6th
1	Item 1						
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)

-

-

-

Attachment 7

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

		Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost		(A/D%)	(B/D%)	(C/D%)	
	Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
	others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost		(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost		(A/D%)	(B/D%)	(C/D%)	
Total		(A/D%)	(B/D%)	(C/D%)	

reference

Minutes of Meetings
on the Preparatory Survey for the Project for
Rehabilitation of Vessel Traffic Navigation Aid in Yangon River

Based on the several preliminary discussions between the Myanma Port Authority (hereinafter referred to as "MPA"), the Ministry of Transport and Communications (hereinafter referred to as "MOTC"), Myanmar and JICA Myanmar office, Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Team for the Outline Design (hereinafter referred to as "the Team") of the Project for Rehabilitation of Vessel Traffic Navigation Aid in Yangon River (hereinafter referred to as "the Project") to Myanmar, headed by Mikio Ishiwatari, Senior Advisor on Disaster Management and Water Resources Management, JICA, from 28 August to 1 September, 2017. The Team held a series of meetings with the officials of MPA and conducted a field survey. In the course of the meetings, both sides have confirmed the main items described in the attached sheets.

Yangon, 1 September, 2017

Mikio Ishiwatari
Leader
Preparatory Survey Team
Japan International Cooperation Agency
Japan

U Ni Aung
Managing Director
Myanma Port Authority
Ministry of Transport and Communications
Republic of the Union of Myanmar

ATTACHMENT

1. Objective of the Project

   The objective of the Project is to improve logistics efficiency through rehabilitation of vessel traffic navigation aid, thereby contributing to sustainable economic growth in Myanmar.

2. Title of the Preparatory Survey

   Both sides confirmed the title of the Preparatory Survey as "the Preparatory Survey for the Project for Rehabilitation of Vessel Traffic Navigation Aid in Yangon River".

3. Project site

   Both sides confirmed that the site of the Project is in the Yangon River, which is shown in Annex 1.

4. Responsible authority for the Project

   Both sides confirmed the authorities responsible for the Project are as follows:

   4-1. The Myanma Port Authority will be the executing agency for the Project (hereinafter referred to as "the Executing Agency"). The Executing Agency shall coordinate with all the relevant authorities to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be managed by relevant authorities properly and on time. The organization charts are shown in Annex 2.

   4-2. The line ministry of the Executing Agency is the Ministry of Transport and Communications. The MOTC shall be responsible for supervising the Executing Agency on behalf of the Government of Myanmar.

5. Items requested by the Government of Myanmar

   5-1. As a result of meetings, both sides confirmed that the items requested by the Government of Myanmar are as follows:

   - Rehabilitation of Lighthouses (Monkey, Thanlyn, Thante Point etc.)
   - Rehabilitation of Buoys (to be discussed for future development as AIS etc.)
   - Installation of Marine observation Facilities at some points

5-2. JICA will assess the feasibility of the above requested items through the survey and will report the findings to the Government of Japan. The final scope of the Project will be decided by the Government of Japan.

5-3. The MPA shall submit a draft of an official request of the Project to the MOTC by September, 2017. The Government of Myanmar shall submit an official request to the Government of Japan through a diplomatic channel before the appraisal of the Project, which is scheduled in February, 2018.

6. Procedures and Basic Principles of Japanese Grant

6-1. The Myanmar side agreed that the procedures and basic principles and basic principles of Japanese Grant as described in Annex 3 shall be applied to the Project.

As for the monitoring of the implementation of the Project, JICA requires Myanmar side to submit the Project Monitoring Report, the form of which is attached as Annex 4.

6-2. The Myanmar side agreed to take the necessary measures, as described in Annex 5, for smooth implementation of the Project. The contents of the Annex 5 will be elaborated and refined during the Preparatory Survey and be agreed in the mission dispatched for explanation of the Draft Preparatory Survey Report.

The contents of Annex 5 will be updated as the Preparatory Survey progresses, and eventually, will be used as an attachment to the Grant Agreement.

7. Schedule of the Survey

7-1. The Team will proceed with further survey in Myanmar until January 2018.

7-2. An official request to the Government of Japan will be submitted before February, 2018.

7-3. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to Myanmar in order to explain its contents around April 2018.

7-4. If the contents of the draft Preparatory Survey Report is accepted and the undertakings for the Project are fully agreed by the Myanmar side, JICA will finalize the Preparatory Survey Report and send it to Myanmar around July 2018.

7-5. The above schedule is tentative and subject to change.

8. Environmental and Social Considerations

8-1. The Myanmar side confirmed to give due environmental and social considerations

before and during implementation, and after completion of the Project, in accordance with the JICA Guidelines for Environmental and Social Considerations (April, 2010).

8-2. The Project is categorized as "C" from the following considerations: Not located in a sensitive area, nor has it sensitive characteristics, nor falls it into sensitive sectors under the Guidelines, and its potential adverse impacts on the environment are not likely to be significant.

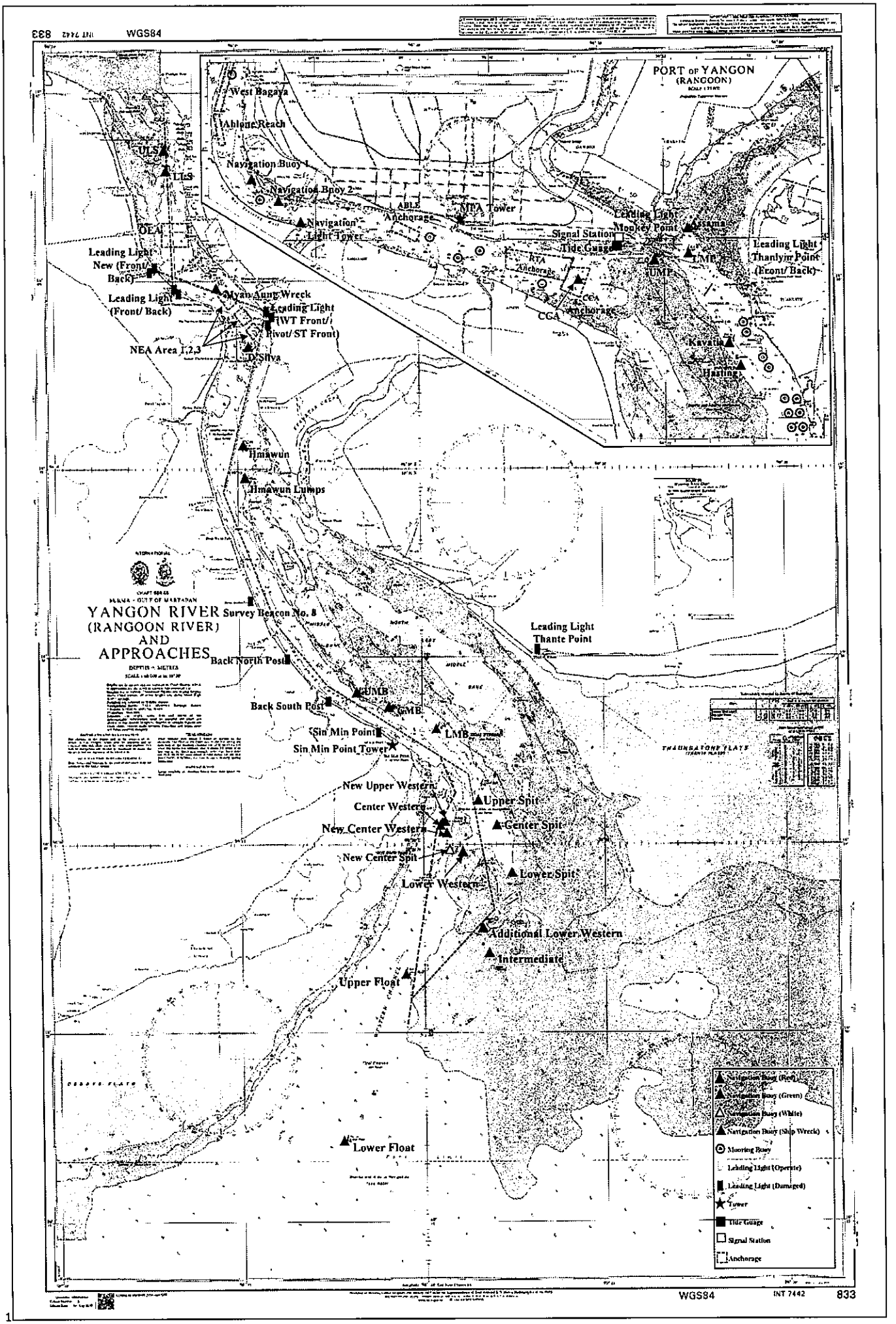
9. Other Relevant Issues

9-1. The Myanmar side confirmed to conduct the necessary procedures concerning the environmental assessment (including Environmental Management Plan (EMP) etc.) and make EMP report of the Project. The EMP approval shall be received from the responsible authorities and submitted to JICA by April 2018.

9-2. Considering the sustainable operation and maintenance of the products and services granted through the Project, Soft Component would be planned under the Project. JICA will proceed with further survey for the Soft Component and propose its contents in a draft Preparatory Survey Report. The Myanmar side confirmed to assign necessary number of counterparts who are appropriate and competent in terms of its purpose of the technical assistance as described in the draft Preparatory Survey Report.

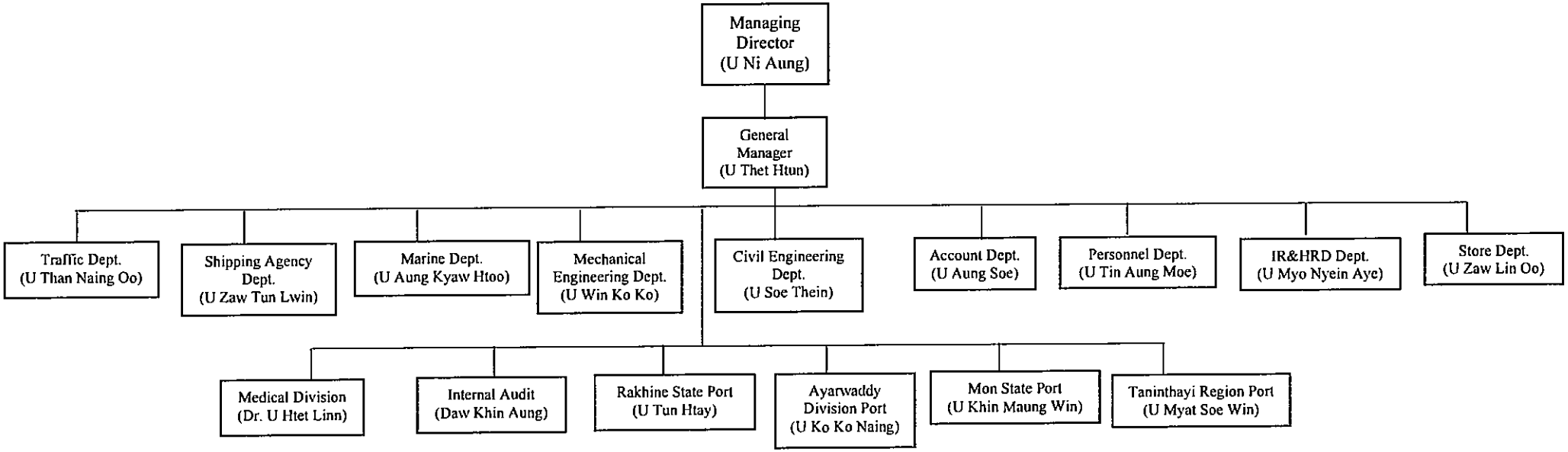
Annex 1 Project Site
Annex 2 Organization Chart
Annex 3 Japanese Grant
Annex 4 Project Monitoring Report (template)
Annex 5 Major Undertakings to be taken by the Government of Myanmar

Annex 1


WGS84
INT 7442
833
PORT OF YANGON
(RANGOON)
West Bagaya
Ahlone Reach
ULS
LLS
Navigation Buoy 1
Navigation Buoy 2
ABLE Anchorage
MPA Tower
Navigation Light Tower
OEA
Leading Light New (Front/ Back)
Leading Light (Front/ Back)
Myan Aung Wreck
Leading Light (WT Front/ Pivot/ ST Front)
NEA Area 1,2,3
D'Silva
Signal Station
Tide Gauge
RTA Anchorage
CGA
CGA Anchorage
Leading Light Monkey Point
Assama
LMB
UMB
Leading Light Thanlyin Point (Front/ Back)
Kayatta
Hastings
Hmawun
Hmawun Lumps
YANGON RIVER
(RANGOON RIVER)
AND
APPROACHES
Survey Beacon No. 8
Back North Post
Back South Post
UMB
LMB
Sin Min Point
Sin Min Point Tower
Leading Light Thante Point
New Upper Western
Upper Spit
Center Western
Center Spit
New Center Western
New Center Spit
Lower Spit
Lower Western
Additional Lower Western
Intermediate
Upper Float
Lower Float
Navigation Buoy (Red)
Navigation Buoy (Green)
Navigation Buoy (White)
Navigation Buoy (Ship Wreck)
Mooring Buoy
Leading Light (Operate)
Leading Light (Damaged)
Tower
Tide Gauge
Signal Station
Anchorage

Annex 2

Organization Chart of Myanma Port Authority (MPA)



Annex 3

JAPANESE GRANT

The Japanese Grant is non-reimbursable fund provided to a recipient country (hereinafter referred to as "the Recipient") to purchase the products and/or services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. Followings are the basic features of the project grants operated by JICA (hereinafter referred to as "Project Grants").

1. Procedures of Project Grants

Project Grants are conducted through following procedures (See "PROCEDURES OF JAPANESE GRANT" for details):

(1) Preparation

- The Preparatory Survey (hereinafter referred to as "the Survey") conducted by JICA

(2) Appraisal

-Appraisal by the government of Japan (hereinafter referred to as "GOJ") and JICA, and Approval by the Japanese Cabinet

(3) Implementation

Exchange of Notes

-The Notes exchanged between the GOJ and the government of the Recipient

Grant Agreement (hereinafter referred to as "the G/A")

-Agreement concluded between JICA and the Recipient

Banking Arrangement (hereinafter referred to as "the B/A")

-Opening of bank account by the Recipient in a bank in Japan (hereinafter referred to as "the Bank") to receive the grant

Construction works/procurement

-Implementation of the project (hereinafter referred to as "the Project") on the basis of the G/A

(4) Ex-post Monitoring and Evaluation

-Monitoring and evaluation at post-implementation stage

2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide basic documents necessary for the appraisal of the the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of

relevant agencies of the Recipient necessary for the implementation of the Project.

- Evaluation of the feasibility of the Project to be implemented under the Japanese Grant from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.
- Confirmation of Environmental and Social Considerations

The contents of the original request by the Recipient are not necessarily approved in their initial form. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant.

JICA requests the Recipient to take measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the executing agency of the Project. Therefore, the contents of the Project are confirmed by all relevant organizations of the Recipient based on the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Survey, JICA contracts with (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

(3) Result of the Survey

JICA reviews the report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the feasibility of the Project.

3. Basic Principles of Project Grants

(1) Implementation Stage

1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as "the E/N") will be singed between the GOJ and the Government of the Recipient to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Recipient to define the necessary articles, in accordance with the E/N, to implement the Project, such as conditions of disbursement, responsibilities of the Recipient, and procurement conditions. The terms and conditions generally applicable to the Japanese Grant are stipulated in the "General Terms and Conditions for Japanese Grant (January 2016)."

2) Banking Arrangements (B/A) (See "Financial Flow of Japanese Grant (A/P Type)" for details)

a) The Recipient shall open an account or shall cause its designated authority to open an account under the name of the Recipient in the Bank, in principle. JICA will disburse the Japanese Grant in Japanese yen for the Recipient to cover the obligations incurred by the Recipient under the verified contracts.

b) The Japanese Grant will be disbursed when payment requests are submitted by the Bank to JICA under an Authorization to Pay (A/P) issued by the Recipient.

3) Procurement Procedure

The products and/or services necessary for the implementation of the Project shall be procured in accordance with JICA's procurement guidelines as stipulated in the G/A.

4) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the Recipient to continue to work on the Project's implementation after the E/N and G/A.

5) Eligible source country

In using the Japanese Grant disbursed by JICA for the purchase of products and/or services, the eligible source countries of such products and/or services shall be Japan and/or the Recipient. The Japanese Grant may be used for the purchase of the products and/or services of a third country as eligible, if necessary, taking into account the quality, competitiveness and economic rationality of products and/or services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm, which enter into contracts with the Recipient, are limited to "Japanese nationals", in principle.

6) Contracts and Concurrence by JICA

The Recipient will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be concurred by JICA in order to be verified as eligible for using the Japanese Grant.

7) Monitoring

The Recipient is required to take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and to regularly report to JICA about its status by using the Project Monitoring Report (PMR).

8) Safety Measures

The Recipient must ensure that the safety is highly observed during the implementation of the Project.

9) Construction Quality Control Meeting

Construction Quality Control Meeting (hereinafter referred to as the "Meeting") will be held for quality assurance and smooth implementation of the Works at each stage of the Works. The member of the Meeting will be composed by the

Recipient (or executing agency), the Consultant, the Contractor and JICA. The functions of the Meeting are as followings:

a) Sharing information on the objective, concept and conditions of design from the Contractor, before start of construction.

b) Discussing the issues affecting the Works such as modification of the design, test, inspection, safety control and the Client's obligation, during of construction.

(2) Ex-post Monitoring and Evaluation Stage

1) After the project completion, JICA will continue to keep in close contact with the Recipient in order to monitor that the outputs of the Project is used and maintained properly to attain its expected outcomes.

2) In principle, JICA will conduct ex-post evaluation of the Project after three years from the completion. It is required for the Recipient to furnish any necessary information as JICA may reasonably request.

(3) Others

1) Environmental and Social Considerations

The Recipient shall carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the Recipient and JICA Guidelines for Environmental and Social Considerations (April, 2010).

2) Major undertakings to be taken by the Government of the Recipient

For the smooth and proper implementation of the Project, the Recipient is required to undertake necessary measures including land acquisition, and bear an advising commission of the A/P and payment commissions paid to the Bank as agreed with the GOJ and/or JICA. The Government of the Recipient shall ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

3) Proper Use

The Recipient is required to maintain and use properly and effectively the products and/or services under the Project (including the facilities constructed and the equipment purchased), to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Japanese Grant.

4) Export and Re-export

The products purchased under the Japanese Grant should not be exported or re-exported from the Recipient.

Attachment I

PROCEDURES OF JAPANESE GRANT

Stage	Procedures	Remarks	Recipient Government	Japanese Government	JICA	Consultants	Contractors	Agent Bank
Official Request	Request for grants through diplomatic channel	Request shall be submitted before appraisal stage.	x	x				
1. Preparation	(1) Preparatory Survey Preparation of outline design and cost estimate		x		x	x		
2. Appraisal	(2)Preparatory Survey Explanation of draft outline design, including cost estimate, undertakings, etc.		x		x	x		
	(3)Agreement on conditions for implementation	Conditions will be explained with the draft notes (E/N) and Grant Agreement (G/A) which will be signed before approval by Japanese government.	x	x (E/N)	x (G/A)			
	(4) Approval by the Japanese cabinet			x				
3. Implementation	(5) Exchange of Notes (E/N)		x	x				
	(6) Signing of Grant Agreement (G/A)		x		x			
	(7) Banking Arrangement (B/A)	Need to be informed to JICA	x					x
	(8) Contracting with consultant and issuance of Authorization to Pay (A/P)	Concurrence by JICA is required	x			x		x
	(9) Detail design (D/D)		x			x		
	(10) Preparation of bidding documents	Concurrence by JICA is required	x			x		
	(11) Bidding	Concurrence by JICA is required	x			x	x	
	(12) Contracting with contractor/supplier and issuance of A/P	Concurrence by JICA is required	x				x	x
	(13) Construction works/procurement	Concurrence by JICA is required for major modification of design and amendment of contracts.	x			x	x	
	(14) Completion certificate		x			x	x	
4. Ex-post monitoring & evaluation	(15) Ex-post monitoring	To be implemented generally after 1, 3, 10 years of completion, subject to change	x		x			
	(16) Ex-post evaluation	To be implemented basically after 3 years of completion	x		x			

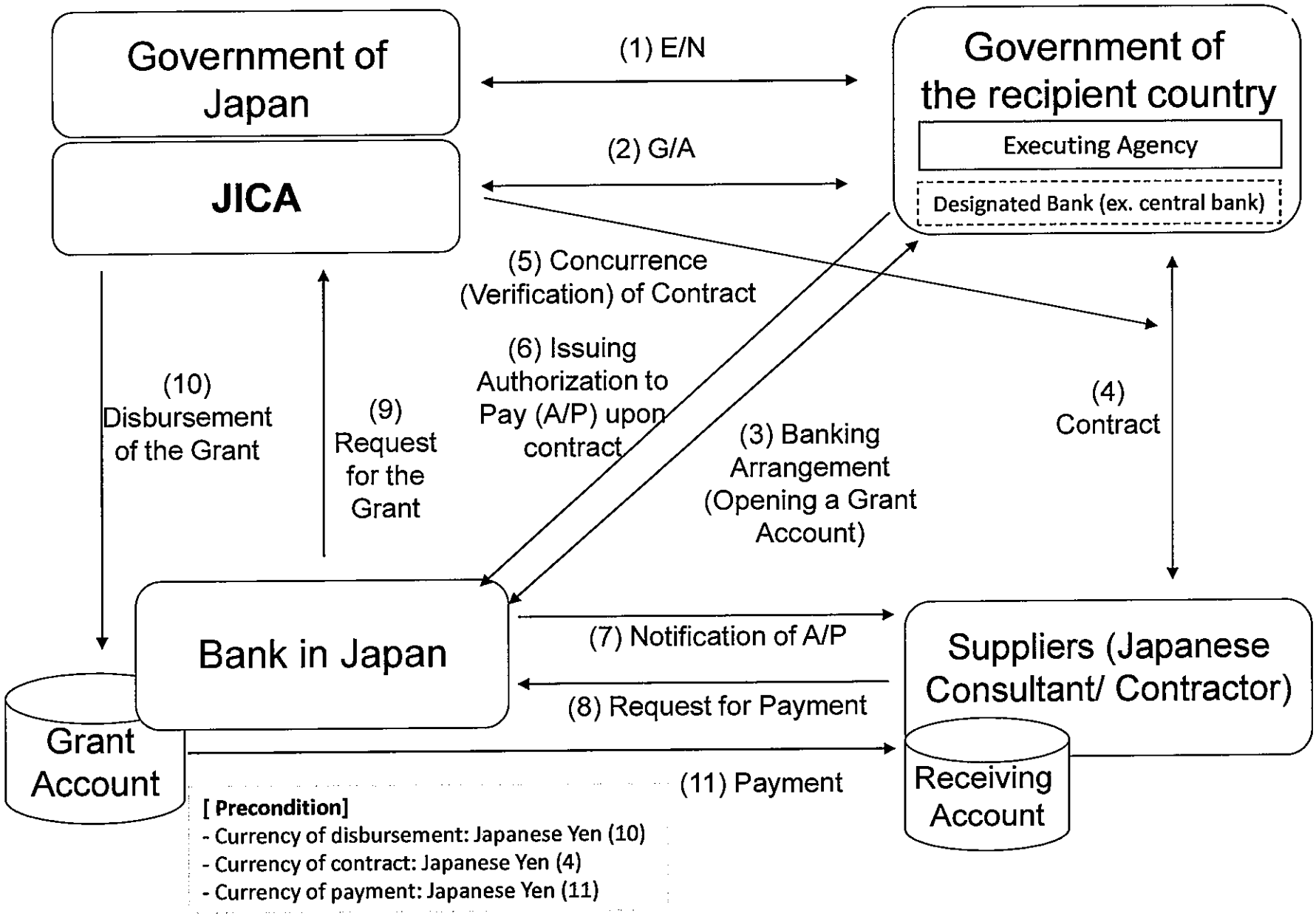
notes:

1. Project Monitoring Report and Report for Project Completion shall be submitted to JICA as agreed in the G/A.

2. Concurrence by JICA is required for allocation of grant for remaining amount and/or contingencies as agreed in the G/A.

Attachment 2

Financial Flow of Japanese Grant (A/P Type)



Project Monitoring Report
on
Project Name
Grant Agreement No. XXXXXXX

20XX, Month

Organizational Information

Signer of the G/A (Recipient)	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:
Executing Agency	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:
Line Ministry	Person in Charge (Designation) Contacts Address: Phone/FAX: Email:

General Information:

Project Title	
E/N	Signed date: Duration:
G/A	Signed date: Duration:
Source of Finance	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

1: Project Description

1-1 Project Objective

1-2 Project Rationale

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

1-3 Indicators for measurement of "Effectiveness"

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr)	Target (Yr)
Qualitative indicators to measure the attainment of project objectives		

2: Details of the Project

2-1 Location

Components	Original *(proposed in the outline design)*	Actual
1.		

2-2 Scope of the work

Components	Original* *(proposed in the outline design)*	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)

2-3 Implementation Schedule

Items	Original		Actual
	(proposed in the outline design)	*(at the time of signing the Grant Agreement)*	

Reasons for any changes of the schedule, and their effects on the project (if any)

2-4 Obligations by the Recipient

2-4-1 Progress of Specific Obligations

See Attachment 2.

2-4-2 Activities

See Attachment 3.

2-4-3 Report on RD

See Attachment 11.

2-5 Project Cost

2-5-1 Cost borne by the Grant(Confidential until the Bidding)

Components			Cost (Million Yen)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			
Total				

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar = Yen

2-5-2 Cost borne by the Recipient

Components			Cost (1,000 Taka)	
	Original *(proposed in the outline design)*	Actual *(in case of any modification)*	Original[1),2)] *(proposed in the outline design)*	Actual
	1.			

Note: 1) Date of estimation:
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

2-6 Executing Agency

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

Original *(at the time of outline design)* name: role: financial situation: institutional and organizational arrangement (organogram): human resources (number and ability of staff):
Actual *(PMR)*

2-7 Environmental and Social Impacts

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

3: Operation and Maintenance (O&M)

3-1 Physical Arrangement

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

Original *(at the time of outline design)*
Actual *(PMR)*

3-2 Budgetary Arrangement

- Required O&M cost and actual budget allocation for O&M

Original *(at the time of outline design)*

Actual *(PMR)*

4: Potential Risks and Mitigation Measures

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

Assessment of Potential Risks *(at the time of outline design)*

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:

	Contingency Plan (if applicable):
Actual Situation and Countermeasures	
(PMR)	

5: Evaluation and Monitoring Plan (after the work completion)

5-1 Overall evaluation

Please describe your overall evaluation on the project.

5-2 Lessons Learnt and Recommendations

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

5-3 Monitoring Plan of the Indicators for Post-Evaluation

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

Attachment

1. Project Location Map
2. Specific obligations of the Recipient which will not be funded with the Grant
3. Monthly Report submitted by the Consultant

Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
- Contractor's Main Staff List

4. Check list for the Contract (including Record of Amendment of the Contract/ Agreement and Schedule of Payment)
5. Environmental Monitoring Form / Social Monitoring Form
6. Monitoring sheet on price of specified materials (Quarterly)
7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final)only)
8. Pictures (by JPEG style by CD-R) (PMR (final)only)
9. Equipment List (PMR (final)only)
10. Drawing (PMR (final)only)
11. Report on RD (After project)

Attachment 6

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

	Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
						Price (Decreased) E=C−D	Price (Increased) F=C+D
1	Item 1	●●t	●	●	●	●	●
2	Item 2	●●t	●	●	●		
3	Item 3						
4	Item 4						
5	Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

	Items of Specified Materials	1st ●month, 2015	2nd ●month, 2015	3rd ●month, 2015	4th	5th	6th
1	Item 1						
2	Item 2						
3	Item 3						
4	Item 4						
5	Item 5						

(3) Summary of Discussion with Contractor (if necessary)

-

-

-

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)
(Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

Annex-5

Major Undertakings to be taken by the Government of Myanmar

1. Specific obligations of the Government of Myanmar which will not be funded with the Grant

(1) Before the Tender

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To open bank account (B/A)	within 1 month after the signing of the G/A	Ministry of Planning and Finance (MOPF)		
2	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the consultant	within 1 month after the signing of the contract	MPA		
3	To approve EMP (Conditions of approval should be fulfilled, if any).	within 1 month after the signing of the G/A	MONREC/ MPA		
4	1) To secure and clear the following lands project sites	before notice of the bidding document	MPA		
5	To obtain the planning, zoning, building permit	before notice of the bidding document	MPA		
6	To submit Project Monitoring Report (with the result of Detail Design)	before preparation of bidding documents	MPA		

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the Supplier(s)	within 1 month after the signing of the contract(s)	MPA		
2	To bear the following commissions to a bank in Japan for the banking services based upon the B/A				
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	MPA		
	2) Payment commission for A/P	every payment	MPA		
3	to ensure prompt unloading and customs clearance at ports of disembarkation in recipient country and to assist the Supplier(s) with internal transportation therein	during the Project	MPA		
4	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	MPA		
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted	during the Project	MOPF		
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	MPA		
7	1) To submit Project Monitoring Report after each work under the contract(s) such as shipping, hand over, installation and operational training	within one month after completion of each work	MPA		
	2) To submit Project Monitoring Report (final)	within one month after signing of Certificate of Completion for the works under the contract(s)	MPA		
8	To submit a report concerning completion of the Project	within six months after completion of the Project	MPA		
9	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site(s)				
	1) Electricity The distributing line to the site	before start of the construction			
	2) Water Supply The city water distribution main to the site	6 months before completion of the construction			
	3) Drainage The city drainage main (for storm, sewer and others) to the site	6 months before completion of the construction			
	4) Furniture and Equipment General furniture	1 month before completion of the construction			
10	To take necessary measure for safety construction - traffic control - rope off	during the construction	MPWT		
11	To implement EMP	during the construction			

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To implement EMP	for a period based on EMP			
2	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	After completion of the construction			

2. Other obligations of the Government of Myanmar funded with the Grant

NO	Items	Deadline	Amount (Million Japanese Yen)*
1	To construct facility and provide equipment 1) To conduct the following transportation a) Marin (Air) transportation of the products from Japan to the recipient country b) Internal transportation from the port of disembarkation to the project site		
	2) To provide equipment with installation and commissioning the equipment		
2	To implement detailed design, bidding support and procurement supervision (Consulting Service)		
	Total		XXX

*The Amount is provisional. This is subject to the approval of the Government of Japan.

reference

MEMORANDUM OF TECHNICAL DISCUSSIONS ON PREPARATORY SURVEY FOR THE PROJECT FOR REHABILITATION OF VESSEL TRAFFIC NAVIGATION AID IN YANGON RIVER

The Preparatory Survey Team for the Project for Rehabilitation of Vessel Traffic Navigation Aid in Yangon River (hereinafter referred to as "the Team") held a series of technical discussions with the officials of Myanma Port Authority at 1st field survey from 28th August to the middle of September 2017. The Team also visited and carried out the field survey along the Yangon River.

Recognizing the quantities and specifications of the final components would be decided after the consultation with Myanma Port Authority and the Team, both side confirmed the items described in the attached sheets as a result of the technical discussions and 1st field survey.

Yangon, September 15th, 2017

Mr. Kazuhisa IWAMI
Chief Consultant
Preparatory Survey Team
Japan International Cooperation Agency
Japan

Mr. Aung Kyaw Htoo
Master Attendant
Myanma Port Authority
Myanmar

ATTACHMENT

1. Scope of Work

1-1. Scope of Rehabilitation

In this project, it will be carried out survey regarding the Aids to Navigation that is operating currently, lighted buoy (25 units), light house (2 units), leading light (2 units). Rehabilitation plan for securing navigational safety and for allowing the sailing in night will also be studied.

1-2. Request Summary from MPA

The Team received request from MPA as below regarding to this Project. The Team will inform to and discuss with Japanese Government and JICA. Japanese Government will decide and the Team will reply the decision of Japanese Government to MPA.

- ✓ Rehabilitation of Aids to Navigation (Lighted buoy, Lighthouse, Leading light, Sector light)
- ✓ Installation of marine observation facilities
- ✓ Procurement of bathymetric survey equipment
- ✓ Repairing of existing dredgers

2. Rehabilitation of Present Aids to Navigation

(1) Lighted Buoy

The buoy's condition is divided into two (2) categories. "Category 1" means replacement to the new buoy. "Category 2" means that the present buoy will be used continuously with maintenance and improvement function. Maintenance of present buoy will be carried out sandblasting and painting, required apparatus that is AIS and GPS will be equipped.

Category 1:	Very bad, the buoy needs to be replaced by new one Conical buoy (due to temporary setting) Buoy made by FRP (due to sinking under strong current)
Category 2:	Good, it is possible to use continuously by rehabilitation

Fig.2-1 Image of Category

The specification of the new buoy will be according to IALA standards and MPA requirement. The specifications are shown as follows.

Table 2-1 Specification of New Buoy

Diameter	3.0 m and 5.0m
Lighting apparatus	light source : LED light color : according to IALA power source : Solar battery
Buoy body	Steel or Fiber
Buoy color	according to IALA

(2) Beacon / Lighthouse

There is one (1) beacon on the along west side of Yangon river (three (3) beacon have been broken due to Cyclone Nargis in 2008). However, its condition is significantly bad and does not light, in addition pilots point out that the condition is not possible to use for navigation. It might be difficult to carry out maintenance due to geographical matter.

Basically, since it is possible to secure navigational safety if lighted buoy is installed properly, it will be supposed to install buoy in this project.

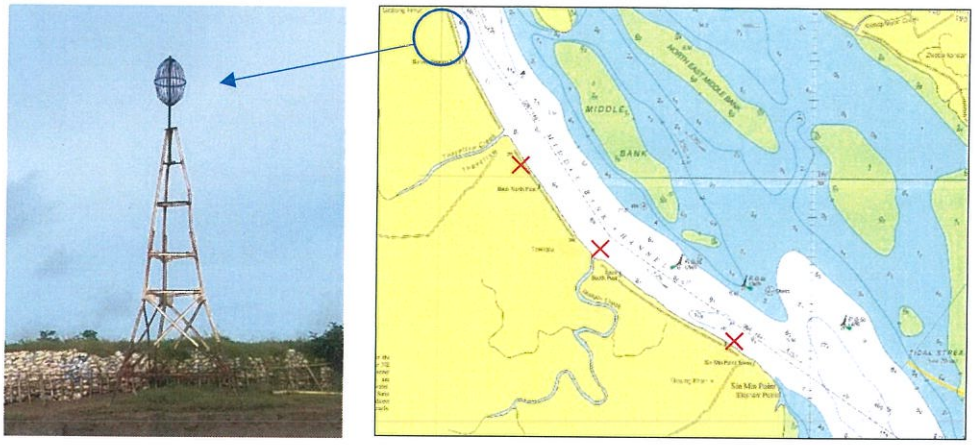


Fig.2-2 beacon on along west side of Yangon river

The lighthouse on Thante Point could be not necessary if the buoy is installed properly along the river, and some pilot said as well. However, some pilot pointed out that it is useful for some small vessel (survey ship, fishing boat etc.). Consequently, regarding maintenance of this lighthouse, it would judge based on discussion with JICA considering maintenance priority and budget.

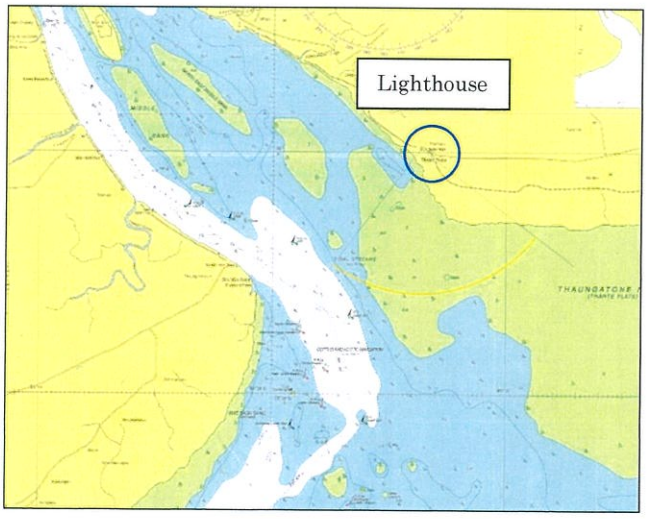


Fig.2-3 Lighthouse on Thante Point

(3) Sector light (Monkey Point)

Although the sector light on Monkey Point works properly, it is difficult to identify the light at night due to overlapping with other lights. In addition, it is not possible to confirm the green light that indicates starboard as a dangerous area due to block off by surrounding trees. Consequently, it will design higher tower than present one in order to improve identification of the light (height 15m – 18m). The sector light will be replaced with higher light intensity. It will attach the panel on tower framework or designing the pole type tower in order to improve identification of the tower in daytime.

(4) Leading light (Thanlyin Point)

The leading light on Thanlyin Point, it was not found regarding visibility at night. However, deterioration of tower is severed, it could be problem on the strength of tower. Consequently, tower replacement is depended on the maintenance priority, and light will be replaced.

3. Improving Navigational Safety

(1) Installing Additional New Buoy

New buoy will be installed in following area based on the site survey and hearing to MPA.

- Cannel from Elephant Point to Hmawun Lumps
- Around bending point

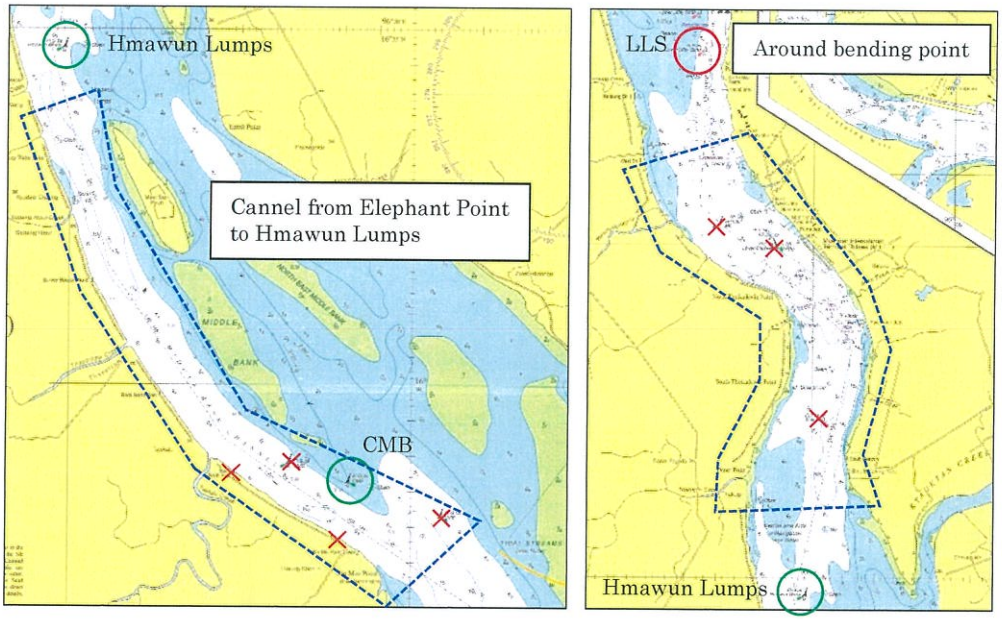


Fig.2-4 Installing Additional New Buoy

(2) Light Synchronizing

The buoys to be installed in Elephant Point and Monkey Point where maneuvering is highly difficult will be supposed synchronizing light in order to confirm the channel line easily. To do so, these buoys will be equipped GPS. Note that, the buoy that GPS is installed is judged based on the survey result.

4. Counter Measure for Theft of Buoy Equipment and Founding Functional Failure

(1) Installing AIS Transmitter

It is desirable to equip AIS on every buoys in order to confirm buoy drifting, functional failure and theft. Since it is impossible to connect AIS to current lantern, it has to replace

lantern. The big size buoys with AIS are needed to install the important and difficulty point in Yangon River. This installation priority could be high.

Eventually the buoy that AIS is installed will be judged based on MPA request and discussion with JICA considering the maintenance priority and the budget.

(2) Installing VTS

Although the VTS is necessary to build tower and installing some facilities (Radar, AIS, VHF, Camera etc.). In addition, it is essential training VTS operator as well.

Currently, more than 1,000GT vessel operated by pilot is managed to contact with each pilot with VHF to avoid encounter with other vessel in dangerous area. Although the amount of the handling cargo and entering ship is increasing year after year, it is considered possible to secure the navigational safety by controlling by each pilot in the current situation in Yangon.

According to the above mentioned facts and MPA's priority requirement, although ship's traffic control with VTS would be necessary in order to adapt to increasing number of the vessel and upsizing according to development Yangon Port, it will prioritize rehabilitation of Aids to Navigation (AtoN) that is required maintenance in urgent in this project.

5. Marine Observation Facilities

MPA has one manual tide gauge at monkey Point and observe for day time only. There are four candidate points for the marine observation facilities.

- Monkey Point
- Thilawa Area Port (Plot No.25, under construction by ODA Fund)
- Elephant Point
- Pilot Station (under design by MPA own fund)

The Team visit and confirmed with MPA for the exact candidate points of Monkey Point and Elephant Point. The Team will study the numbers of installation and specifications of facilities in Japan.

6. Bathymetric survey equipment

MPA requested the modernize bathymetric survey equipment of echo sounder, and software of hydrographic survey data collection and processing and other related equipment. MPA does not have the equipment and it is useful for the operation and maintenance of AtoN.

7. Repairing of Existing Dredgers

MPA owns four dredgers for the maintenance dredging at Yangon River Channel. Among them, two dredgers were made in Japan in 1998. MPA requested the repairing and upgrading of the existing two Japan made dredgers.

8. Soft-component Training

MPA requested Soft-component training at the same timing of installation of AtoN in order to operate and maintain AtoN facilities to be provided in the Project properly and orderly.

The training as the Soft-component will be conducted in accordance with the model course recommended by the IALA's recommendation E-141 which, among other things, includes subjects of:

(1) Technical knowledge and technique of AtoN
(2) Operation and maintenance of AtoN
(3) Set up of an organization and/or back up system which enables operation and maintenance of AtoN effectively and efficiency

reference

Minutes of Discussions
on the Preparatory Survey for the Project for
Rehabilitation of Vessel Traffic Navigation Aid in Yangon River
(Explanation on Draft Preparatory Survey Report)

With reference to the minutes of discussions signed between the Myanma Port Authority (hereinafter referred to as "MPA"), the Ministry of Transport and Communications (hereinafter referred to as "MOTC"), the Government of Myanmar (hereinafter referred to as "Myanmar") and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on 1 September, 2017 and in response to the request from Myanmar dated 10 January 2018, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for Rehabilitation of Vessel Traffic Navigation Aid in Yangon River (hereinafter referred to as "the Project").

As a result of the discussions, both sides agreed on the main items described in the attached sheets.

Yangon, 20 December, 2018

Satoshi Umenaga	U Ni Aung
Leader	Managing Director
Preparatory Survey Team	Myanma Port Authority
Japan International Cooperation Agency	Ministry of Transport and Communications
Japan	Republic of the Union of Myanmar

ATTACHEMENT

1. Objective of the Project, Title of the Preparatory Survey, Project site, Procedures and Basic Principles of Japanese Grant, and Environmental and Social Considerations

   Both sides confirmed the above-captioned subjects unchanged from those agreed in the Minutes of Discussions signed on 1 September 2017.

2. Contents of the Draft Report

   After the explanation of the contents of the Draft Report by the Team, the Myanmar side agreed to its contents.

3. Cost estimate

   Both sides confirmed that the cost estimate including the contingency explained by the Team is provisional and will be examined further by the Government of Japan for its approval. The contingency would cover the additional cost against natural disaster, unexpected natural conditions, etc.

4. Confidentiality of the cost estimate and technical specifications

   Both sides confirmed that the cost estimate and technical specifications of the Project should never be disclosed to any third parties until all the contracts under the Project are concluded. The Preparatory Survey Report from which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey.

5. Timeline for the project implementation

   The Team explained to the Myanmar side that the expected timeline for the project implementation is as attached in Annex 1. The Team also explained to the Myanmer side that the timeline is tentative and the project will be started after the approval by the Japanese Cabinet and conclusion of E/N and G/A.

6. Expected outcomes and indicators

   Both sides agreed that key indicators for expected outcomes are as follows. The Myanmar side will be responsible for the achievement of agreed key indicators targeted in year 2024 and shall monitor the progress based on those indicators.

[Quantitative indicators]

Indicators	Baseline Value (Year 2016)	Target Value (Year 2024) 3 years after completion of the Project
Container ship calls in Yangon port (ship/year)	850	1300
Handling volume of contenarized cargo in Yangon port (TEU/year)	1,026,216	2,000,000

[Qualitative indicators]

- Invigoration of trade
- Securing the safty of navigation to Yangon Port
- Improving the efficiency of logistics

7. Technical assistance ("Soft Component" of the Project)

Considering the sustainable operation and maintenance of the products and services granted through the Project, following technical assistance is planned under the Project. The Myanmar side confirmed to deploy necessary number of counterparts who are appropriate and competent in terms of its purpose of the technical assistance as described in the Draft Report.

1) Technical training (theoretical study and practical training) on Aids to Navigation
2) Group work and/or discussion on organizaition and back up system for effective and efficient implementation of Aids to Navigation provision service
3) Support to develop "Aids to Navigation manuals" and "Check and Maintenance manual"
4) Training on tbe hydrographic or meteorological observation

8. Undertakings of the Project

Both sides confirmed the undertakings of the Project as described in Annex 2. With regard to exemption of customs duties, internal taxes and other fiscal levies as stipulated in (2)-6 of Annex 2, both sides confirmed that such customs duties, internal taxes and other fiscal levies include, commercial tax, income tax and corporate tax, which shall be clarified in the bid documents by MPA with the prior approval of MOPF in accordance with the existant taxation laws, Custom Acts and the relevant Rules, Regulations and Notifications of MOPF during the implementation stage of the Project.

The Myanmar side assured to take the necessary measures and coordination including allocation of the necessary budget which are preconditions of implementation of the Project. It is further agreed that the costs are indicative, i.e. at Outline Design level. More accurate costs will be calculated at the Detailed Design stage.

Both sides also confirmed that the Annex 2 will be used as an attachment of G/A.

9. Monitoring during the implementation

The Project will be monitored by the Executing Agency (MPA) and reported to JICA by using the form of Project Monitoring Report (PMR) attached as Annex 3. The timing of submission of the PMR is described in Annex 2.

10. Project completion

Both sides confirmed that the Project completes when all the equipment procured and installed properly by the grant are in operation, and planned support activities are completed. The completion of the Project will be reported to JICA promptly, but in any event not later than six (6) months after completion of the Project.

11. Ex-Post Evaluation

JICA will conduct ex-post evaluation after three (3) years from the project completion, in principle, with respect to five evaluation criteria (Relevance, Effectiveness, Efficiency, Impact, Sustainability). The result of the evaluation will be publicized. The Myanmar side is required to provide necessary support for the data collection.

12. Schedule of the Study

Myanmar side agreed that further comments on the Draft Report will be submitted in written form to JICA Myanmar Office no later than 15th of January, 2019. The Team will finalize the Preparatory Survey Report by incorporating the further comments submitted. The report will be sent to the Myanmar side in March 2019.

13. Other Relevant Issues

13-1. Disclosure of Information

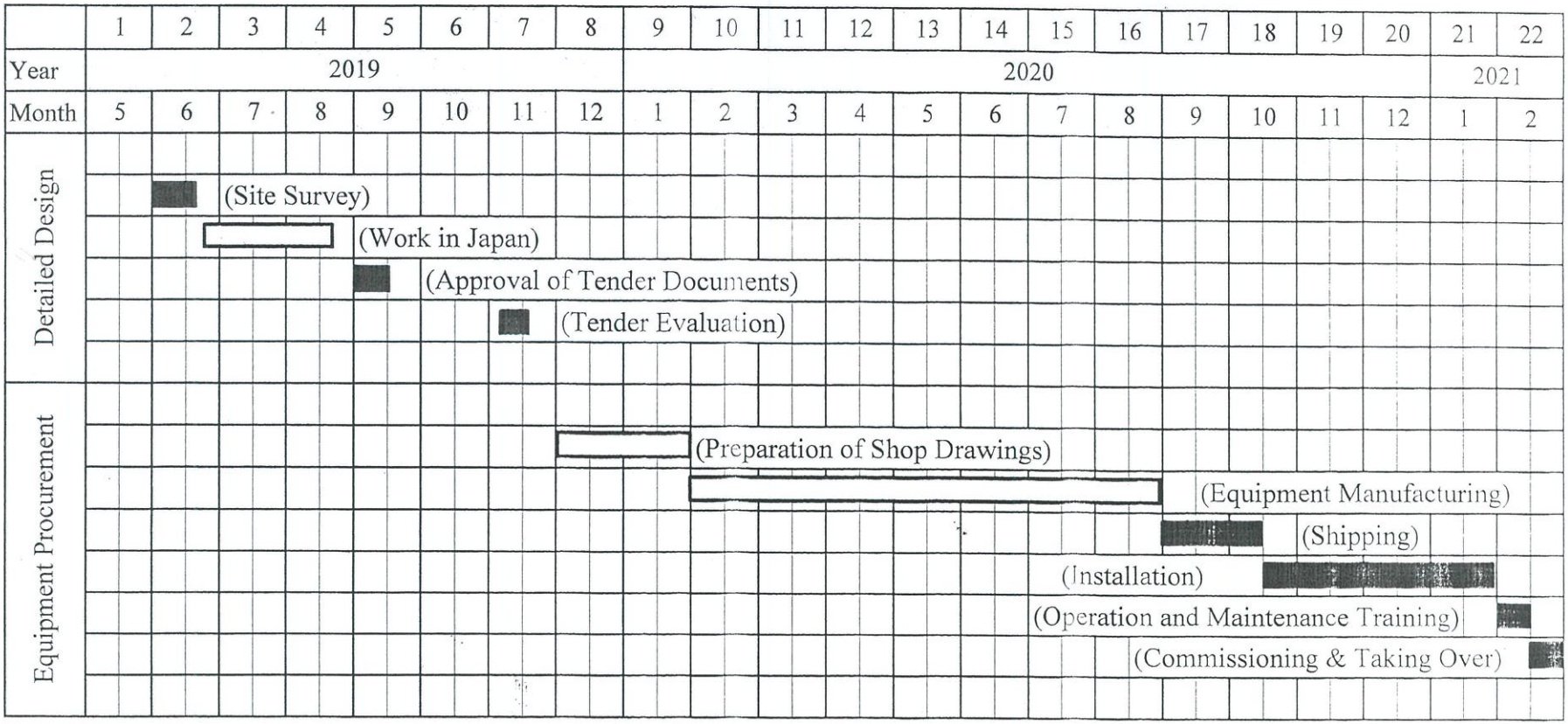
Both sides confirmed that the Preparatory Survey Report from which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey. The comprehensive report including the project cost will be disclosed to

the public after all the contracts under the Project are concluded.

Annex 1 Project Implementation Schedule
Annex 2 Major Undertakings to be taken by the Government of Myanmer.
Annex 3 Project Monitoring Report (template)

Annex-1

Project Implementation Schedule



Annex-2

Major Undertakings to be taken by the Government of Myanmar

1. Specific obligations of the Government of Myanmar which will not be funded with the Grant

(1) Before the Tender

NO	Items	Deadline	In charge	Estimated Cost (Thousand USD)	Ref.
1	To open bank account (B/A)	within 1 month after the signing of the G/A	Ministry of Planning and Finance (MOPF)	-	
2	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the consultant	within 1 month after the signing of the contract	Myanmar Port Authority (MPA)	-	
3	To provide the latest information about the navigation aids 1) location maps of the navigation aids 2) situation of the navigation aids	within 1 month after the signing of the contract	MPA	-	
4	To secure and clear the following lands project sites 1) project sites to construct and install new equipment 2) temporary storage near the project site	before notice of the bidding document	MPA	180	
5	To obtain the entering and constructing permission in the project site	before notice of the bidding document	MPA	-	
6	To submit Project Monitoring Report (with the result of Detail Design)	before preparation of bidding documents	MPA	-	
7	To assign the necessary staffs to the project team for smooth implementation of installation, adjustment, commissioning, initial operation instruction, operation guidance, acceptance, delivery, training, etc.	By the signing of the contract(s) to the Supplier(s)	MPA	-	
8	To make budgetary arrangement necessary for disbursement of the Grant as well as for implementation of undertakings by the Myanmar side	By the beginning of fiscal year 2019/2020	MPA		

(B/A: Banking Arrangement, A/P: Authorization to pay)

(2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost (Thousand USD)	Ref.
1	To issue A/P to a bank in Japan (the Agent Bank) for the payment to the Supplier(s)	within 1 month after the signing of the contract(s)	MPA	-	
2	To bear the following commissions to a bank in Japan for the banking services based upon the B/A			-	
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	MPA	-	
	2) Payment commission for A/P	every payment	MPA	13	
3	To make budgetary arrangement necessary for disbursement of the Grant as well as for implementation of undertakings by the Myanmar side	By the beginning of each fiscal year	MPA		
4	To ensure prompt unloading and customs clearance at ports of disembarkation in recipient country and to assist the Supplier(s) with internal transportation therein	during the Project	MPA	-	
5	To accord Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	MPA	-	
6	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted	during the Project	MOPF	-	
7	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project, except for the responsibility under the contract of the contractor / equipment supplier.	during the Project	MPA	-	
8	To obtain the permission and allow the Supplier(s) to enter, construct and install equipment in the project site	during the Project	MPA	-	
9	To obtain the permission and allow the Supplier(s) to construct temporary structure for the storage for buoys and materials	during the Project	MPA	-	
10	To submit Environmental Management Plan (EMP) to Ministry of Natural Recourses and Environmental Conservation (MONREC)	before start of the construction/ installation	MPA	-	
11	To relocate and/or remove the existing equipment to clear the following lands project sites 1) project sites to construct and install new equipment 2) temporary storage near the project site	before start of the construction/ installation	MPA	-	
12	To provide facilities for distribution of electricity required for installation, adjustment and acceptance inspection of equipment and training	before start of the construction/ installation	MPA	-	
13	To secure a radio frequency band and obtain the permission required for transmission and reception of the AIS data of navigation aids and observation data of the meteorological and oceanographic observation stations	before start of the construction/ installation	MPA	-	
14	To secure the display place for the meteorological and oceanographic observation data in the headquarters of MPA	before start of the construction/ installation	MPA	-	
15	To take necessary measure for safety construction and installation 1) Traffic control 2) Rope off 3) Dissemination of the safety information to the sailing vessels during the installation and removal of buoys	during the construction/ installation	MPA	-	

16	To dispose replaced navigation aids after installation of new navigation aids	during the construction/ installation	MPA	-	
17	1) To submit Project Monitoring Report after each work under the contract(s) such as shipping, hand over, installation and operational training	within one month after completion of each work	MPA	-	
	2) To submit Project Monitoring Report (final)	within one month after signing of Certificate of Completion for the works under the contract(s)	MPA	-	
18	To submit a report concerning completion of the Project	within six months after completion of the Project	MPA	-	

(3) After the Project

NO	Items	Deadline	In charge	Estimated Cost (Thousand USD)	Ref.
1	To maintain, and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection 4) Power supply for maintenance and operation of equipment	After completion of the construction	MPA		
2	To store the meteorological and oceanographic data	After completion of the construction	MPA		

2. Other obligations of the Government of Myanmar funded with the Grant

NO	Items	Deadline	Amount (Million Japanese Yen)*
1	To construct facility and provide equipment 1) To conduct the following transportation a) Marin (Air) transportation of the products from Japan to the recipient country b) Internal transportation from the port of disembarkation to the project site		
	2) To provide equipment with installation and commissioning the equipment		
2	To implement detailed design, bidding support and procurement supervision (Consulting Service)		
3	Contingencies		
	Total		

This Page is closed due to the confidenciality.

*The Amount is provisional. This is subject to the approval of the Government of Japan.

Myanma Port Authority

THE PREPARATORY SURVEY
FOR
THE PROJECT FOR
REHABILITATION OF VESSEL TRAFFIC NAVIGATION AID IN YANGON RIVER
IN
THE REPUBLIC OF THE UNION OF MYANMAR
(ADDITIONAL SURVEY)

Soft Component Plan

February 2020

NIPPON KOEI CO., LTD.
JAPAN MARINE SCIENCE INC.

Table of Contents

Page

1. Background of the Project

About 60km of the navigational channel to the Yangon Port from the estuary of Yangon River in the Republic of the Union of Myanmar (hereinafter referred to as Myanmar) is narrow passage, and sandbank and sallow water exisiting in the vicinity. Because of this, the area has risk of navigation and marine incident such as collision and grounding ocurres frequently. In addition, accessing to Yangon Port is limited once a day of daytime with high tide, due to vessels needs to pass near two shallow water and poor quality and quantity of navigational aids along passage, and this limitation is bottleneck of the port operation.

Under these circumstances, to promote efficient domestic and international logistics, the Government of Myanmar placed the project of rehabilitation of navigational aids along Yangon River Channel as important task and requested Japanese Government to cooperate of these maintenances. To respond to the request, Japanese Government decided Grant Aid and planned "The Project For Rehabilitation of Vessel Traffic Navigation Aid in Yangon River in The Republic of the Union of Myanmar" (hereinafter referred to as “the Project”) for rehabilitation of navigational aids along access channel to Yangon Port. The location of navigation aids of rehabilitation plan is shown in Attachment 1.

However, Myanma Port Authority (hereinafter referred to as "MPA") which has respobilitiy of managing navigational aids had not organized and provided staff training plans, beause of difficulty of staffing experts for navigational aids. Also, the IALA (International Route Traffic Association) had not provided as well. Therefore, the maintenance and operation had conducted by staffs who trained by OJT. For this reson, the staffs who assinged navigational aids maintenenances dosn't know the importance of transmiting information from navigational aids such as lamp color, light quality, light intensity and light reach distance. Also, importance of maintaining these transmiting information same condition as notifyed to the public was not known. Furthermore, their maintainance skill was unsfficient. Several navigation aids were operated in a state where the lighting quality, paint color and head mark were different from noticed information.

It is necessary to implement soft component as start-up support to improve the technical capabilities of MPA staff in order that navigation aids maintained by Japanese Grant aid kept functions normally such as light quality and are operated sustainably and properly. Specifically, improvement of management and maintenance technological ability to properly management of navigation aids, formulation of operational guidelines such as inspection and maintenance manual for smooth and effective implementation of navigation aids, maintenance of suitable system against accidents such as extinction of the lights, improvement of capability for the rearrangement of navigation aids due to changing of navigational passage caused by sedimentation, and improvement of utilization techniques of acquisition of meteorological and hydrographic observation technology and collected data of maritime traffic safety measure. Furthermore, it is expected to create the environment such as implementation of training program and promotion of self-help efforts towards implementation since the importance of personnel development is recognized by MPA. Therefore, it is necessary to implement soft components.

2. Soft Component Purpose

This soft component provided by Japanese Grant Aid is planned as practical training that containing nessesary knowlage and techniques, for the checking, maintenance, managing, operation of the

navigational aids appropriatly, weather observation and usage of collected hydrographic and meteorological data.

In implementing the soft component, the achievements, in considering the objectives and sustainability of Japan's Grant Aids, are to be set as follows:

(1) Fundamental knowledge of navigation aids, specifically such knowledge of navigation aids' notified information to mariners as paint color, shape, light intensity, visible range and light character will be understood. As well as importance of keeping operation of navigation aids properly by maintaining appropriately will also be understood. At the same time, system composition of power supply and functions of lighting equipment will also be learned. Checking, maintenance and operation techniques will also be included in the training subjects.
(2) Training syllabus and text book will be prepared and made available which can be used for MPA' own training to be organized in the future.

3. Expected Achievement of Soft Component

Achievements that can be expected to attain, are as stated in the following.

3.1 Purpose

Safety and efficiency of ships navigation in the Yangon River will be strengthen and it becomes possible for ships to navigate during night time.

3.2 Expected Achievement

Fundamental knowledge of navigation aids (role, necessity, function, international regulation/standard etc.) and technique needs to administrate, operate and maintain navigation aids will be understood by MPA personnel. Then, it is expected that this leads to the appropriate maintenance of navigation aids. In addition, knowledge and principles of the meteorology and hydrography will be understood. Data interpretation techniques will also be learned, and this could contribute to the safety of ships navigation. After the training, trainees could rightly deal with the following navigation aids duties.

(1) Understand checking items and methods necessary for proper administration of navigation aids. Operation of navigation aids on international standard will then be made possible.
(2) Understand necessities of job instructions or manuals such as operation manuals, checking/maintenance manuals, light lists and other documents. Preparation work of such documents will be begun.
(3) Be able to monitor operation condition of navigation aids continuously so that prompt response to emergency situation, ships' collision etc., could then be made possible.
(4) Be able to work on relocation plan of navigation aids placement at sea in accordance with resetting or change of traffic lanes required due to accumulation of sands or dredging works.
(5) Get familiar with knowledge of meteorology and hydrography, specifically data collection and interpretation as well as ways of calculation of wave occurrence probability based on the wind

velocity and direction. Trainees will be able to avail data for forecasting weather and tide level, thus contributing to sailing safety.

4. Identification Method of Expected Achievement

The expected achievement of soft component that can be identified method, are as stated in the following.

(1) Identification of understanding of trainees about meteorology and hydrography technique level of acquisition through evaluation exam and questionnaire.

(2) Identification of correspondence regarding to the question of countermeasures to trainee about correspondence of theme/case of trainee and case study for processing capacity such as how to correspond in case of reporting light off from pilot.

(3) Understanding the necessity of navigation aids manuals and inspection and maintenance guidelines.

(4) Then starting document preparation.

(5) Identifying whether MPA start formulation work of resume or handbook or not.

(6) Meteorological and hydrographic data is utilized navigation aids work or safety of ships navigation. Then inquiring and identifying with MPA.

5. Activity of Soft Component (Introduction Plan)

Introduction plan of Japanese side and Myanmar side are stated in the following.

Table1 Introduction Plan

<table>
<tr><td colspan="2">Expected achievement by introducing soft component</td></tr>
<tr><td colspan="2">(1) Acquiring knowledge of navigation aids and maintenance/administration technique and operating properly administrated navigation aids.
(2) Acquiring knowledge of meteorology and hydrography and decording technique of observation data and utilizing properly navigation aids work and sailing safety work.
(3) Developing human resources who are familiar with navigation aids and meteorology and hydrography.</td></tr>
<tr><td colspan="2">1. Activities that lead to expected achievements</td></tr>
<tr><td>Necessary technique /industry type</td><td>■Japanese side
Teaching technique and knowledge needed for conducting navigation aids work and meteorological and hydrographic observation. Formulating curriculum for it and conducting training. (Outline of the training supposed at this time are stated in “3 training”.)

■Myanmar side
Dispatching 25 navigation aids trainees. (Breakdown of trainee are stated in “3 training”.)</td></tr>
<tr><td>The present technical standards/Technical standards to be required</td><td>■Current situation
Lacking knowledge about navigation aids such as role, function, arrangement and international standard and maintenance/administration technique. Therefore, navigation aids are not maintained properly. (Several navigation aids are operated in the undesirable state such as those which the paint color can not be identified by breaking form or peeling paint due not to recognize necessity and importance for keeping function of navigation aids and the light quality is different from notification matter.)

■Plan
Recognizing contribution of channel safety of vessel including ocean going vessel by understanding basic knowledge regarding navigation aids.
Furthermore, expecting decrease of incident situation rate and extension of durability year of navigation aids introduced at this project by understanding importance of maintenance regularly and basic of maintenance technique.
In addition, expecting budget reduction by planned supply by understanding necessity of future plan and basic knowledge of channel plan.</td></tr>
</table>

Subject	■Subject：25 navigation aids personnel of MPA 25persons (Working level) ■Breakdown：Light House Office (1 person), Light House Engineer (4 persons), Light House Department (5 persons), Survey Department (5 persons), Buy Tender Relevant(Crew 5 persons, Mooring Officer 5 persons) *Assuming participation of all 25 persons. However, deciding by discussing with MPA in case of requesting participation of specific field. Plan for making time to exchange the views and discuss with training participants and identifying understanding level of training participants. Furthermore, trainee with lacking understanding and trainee without participation is followed by internal training held by Public Assistance Administrators because Light House officer participate. ■Requirement from the other party 25 persons expect participation from MPA. The organization of them and administration are difficult as above. Therefore, requested to give consideration not to obstruct work during training by MPA.

2. Implemental method => Outdoor practical training such as lecture and sign inspection.	
Implemental resource	■Japanese side burden matter：Japanese engineer 3 persons (The person who is familiar with the field of navigation aids and meteorology and hydrography) 5MM in total 1. Domestic work Breakdown of 2.5MM are stated below (1) Technique (Equipment, Buoy, Maintenance) Information gathering Information gathering to Japan Coast Guard (central government office) (3 charges) 3 days Information gathering to Japan Coast Guard (office) (2 place) 2 days Information gathering to Japan Coast Guard (base of buoy) 1 day Information gathering to maker (2 companies) 2 days Information gathering by Internet 1 day Preparation of teaching materials 200pages 20 days 29 days in total 1.45MM (2) Plan, Operation, Rule Information gathering Information gathering to Japan Coast Guard (central government office) 2 days Information gathering to Japan Coast Guard (headquarters)1 day Information gathering to Japan Coast Guard (office) (2 place) 2 days Information gathering by Internet 2 days Preparation of teaching materials 50 pages 5 days 12 days in total 0.6 MM (3) Meteorology and hydrography Information gathering to Meteorological Agency 2 days Information gathering to Japan Coast Guard (Hydrographic and Oceanographic Department) 1 day Information gathering by Internet 1 day Preparation of teaching materials 50 pages 5 days Total 9 days 0.45 MM 2. Breakdown of 2.5MM field work are stated in schedule ■Myanmar side burden matter：Providing the training facility and equipment
Deliverables	■Japanese side Resume of training text, the duties reference materials of administrated navigation aids manuals and guideline (Details are stated in Deliverables of Soft Component)

3. Training	
General	Soft component is contents based on model course which IALA (International Association of Marine and Lighthouse Authority) urge as a guidance for personnel development and IALA E-141(Model Course for Navigation Aids Training) since knowledge and technology are required to manage appropriately the navigation aids as qualification requirements of the Navigation Aids personnel is required (In the recommendation, the fields of training are classified according to a module as follows). Most of navigation aids administrated by MPA are installed in the Yangon River and operated under the severe natural condition of forceful tide current. Therefore, planed the practical training corresponding to the fact as setup support. The purpose of this training is that trainees acquire knowledge and the technology of the Navigation Aids and achieve the worker level of management and operation of Navigation buoys maintained by official method and procedure and qualified accomplishment of duties to affect the meteorology and hydrography.
Training field	Training of field planed the training is stated as follows. In addition, the items which are referred an underline shows a training item to carry out priority depending on actual circumstance of navigation aids administrated by MPA. (1) The technical training of navigation aids (lecture, training) Module 1: Introduction of navigation aids (Navigation Aids knowledge), classification of the navigation aids, use form/use range depending on the ship, communication tools (quality of installation, painting, light color and quality), SOLAS agreement and international rule of the marine buoy Module 2: Source of light (power supply), solar battery system Module 3: A light and light device, the characteristic of the emphasis style buoy, deterioration of the visibility and countermeasure by circulation of the light, wide emission angle type light device Module 4: Painting and coating, necessity of frequent maintenance of buoy by The deterioration of painting, abrasion of the chain Module 5: Vessel of Navigation Aids (Buoy tending vessels, patrol vessel) Module 6: Radar beacon Module 7: AIS Module 8: Radio signal and satellite navigation system, GPS navigation, GPS system with synchronizer Module 9: Remote monitoring/control, remote monitoring system of Navigation Aids by the AIS Module 10: Structure, materials and maintenance (2) The backup system for effective and efficient navigation aids duties to accomplishment (including the technology succession and the personnel training), the way of the organization (group work and discussion). (3) Navigation aids hand book, development preparations for duty guidance such as checking maintenance manuals (group work and discussion). (4) Basic knowledge of the meteorology and hydrography and analysis of an observation technology and observation data and utilization (relations of a tide level, tide prediction, atmospheric pressure and the weather)

6. Method for Implementation Resources of Soft Component

In Myanmar, it is difficult to secure human resources which have specialized knowledge, experience and skill of navigation aids or meteorologic/hydrographic field. Regarding to implementation resources, planning to dispatch instructors from consultant engaged in preparatory investigation.

The instructor schedules the following three technicians familiar with each field.

(1) Instructor of Technical (equipment, buoy, maintenance)

Those familiar with navigation aids system/equipment, buoy work and technology and have known how to implement this training.

The responsible field shall be set as follows.

- ✓ System of navigation buoy and land signs(sector light, transit light, and lighthouse)and equipment(lighting instrument、electric switch、power)
- ✓ AIS and GPS

- ✓ Inspection and Maintenance of navigation buoys and Land signs.

(2) Instructor of Plan, Operation and, Rule

Those familiar with formulation of navigation aids work, in particular law about navigation aids, rule and manual of regulation documents and have known how to implement this training.

The responsible field shall be set as follows.

- ✓ International treaty such as SOLAS, recommendation/guideline issued by IALA
- ✓ Formulation preparation of work guideline document(administrated navigation aids handbook((name of navigation aids ,announcement to user (location、details of light quality))and reference documents listed career etc.)) and inspection and maintenance manual

(3) Instructor of Meteorology and Hydrography

Those familiar with meteorology and hydrography field and those who have known how to implement this training.

The responsible field shall be set as follows.

- ✓ Overview of meteorology (air temperature, quantity of rain, humidity, wind direction, wind speed, sunshine) and hydrographic phenomena (tide level)
- ✓ Observation of meteorology/tidal current, interpretation of data and activation method

7. Implemental Schedule of Soft Component

Implemental schedule of soft-component and project are stated in table2 of attachment 2. Dispatching plan (M/M) are stated in table 3 of attachment 2. Survey dates are stated in table 4 of attachment 2.

8. Deliverables of Soft Component

Deliverables of soft-component shall be set as follows.

8.1 Documents to Myanmar

(1) Final Report of Soft Component

(2) textbook for education

8.2 Documents to Japan

(1) Report of soft-component

- ✓ Initial purpose and achievement
- ✓ Initial investment and implementation situation of activity
- ✓ Current achievements
- ✓ Comment from Myanmar

(2) Completion report of Soft-component

- ✓ Project outline
- ✓ Soft component outline
- ✓ Future tasks and recommendations to develop/sustain effect and achieve goal
  - ➢ Attachment (implementation schedule, list of participants of other country, attendance for training, list of deliverables)
  - ➢ Attachment reference material ((deliverables settlement sheet to Myanmar, used textbook, test/questionnaire result after training and midterm, others (pictures etc.))

9. Outline project Cost of Soft Components

Cost is closed due to the confidenciaity.

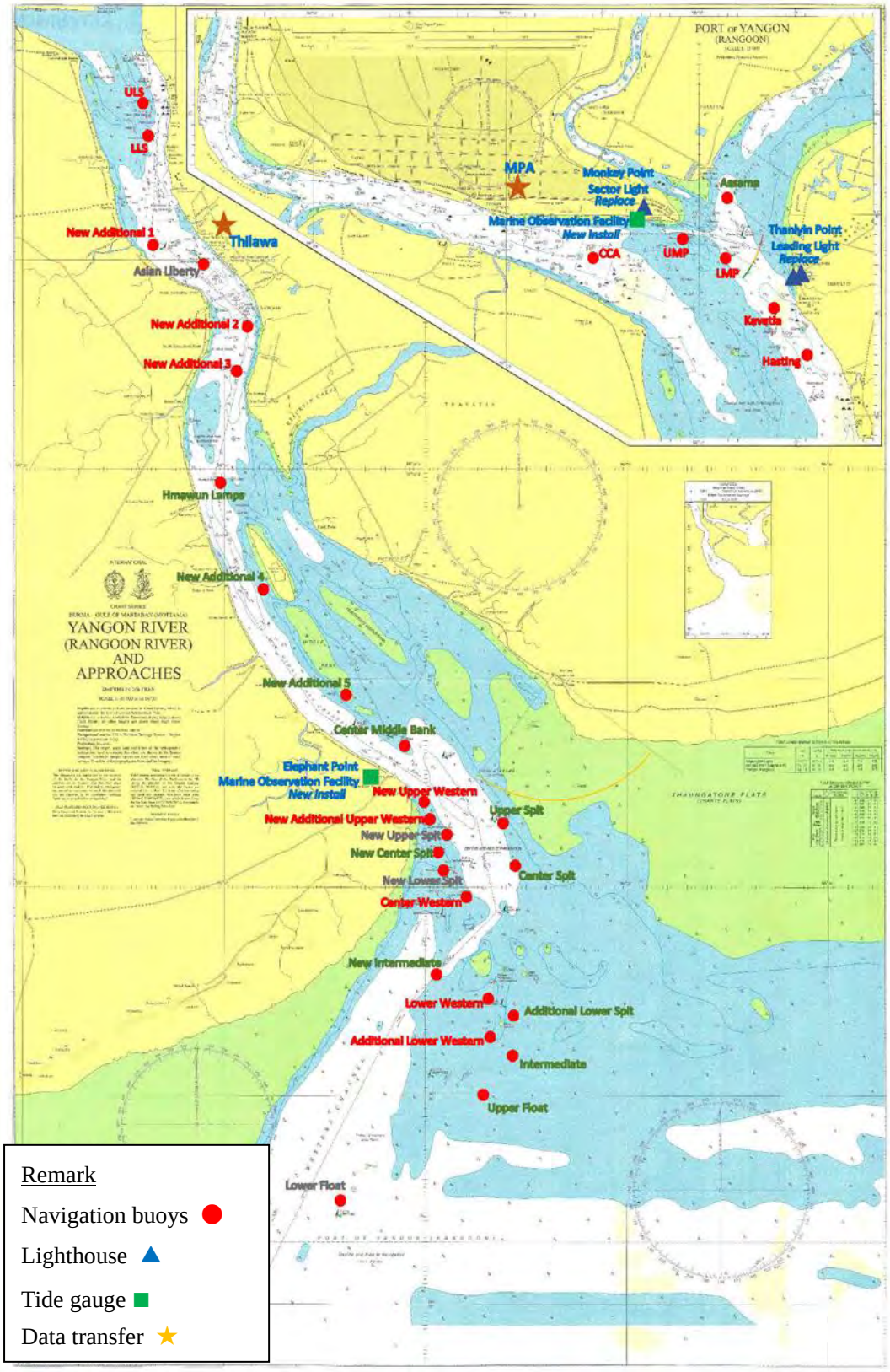
10. Responsibility of the Receipient Country

As responsibility of the partner country side, there are burden on expenses for the following matters.

(1) Providing necessary facilities for training (training place, providing facilities /equipment)

(2) Expenses required for dispatching and staying trainees

Attachment 1：Location Map for Navigation Aids



Source：JICA team

Figure 1 Location Map for Navigation Aids

Attachment 2：Work Schedule

Table 2 Soft Components Work Schedule

		1	2	3	4	5
1	Instruction of Technique (Equipment, Buoy, Maintenance)	Japan 1.45MM		Myanmar 1.50MM		
2	Instruction of Plan, Operation, Rule		Japan 0.60MM		Myanmar 0.50MM	
3	Instruction of Meteorology and hydrography		Japan 0.45MM		Myanmar 0.50MM	
Work in Myanmar					2.0months	

Work in Japan

Work in Myanmar

Attachment 6

Outline Design Drawing

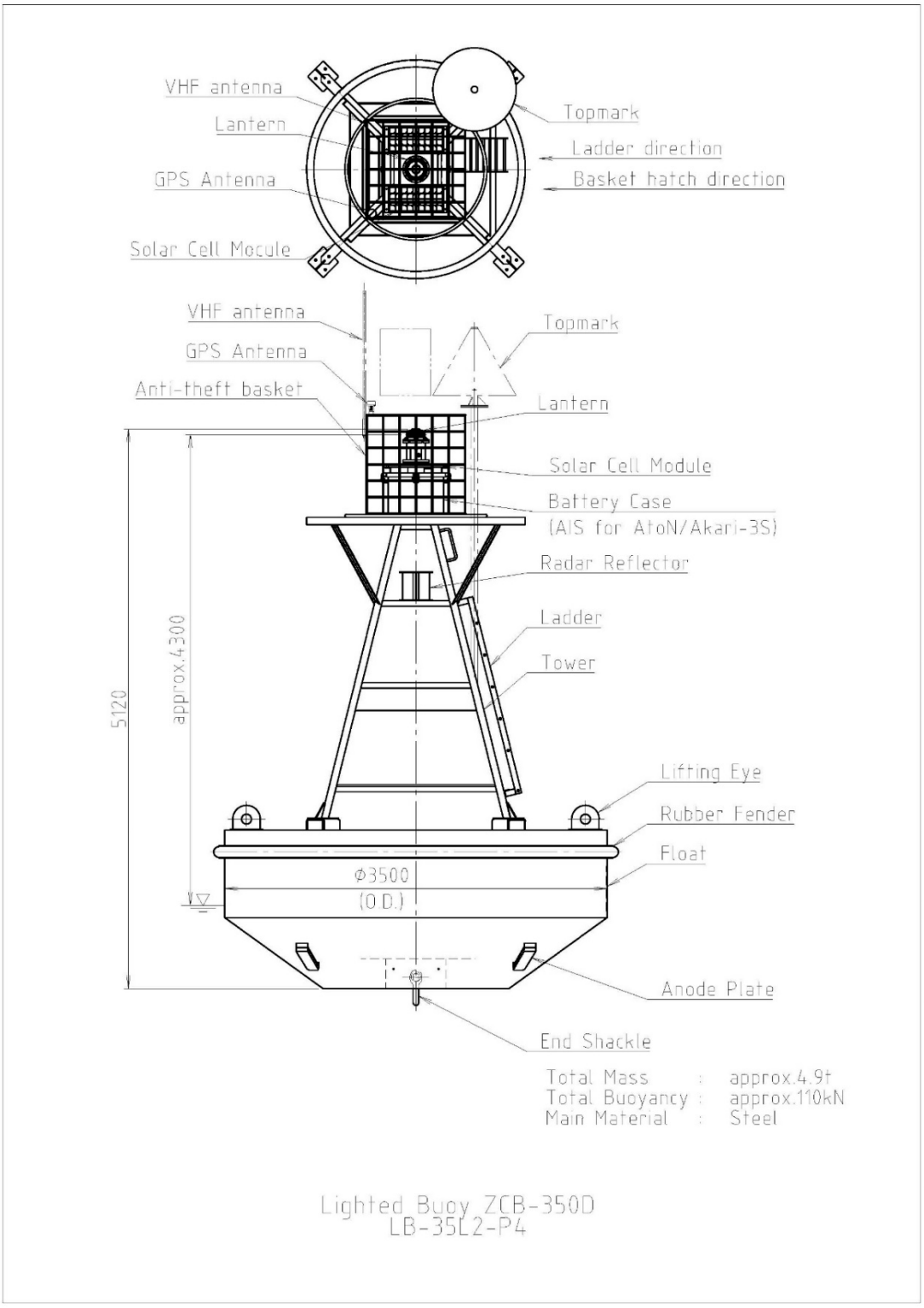
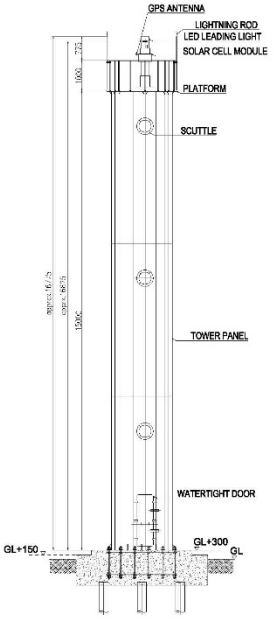
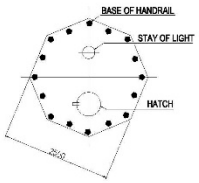


Figure 1 Navigation Buoy (Item Number 1)

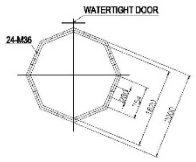
SECTOR LIGHT TOWER AT MONKEY POINT



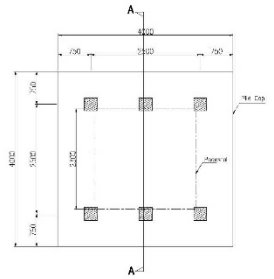
LIGHT HOUSE ELEVATION



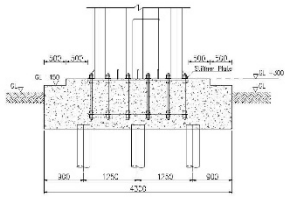
TOP VIEW



BOTTOM VIEW

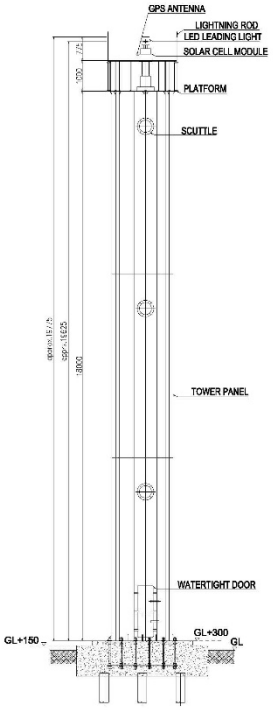


PLAN

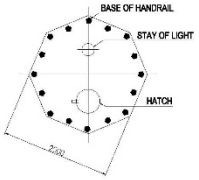


SECTION A-A

LEADING LIGHT TOWER (FRONT) AT TANLYIN POINT

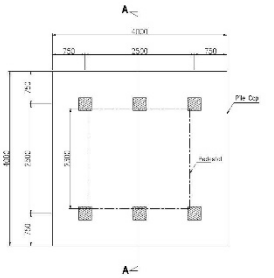


LIGHT HOUSE ELEVATION

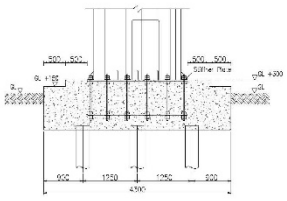


TOP VIEW

BOTTOM VIEW



PLAN



SECTION A-A

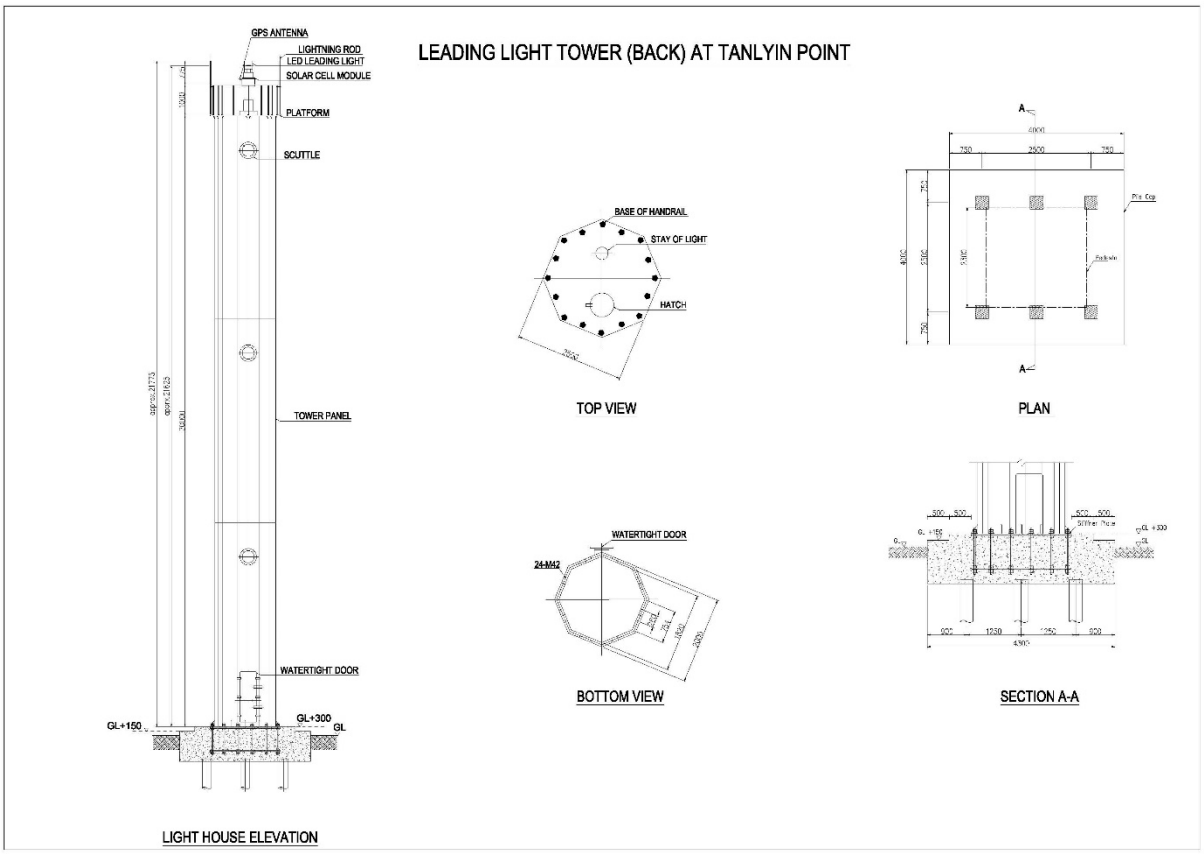


Figure 2 Light Tower (Item Number 3)

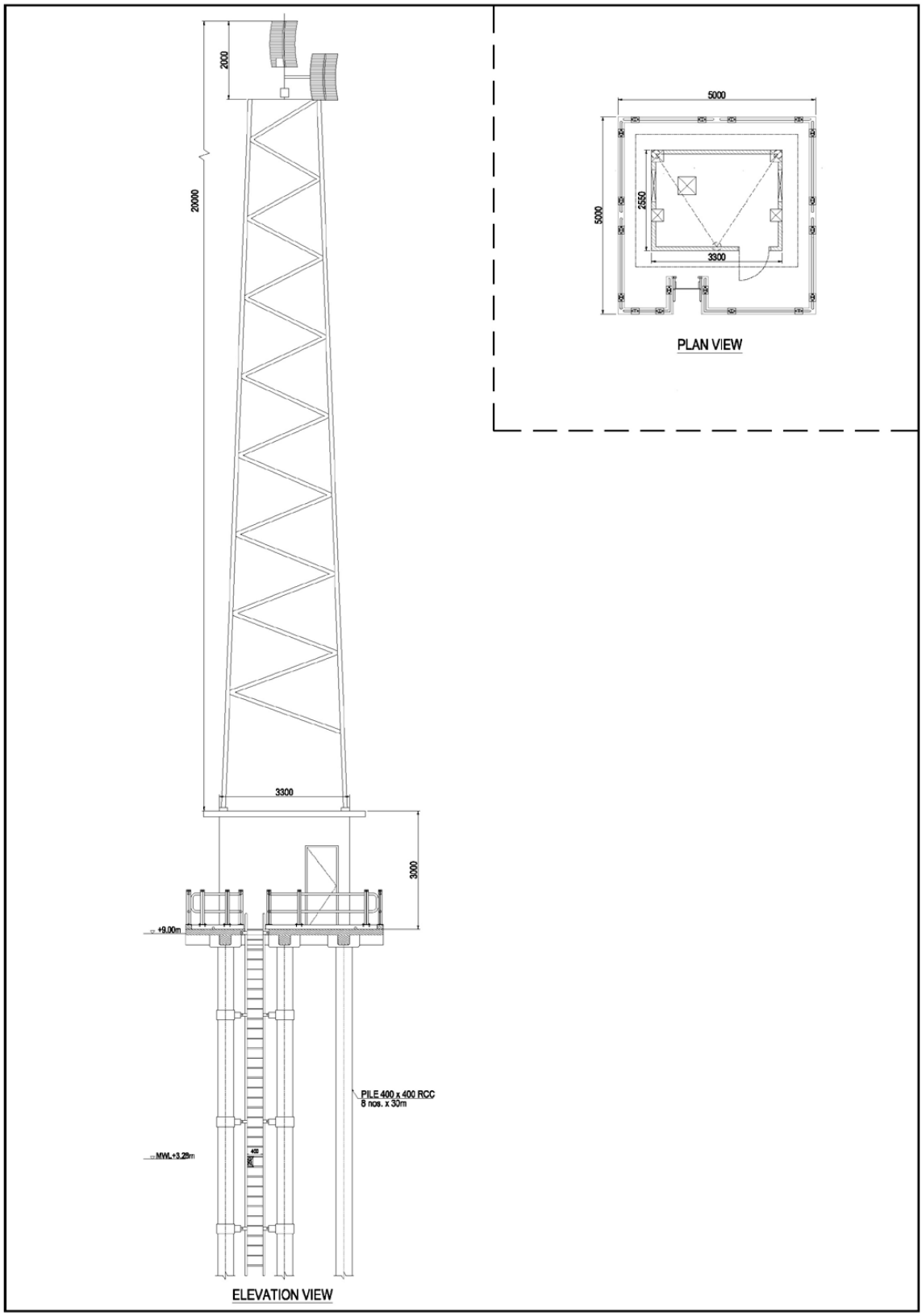
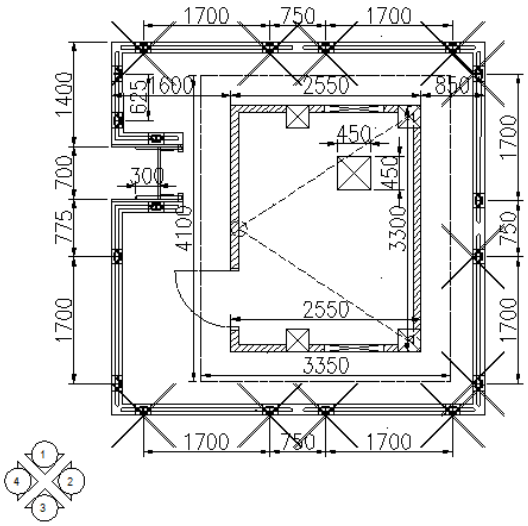
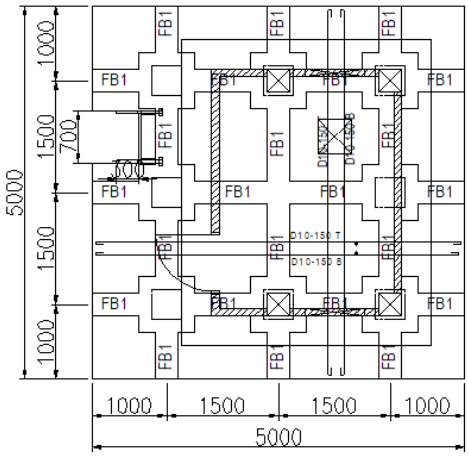


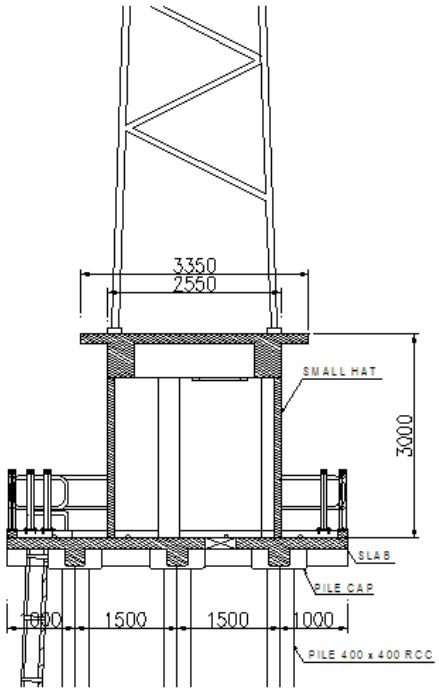
Figure 3 Tide Gauge Station (Item Number 4)



HAND RAIL PLAN



PILE ARRANGEMENT PLAN



SECTION A-A

RC MEMBER DETAIL SCHEDULE
BEAMS

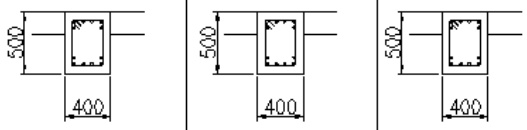
MARK	FB1		
POSITION	Eo	C	Ei
FORM			
B X D	400 x 500		
TOP BAR	6 - D 18 mm	6 - D 18 mm	6 - D 18 mm
BOTTOM BAR	6 - D 18 mm	6 - D 18 mm	6 - D 18 mm
WEB BAR	-		
STIRRUP	D 8 @ 150		

Figure 4 Tide Gauge Station (Item Number 4)

Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMOP) for the Project for Rehabilitation of Vessel Traffic Navigation Aid in Yangon River

1. OBJECTIVE OF ENVIRONMENTAL MANAGEMENT PLAN (EMP)

The purpose of the EMP is clarified mitigation measures and its monitoring to be implemented during construction phase by the contractor and during operation phase by Myanma Port Authority (MPA) as the Project Proponent in the Project for Rehabilitation of Vessel Traffic Navigation Aid in Yangon River (hereafter called “the upgrading Project”).

The EMP shall be reviewed during all phases to verify that mitigation measures in the EMP are duly targeted to minimize the negative impact on natural and social environment in the project areas and then revised as appropriate. This iterative process shall continue throughout all phases.

2. LAW REQUIREMENT

The project owner (MPA), construction contractor, his sub-contractors, all persons employed on site and any other person authorized to be on site shall be responsible for the full compliance with the following laws, regulations and / or guidelines with respect.

a) Environmental Conservation Law (2012)

b) Environmental Conservation Rules (2014)

c) EIA Procedure (2015)

d) National Environmental Quality (Emission) Guidelines (2015)

e) The Conservation of Water resources and Rivers law (2006)

f) The Protection of Wildlife and Conservation of Natural Areas Law (1994)

g) The Forest Law (1992)

h) Freshwater Fisheries Law (1991)

i) Law on Aquaculture (1989)

j) Irrigation Laws and Regulations (1982)

k) Farmland Law (2012)

l) Farmland Rules (2012)

m) Public Health Law (1972)

n) Underground Water Act (1930)

o) Social Security Law (2012)

p) Natural Disaster Management Law (2013)

q) Myanmar Fire-brigade Law (2015)

3. ENVIRONMENTAL STANDARD AND TRAGRT VALUE FOR ENVIRONMENTAL MANAGEMENT IN CONSTRUCTION PHASE

3.1 Environmental Standard in Myanmar

According to the Environmental Conservation Law, MONREC shall set standards of environmental qualities as agreed by the Union Government and the Environmental Conservation Committee. Standards to be set by MONREC are as follows:

(a) standard quality of water related to the use of inland water available to public places, dams, ponds, swamps, flooded land, channel, creeks and rivers
(b) standard quality of water at coastal regions and delta area
(c) standard quality of groundwater
(d) standard quality of air
(e) standard of noise and vibration
(f) standard of odor and emission gas
(g) standard of wastewater
(h) standard of soil and leachate from solid waste
(d) other standard environment qualities set by the Union Government

As of March 2018, these standards have not been set yet. However National Environmental Quality (Emission) Guidelines (NEQGs) enacted by MONREC in December 2015 applies to new and/or expansion of projects which are required to implement EIA/ IEE study. Therefore, the EMP set quantitative target levels based on the NEQGs. The applied target levels are water quality and, noise in construction phase. These are elements which may cause adverse impact to surrounding environment or occupational health and safety, thus

quantitative target levels were set each quantitative target level to be applied for the upgrading Project is described below.

3.2 Target Value for Environmental Management

3.2.1 Target value of Water Quality for Discharge water from Construction Site

As for wastewater treatment by construction site, target parameters and its values are also applied based on characteristics of discharge from sanitary wastewater discharges stipulated in NEQGs as shown in Table 3.2 basically.

Table 3.2 Target Water Quality Level (Site runoff and water discharge)

No	Items	Value
1.	Biological Oxygen Demand	30 mg/L
2.	Chemical Oxygen Demand	125 mg/L
3.	Oil & Grease	10 mg/L
4.	pH	6-9
5.	Total Coliform Bacteria	400 /100mL
6.	Total Nitrogen	10 mg/L
7.	Total Phosphorus	2 mg/L
8.	Total suspended solids	50 mg/L

4. ENVIRONMENTAL MANAGEMENT PLAN (EMP) IN CONSTRUCTION PHASE

4.1 Pollution Control

The contractor shall implement environmental management plan for pollution control such as air quality, water quality, waste, noise, and vibration as shown in Table 4.1. The cost for implementation of environmental management shall be expensed by the contractor.

Table 4.1 Environmental Management Plan (Pollution Control)

Item	Evaluation of Impact	Mitigation and Improvement Measures	Implementation Schedule
Air Quality	Dust and emission gas from construction work and transportation of construction vehicle are anticipated.	- Sprinkle water to prevent dust impact in dry season - Prohibition of idling will be implemented. - Intensive operating of the construction machinery will be avoided. - Construction equipment, machines and vehicle will be inspected and maintained regularly.	Throughout construction period
Water Quality	Muddy water inflow to river from bare land of construction site may deteriorate water quality.	- Settling ponds or simple turbid water treatment will be installed to prevent muddy inflowing to paddy fields, river, creek as necessary.	Throughout construction period
	Discharge from the lodging of construction may deteriorate water quality.	- Septic tank to comply with target level will be set up in construction site or all wastewater from construction site will be stored and collected by waste treatment service companies/ organizations.	Throughout construction period
	Discharge from the wastewater from construction work may deteriorate water quality.	- Simple wastewater treatment facility from cement producing activity will be set up in construction site.	Throughout construction period
Waste	Impact on solid waste may be occurred by generation of waste by excavation, removal work structures will be sorted out to be reused as much as possible and the rest will be treated in the disposal field.	- Recycling of construction soil, materials, general waste as much as possible - Waste storage area with segregation function shall be secured in the site. - Rest of waste shall be disposed to dumping site of municipalities and/ or waste treatment service company. - Appropriate disposal of removed work piece	Throughout construction period
	Impact on hazardous waste will be anticipated if spillages of hazardous wastes and drainage away without treatment occur.	- Record of usage of hazardous and chemical substance will be prepared and updated regularly. - Hazardous and chemical substance to be disposed will be	Throughout construction period

Item	Evaluation of Impact	Mitigation and Improvement Measures	Implementation Schedule
		stored at the designated storage area and entrusted to the waste treatment service company	
Noise and Vibration	Noise and vibration impact is estimated as small due to more than enough distance from construction site to the nearest residence. Noise and vibration from transportation of construction vehicle are anticipated. However, this is a temporary matter and the impact may be limited.	- Advance notice of operations at night time to residence if necessary - obey maximum driving speed	Throughout construction period

4.2 Natural Environment Mitigation

The contractor shall implement environmental management plan for natural environmental mitigation such as flora, fauna, ecosystem, and landscape in Table 4.2. The cost for implementation of environmental management shall be expensed by the contractor.

Table 4.2 Environmental Management Plan (Natural Environment Mitigation)

Item	Evaluation	Mitigation and Improvement Measures	Implementation Schedule
Flora and Fauna, Ecosystem	Impact on flora and fauna, ecosystem is not assumed. Area around the site is pasture and agricultural land, and important species of animals and plants have not been identified.	- Planting trees if trees are cut by construction activities	Before completion of construction

4.3 Social Impact Mitigation

The contractor shall implement environmental management plan for social impact mitigation such as poor, local economy, gender, and children's right in Table 4.3. The cost for implementation of environmental management shall be expensed by the contractor.

Table 4.3 Environmental Management Plan (Social Impact Mitigation)

Item	Evaluation	Mitigation and Improvement Measures	Implementation Schedule
Poor	Employment residents and poverty group in the area as construction worker is expected to contribute to vitalize regional	- The contractor shall contribute to regional economy such as hiring worker from surrounding area within the limitation of the	Throughout construction period

Item	Evaluation	Mitigation and Improvement Measures	Implementation Schedule
	economy and income increase of the poor.	contractors' capability.	
Local economy such as employment and livelihood	Employment of community people in the area as construction worker and procurement of fuel and food for workers from the area expected to contribute to vitalize regional economy and income increase of the poor.	- The contractor shall contribute to regional economy such as hiring worker from surrounding area within the limitation of the contractors' capability.	Throughout construction period
Gender and Children's Right	Negative impact on gender and children's right is not anticipated.	- The contractor shall not cause impact on gender and children right.	Throughout construction period

4.4 Occupational Health and Safety

The contractor shall implement environmental management plan for occupational health and safety for general mitigation measures and mitigation measures related to construction of thermal plant in Table 4.4. The cost for implementation of environmental management shall be expensed by the contractor.

Table 4.4 Environmental Management Plan (Occupational Health and Safety)

Item	Evaluation	Mitigation and Improvement Measures	Implementation Schedule
General occupational health and safety for construction activity	Accidents and health impact to construction workers are expected with a fixed probability. Working conditions and safety of construction shall be considered.	- Working condition during construction will be managed by contractor based on OHS training stipulated in international guidelines such as EHS Guidelines by IFC as follows; * Provision of adequate healthcare facilities (first aid) within construction sites; * Training of all construction workers in basic sanitation and healthcare issues, general health and safety matters, and on the specific hazards of their work; * Personal protection equipment for workers, such as safety boots, helmets, gloves, protective clothing, spectacles and ear protection; * Clean drinking water facilities for all workers; * Adequate protection to the general public, including safety barriers and marking of hazardous areas; * Safe access across the construction site;	Throughout construction period

Item	Evaluation	Mitigation and Improvement Measures	Implementation Schedule
		* Adequate drainage throughout the camp to ensure that disease vectors such as stagnant water bodies and puddles do not form; * Septic tank and garbage bins will be set up in construction site, which will be regularly cleared by the contractors to prevent outbreak of diseases, and * Where feasible the contractor will arrange the temporary integration of waste collection from work sites into existing waste collection systems and disposal facilities of nearby communities.	
Occupational health and safety for construction of thermal plant	Accidents and health impact to construction workers are expected with a fixed probability. Working conditions and safety of construction shall be considered.	Working condition during construction will be managed by contractor based on OHS training stipulated in international guidelines such as EHS Guidelines for thermal plant by IFC as follows; * Noise prevention * Proper method to enter confined space * Working at height * Chemical hazards management * Dust prevention	Throughout construction period and test operation
Risk for infectious disease such as AIDS/HIV	Risks of infectious disease are expected with a fixed probability. Preventive measures against infectious disease shall be considered.	- The following measures of infectious disease will be implemented as necessary. * Prevention of infectious disease from spreading * Training to workers	Throughout construction period

4.5 Community Health and Safety

The contractor shall implement environmental management plan for community health and safety for general mitigation measures and mitigation measures related to construction of thermal plant in Table 4.5. The cost for implementation of environmental management shall be expensed by the contractor.

Table 4.5 Environmental Management Plan (Community Health and Safety)

Item	Evaluation	Mitigation and Improvement Measures	Implementation Schedule
General community health and safety for	Accidents and health impact to community are expected with a fixed probability.	- Community health and safety will be managed by the contractor based on international guidelines such as EHS Guidelines by IFC as follows;	Throughout construction period

Item	Evaluation	Mitigation and Improvement Measures	Implementation Schedule
construction activity	Community health and safety shall be considered.	* The incidence of road accidents involving project vehicles during construction should be minimized through a combination of education and awareness-raising	
Community health and safety for construction of thermal plant	Accidents and health impact to community are expected with a fixed probability. Community health and safety shall be considered.	Community health and safety will be managed by the contractor based on international guidelines such as EHS Guidelines for thermal plant by IFC as follows; * Not compromise availability of water for personal hygiene, agriculture, and other community needs * Ensuring traffic safety to community on transportation of fuel and other materials	Throughout construction period and test operation
Risk for infectious disease such as AIDS/HIV	Risks of infectious disease are expected with a fixed probability. Preventive measures against infectious disease shall be considered.	- The following measures of infectious disease will be implemented as necessary. * Prevention of infectious disease from spreading * Communication with local resident including lecture	Throughout construction period

5. ENVIRONMENTAL MANAGEMENT PLAN (EMP) IN OPERATION PHASE

The Project Proponent (MPA) shall implement environmental management plan to manage/ control pollution, natural environment, social impact, health impact, emergency risks related to operation of the improved thermal plant in Table 5.1. The cost for implementation of environmental management shall be expensed by the Project Proponent.

Table 5.1 Environmental Management Plan (Pollution and Natural Environment)

Category	Item	Mitigation and Consideration Measures
Pollution, Natural Environment	Hazardous substance management/ Solid Waste/ Soil contamination	- Hazardous material will be controlled and managed (secure proper storage with ventilation, temperature control, and lock, limitation of persons to enter storage, regular recording). - Sludge of wastewater treatment from office and will be disposed to the controlled landfill site. - Prevention of solid and liquid waste from infiltrating into ground to avoid soil contamination and groundwater contamination.
Health Impact	Occupational health and safety including accidents and infection disease	- Consideration of working conditions will be implemented based on requirement of Occupational Health and Safety (OHS) stipulated in international guidelines such as EHS Guidelines by IFC. Proper method to enter confined space Chemical hazards management Working at height - Measures of infectious disease will be implemented as follows; Plan for prevention of infectious disease from spreading - Training to workers
	Community health and safety including accidents and infection disease	- Consideration of community health and safety will be implemented based on requirement of international guidelines such as EHS Guidelines by IFC. - Not compromise availability of water for personal hygiene, agriculture, and other community needs - Ensuring traffic safety to community on transportation of fuel and other materials -Measures of infectious disease will be implemented as follows; Plan for prevention of infectious disease from spreading Training to workers Communication with local resident including lecture
Emergency Risk	Flood risks	- Proper elevation level will be set to avoid flood risks such as heavy rain, typhoon, high tide water, and tsunami.
	Risks for fire	- Fire protection facilities such as fire hydrants will be installed.

6. ENVIRONMENTAL MONITORING PLAN (EMOP)

6.1 EMOP before Construction Phase and during Construction Phase

Environmental monitoring plan including monitoring items, location, frequency and responsible organization at before-construction phase and construction phase are shown in Table 6.1 and Table 6.2. The contractor is in charge of implementation of monitoring and report preparation based on monitoring results. The contractor shall also submit monitoring report to the Project Proponent once a month. The cost for implementation of environmental monitoring shall be expensed by the contractor

Table 6.1 Monitoring Plan (Before Construction Phase)

Category	Item	Location	Frequency	Responsible Organizations
Common	- Monitoring of designing for mitigation measures for air pollution, water quality, noise, land elevation for prevention of flood, greening - Monitoring of planning for mitigation measures in construction phase	Project site	Once	Contractor

Table 6.2 Monitoring Plan (Construction Phase)

Category	Item	Location	Frequency	Responsible Organizations
Common	- Monitoring of mitigation measures shown in Table 4.1-4.5	-	Once/month	Contractor
Ambient Air Quality	- Monitoring of status of spraying water to prevent dust in dry season by visual inspection	Construction site and its surrounding area	Everyday	Contractor
Water Quality	- Maintenance record of septic tank - BOD, COD, Oil and grease, pH Value, Total coliform bacteria, Total nitrogen, Total phosphorus, Total SS - Record of collection of wastewater	Wastewater treatment facility/ outlet of septic tank (1 point)	Once/2 month	Contractor
Waste	- Amount of solid waste - Recording of management of construction waste - Recoding of hazardous and chemical substance management	Construction site	Once/month	Contractor
Noise and Vibration	- Noise level	Nearest residence around project site (1 point)	24 hrs (test operation)	Contractor
Occupational health and safety	- Status of condition of occupational safety and health	Construction site	Once/month	Contractor
Community health and safety	- Status of condition of community safety and health	Construction site and surrounding area	As occasion arises	Contractor

6.2 EMOP during Operation Phase

Environmental monitoring plan including monitoring items, location, frequency and responsible organization during operation phase are shown in Table 6.3. The Project Proponent is in charge of implementation of monitoring and report preparation based on monitoring results. The Project Proponent shall also submit monitoring report to Ministry of Natural Resources and Environmental Conservation (MONREC). The cost for implementation of environmental monitoring shall be expensed by the Project Proponent

Table 6.3 Monitoring Plan (Operation Phase)

Category	Item	Location	Frequency	Responsible Organizations
Common	- Monitoring of mitigation measures shown in Table 5.1	-	Once/month	Project Proponent
Waste	- Amount of solid waste - Recording of management of construction waste - Recoding of hazardous and chemical substance management	Project site	Once/month	Project Proponent
Occupational health and safety	- Status of condition of occupational safety and health	Project site	Once/month	Project Proponent
Community health and safety	- Status of condition of community safety and health	Project site and surrounding area	As occasion arises	Project Proponent
Accident	- Record of accident	Project site	As occasion arises	Project Proponent

Attachment 1: Photos of the Site and Existing Facilities

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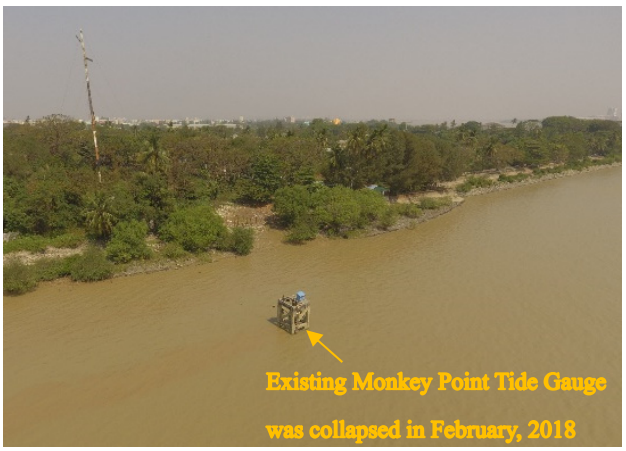
<td> 

Photo: Aerial Photo of Monkey Point</td>
<td> 

Photo: The Area near Monkey Point Tide Gauge</td>
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Photo: The Area near Monkey Point Tide Gauge after the Tide Gauge was collapsed</td>
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Photo: The Area near Existing Monkey Point Light Tower (In Navy Compound)</td>
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Photo: Aerial Photo of Thanlyin Point

Photo: The Area near the Existing Thanlyin Point Light Towers

Photo: The Existing Thanlyin Point (Back) Light Tower

Photo: The Existing Thanlyin Point (Front) Light Tower

	
Photo: Aerial Photo of Elephant Point	**Photo: The Area near the Elephant Point (During Rainy Season)**
	
Photo: One of the Existing Navigation Buoy in Yangon River	**Photo: Buoy Painting and Moving by MPA**

Attachment 2: Location Map of Navigation Facilities