

The Republic of the Union of Myanmar  
Ministry of Construction

**The Project for Capacity Development  
of Road and Bridge Technology  
in the Republic of the Union of Myanmar**

**Project Completion Report**

**June 2019**

JAPAN INTERNATIONAL COOPERATION AGENCY

CTI Engineering International Co., Ltd.  
Oriental Consultants Global Co., Ltd.  
East Nippon Expressway Company Limited  
Metropolitan Expressway Company Limited  
Nippon Koei Co., Ltd.  
Nippon Engineering Consultants Co., Ltd.

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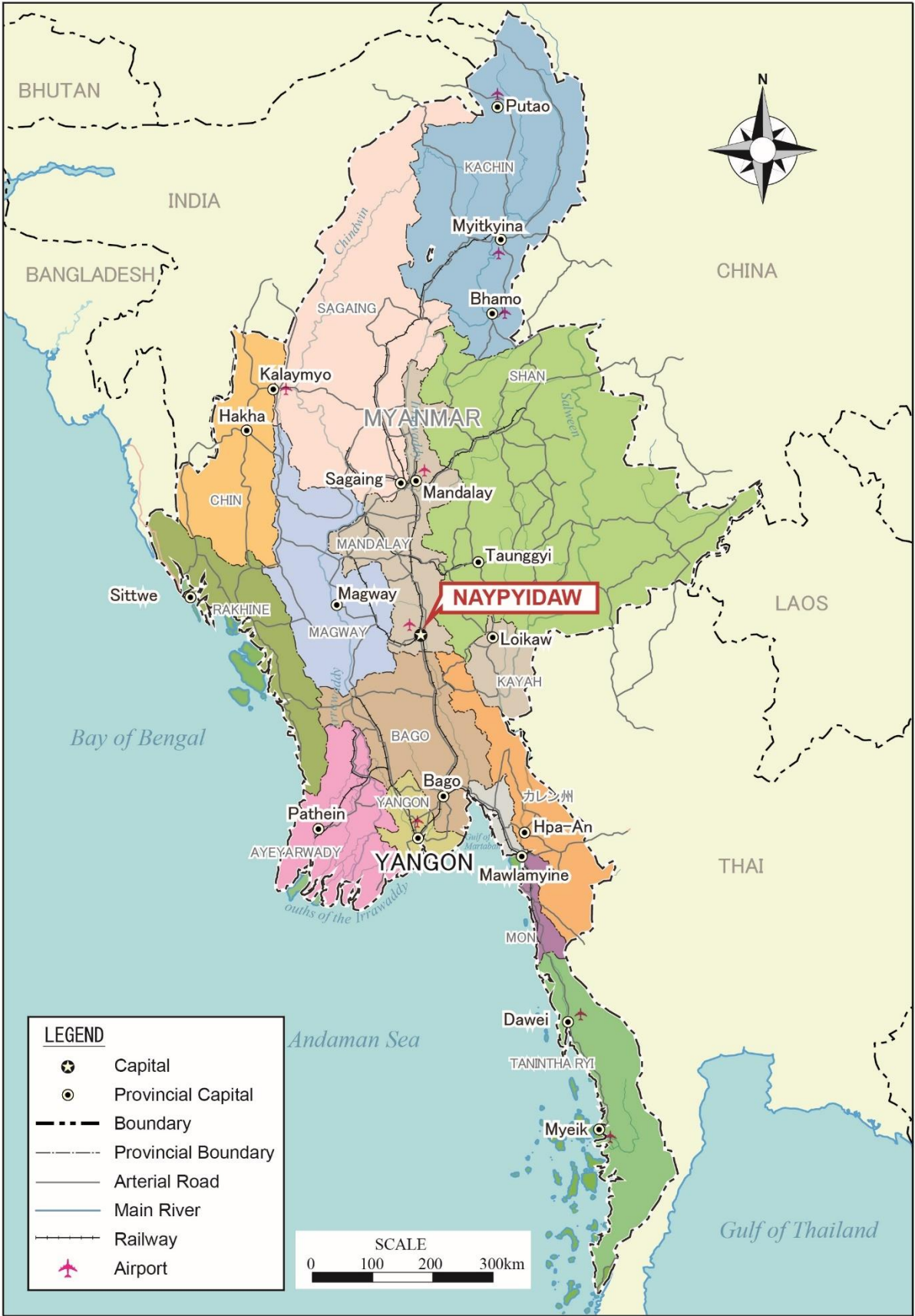
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Project Location Map



**The Project for Capacity Development of Road and Bridge Technology  
in the Republic of the Union of Myanmar**

**Project Completion Report**

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## Abbreviations

ADB	Asian Development Bank
ASEAN	Association of South East Asian Nations
BMS	Bridge Maintenance System
BRL	Bridge Research Laboratory
C/P	Counterpart
CTC	Central Training Center
DOB	Department of Bridge
DOH	Department of Highways
EEHE	Project for Enhancement of Engineering Higher Education
JCC	Joint Coordination Committee
JSCE	Japan Society of Civil Engineers
JDS	Japanese Grant Aid for Human Resource Development Scholarship
JICA	Japan International Cooperation Agency
JISC	Japanese Industrial Standards Committee
JPCI	Japan Prestressed Concrete Institute
JRA	Japan Road Association
MES	Myanmar Engineering Society
MOC	Ministry of Construction
MOAI	Ministry of Agriculture and Irrigation
PC	Prestressed Concrete
PDM	Project Design Matrix
PPP	Public Private Partnership
QA	Quality Assurance
QC	Quality Control
SATREPS	Science and Technology Research Partnership for Sustainable Development
WS	Workshop
YCDC	Yangon City Development Committee
YTU	Yangon Technological University



## **Chapter 1 Basic Information of the Project**

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### **1.1 Country**

The Republic of the Union of Myanmar

### **1.2 Title of the Project**

The Project for Capacity Development of Road and Bridge Technology

### **1.3 Duration of the Project**

May 2016 - April 2019 (36 months)

### **1.4 Background**

In the Republic of the Union of Myanmar (hereinafter referred to as “Myanmar”) economy has been growing rapidly with annual growth rate of 7.8% in both Fiscal Year 2014 (ending 31 March 2015) and in Fiscal Year 2015. Such growth is supported by rising investments by improved business environment, commodity exports, rising production of natural resources, etc. Though proper investment to meet the rapid economic growth is a foundation for healthy economy, roads and bridges in Myanmar are not fully meeting with growing traffic and the sizes and loads of the means of transportation. Accordingly, there is a strong need of capacity development of Ministry of Construction (MOC) that directly impellent those construction works.

Though MOC’s bridge construction technology, which is essential for road construction, has maintained in certain technological level, the selection of bridge type is still narrow because of the limitation to access the most updated information and technologies on bridge design and construction during the selection. In addition, training and development of young engineers engaging the road and the bridge sectors is difficult due to the constraints for the adequate capacity in instruction of the related technologies, such as bridge design and supervision suitable to local environment. Accordingly, variety of issues related to operation and maintenance of structures become apparent to MOC. As the result, MOC could not reach to sufficient engineering capacity to develop sufficient infrastructures, and to accommodate the future demand on Quality Infrastructure.

Under such circumstances, the Government of Myanmar requested a technical cooperation project, "The Project for Capacity Development of Road and Bridge Technology (hereinafter referred to as “the Project”)," which aims at establishment of the technical standards of roads and bridges, and at improvement of construction supervision, to the Government of Japan in January 2014.

Considering the fact that the design and supervision of major roads and bridges are carried out by engineers of MOC, and that some grant aid projects, such as "The Project for Construction of New Thaketa Bridge" were in progress, the enhancement of the capacity of MOC should be taken into the consideration. In this context, Japan International Cooperation Agency (JICA) determined to transfer technologies in order to facilitate improvement of construction quality/safety on road and bridge construction by MOC, and the Project was implemented.

## 1.5 Overall Goal and Project Purpose

**1. Overall Goal:** Quality of bridges and concrete structures constructed or managed by MOC are improved.

**2. Project Purpose:** The capacity of MOC engineers on construction management for bridge and road construction are enhanced.

### 3. Output :

[Output1] Advises to a broad policy matters and technical documents on road and bridge sectors are provided.

[Output2] The work process for quality and safety of concrete and bridge construction projects are developed and enhanced.

[Output3] The technical documents on quality and safety control for concrete and bridge construction are developed.

### 4. Activities of the Project :

[Activities for Output 1]

1-1. Provide various information on technologies and policy related to the road and bridge sectors in Japan or other countries through workshops/ seminars, trainings etc.

1-2. Provide necessary advice on various issues related to the road and bridge sectors when consulted based on the information collected.

1-3. Propose prospective Japanese technical assistance for the road and bridge sectors.

1-4. Introduce Japanese technical documents through seminars.

[Activities for Output 2]

2-1. Investigate the current condition of the overall capacity and the work process in MOC.

2-2. Introduce the outlines of construction management and the work process in Japan or other countries through workshops/ seminars and trainings.

2-3. Draft the guideline on construction management methods and the work process to apply the technical documents developed by the Project.

2-4. Develop the bridge inventory (system framework and sample database) to keep documents and data necessary by the Project.

2-5. Draft the procedures to hand-over the as-built drawings, etc. from the construction dept. to the maintenance dept. when projects complete.

2-6. Carry out on-the job training on the construction management and the work process applying the contents of the procedures utilizing the selected pilot projects.

2-7. Distribute the guideline and procedures to relevant organizations / officers / engineers through workshops / seminars.

2-8. Monitor the progress of the above activities and attainment & application of the technical contents periodically and report the results to JCC.



[Activities for Output 3]

- 3-1. Investigate the current condition of the existing technical documents of MOC.
- 3-2. Introduce the outlines of construction supervision, the technical documents and the technologies used in Japan and other countries through workshop / seminars and trainings.
- 3-3. Draft technical documents on construction supervision (quality and safety control for road and bridge construction)
- 3-4. Carry out on-the-job training on construction supervision utilizing the selected pilot project(s).
- 3-5. Distribute the technical documents to the relevant organizations / officers / engineers through workshops / seminars.
- 3-6. Monitor the progress of the above activities and attainment & application of the technical contents periodically and report the results to JCC.

**1.6 Implementing Agency**

Department of Bridge (hereinafter DOB) and Department of Highways (hereinafter DOH),  
Ministry of Construction

### 1.7 Project Implementation Schedule

Implementation Schedule of each activity of JICA Long-term Expert and Short-term expert are presented as below.

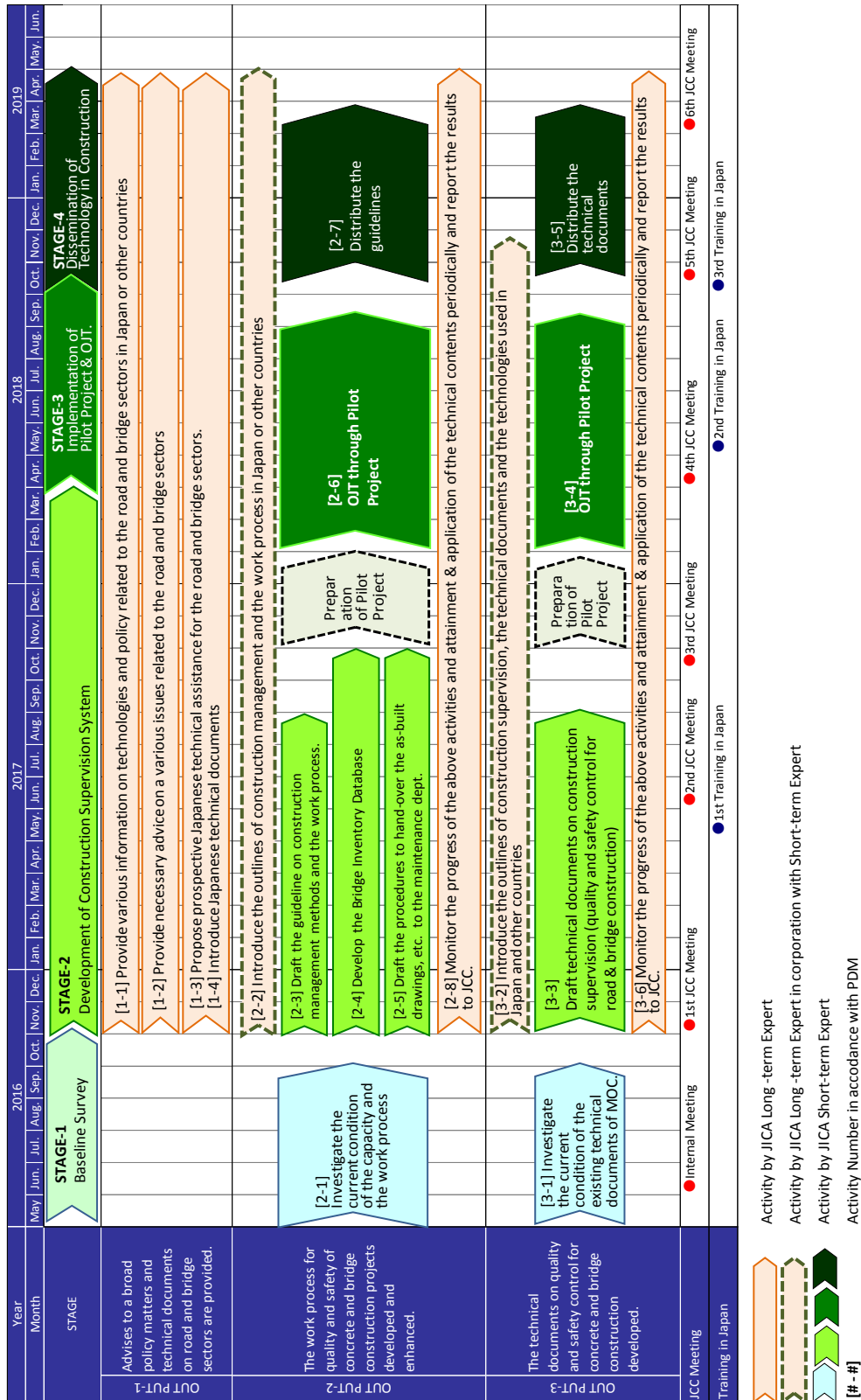


Figure 1-1 Project Implementation Schedule

## Chapter 2 Results of the Project

### 2.1 Results of the Project

#### 2.1.1 Input from the Japanese side (Planned and Actual)

Table 2-1 to Table 2-9 show summary of inputs by Japanese side to the Project.

**Table 2-1 Summary of Inputs by Japanese side**

Planned (PDM Ver.0)	Actual	Remarks
1. Long-term Experts 1) Road / Bridge Policy Advisor 2) Construction Management / Monitoring and Evaluation / Coordinator	1. Long-term Experts 1) Road / Bridge Policy Advisor 2) Construction Management / Monitoring and Evaluation / Coordinator	No change
2. Short-term Experts 1) Quality Control (Concrete) 2) Quality Control (Steel bridge) 3) Quality Control (PC bridge) 4) Quality Control (Foundation) 5) Safety Control 6) Bridge Inventory	2. Short-term Experts 1) <b>Team Leader / Quality control (Concrete) 1</b> 2) <b>Deputy Team Leader / Quality Control (Concrete) 2</b> 3) Quality Control (Steel bridge) 4) Quality Control (PC bridge) 5) Quality Control (Foundation) 6) <b>Construction Management</b> 7) Safety Control 8) <b>Bridge Inventory 1</b> 9) <b>Bridge Inventory 2</b> 10) <b>Design Examination (Steel Bridge)</b> 11) <b>PPP Road Policy</b> 12) <b>River Planning</b> 13) <b>River Structure</b> 14) <b>Bridge Planning</b> 15) <b>Coordinator / Training Planning / Project Evaluation Support</b>	
3. Training in Japan 3times (1 time / year)	3. Training in Japan 3times (1 time / year)	

Note: The boldfaced in the above table show the contents modified during the Project from the original plan or planned in version 0 (ver. 0) of the Project Design Matrix (PDM).

**Table 2-2 Name List of the Long-term Experts**

No.	Name	Position	Organization
1	Mr. MITSUISHI Akira	Road / Bridge Policy Advisor	East Nippon Expressway Co., Ltd.
2	Mr. SENOO Kei	Construction Management / Monitoring and Evaluation / Coordinator	West Nippon Expressway Co., Ltd.

**Table 2-3 Name list of the Short-term Experts**

No.	Name	Position	Organization	Work in Myanmar	Work in Japan	Total
1	Mr. OKAZAKI Akio	Team Leader /Quality Control (Concrete-1)	CTII	11.53	0.50	12.03
2	Mr. WATANABE Ryohei	Deputy Team Leader / Quality Control (Concrete-2)	CTII	8.00	0.50	8.50
3	Dr. YASUDA Masahiko	Quality Control (Steel Bridge)	NE	8.00	-	8.00
4	Mr. MUKOYAMA Tatsuo	Quality Control (Concrete Bridge)	OCG	10.00	-	10.00
5	Mr. OCHIAI Eiji	Quality Control (Foundation)	MEX	8.50	-	8.50
6	Mr. ASAKURA Hajime	Construction Management	NK	2.00	-	2.00
7	Mr. TONEGAWA Yasunori /Mr. KUGE Takahiro	Safety Control	NEXCO East	5.50	-	5.50
8	Mr. KUNIKATA Keigo / Mr. Kyaw Moe Aung	Bridge Inventory (1)	CTII	2.30	4.50	6.80
9	Dr. TSUCHIDA Takayuki	Bridge Inventory (2)	CTII	1.00	-	1.00
10	Mr. TAKAGI Nobuhiko	Design Examination (Steel Bridge)	NE	3.00	-	3.00
11	Dr. MINATO Takayuki	PPP Road Policy	CTII	0.40	-	0.40
12	Dr. Jovito Cruz SANTOS	Bridge Planning	CTII	0.27	-	0.27
13	Mr. TAKATA Satoshi	River Structure	CTII	0.27	-	0.27
14	Mr. NAGATA Hitoshi	River Planning	CTII	0.27	-	0.27
15	Ms. NAKAYAMA Makiko	Coordinator/Training Planning/ Project Evaluation Support	CTII	2.00	4.50	6.50

CTII: CTI Engineering International Co., Ltd.  
OCG: Oriental Consultants Global Co., Ltd.  
NK: Nippon Koei Co., Ltd.

NE: Nippon Engineering Consultants Co., Ltd.  
MEX: Metropolitan Expressway Co., Ltd.  
NEXCO East: East Nippon Expressway Co., Ltd.

**Table 2-4 Training in Japan conducted by the Project**

	Schedule	Nos. of Participants	Contents	Organizations
1 <sup>st</sup>	7 <sup>th</sup> May 2017 - 20 <sup>th</sup> May 2017	9	<ul style="list-style-type: none"> <li>● MLIT's Policies for Quality Assurance of Public Works</li> <li>● Introduction of Manuals in Japan</li> <li>● Quality/Safety Control by Road Administrator</li> <li>● Quality Control with Secondary Products (PC girder and piles)</li> <li>● Akashi-kaikyo Bridge</li> <li>● Education for Bridge Engineers in University</li> </ul>	MLIT East Nippon Expressway Company Limited IHI Infrastructure Systems Company Limited Honshu-Shikoku Bridge Expressway Company Limited University of Kyoto Metropolitan Expressway Company Limited JFE Steel Corporation University of Saitama
2 <sup>nd</sup>	6 <sup>th</sup> May 2018 - 19 <sup>th</sup> May 2018	7	<ul style="list-style-type: none"> <li>● MLIT's Policies for Quality Assurance of Public Works</li> <li>● Practical Work of Quality/Safety Control by Road Administrator</li> <li>● Practical Work of Quality Control Testing at Factory</li> <li>● Issues on Quality Control in ASEAN Countries</li> <li>● Procedures of Safety Control by Private Sector</li> </ul>	MLIT East Nippon Expressway Company Limited Metropolitan Expressway Company Limited JFE Shoji Terre-One Nippon Expressway Research Institute Company Limited Meidensha Company Limited Sakai Heavy Industries, Limited West Nippon Expressway Company Limited Taiheiyō Materials Corporation, Taiheiyō Cement Corporation University of Tokyo
3 <sup>rd</sup>	5 <sup>th</sup> Nov. 2018 - 18 <sup>th</sup> Nov. 2018	17	<ul style="list-style-type: none"> <li>● MLIT's Policies for Road and Bridge Maintenance</li> <li>● Road and Bridge Maintenance by Road Administrator</li> <li>● Durability Enhancement of Steel Bridge</li> <li>● Issues on Bridge Maintenance in Myanmar</li> <li>● Bridge Maintenance by Local Government</li> </ul>	MLIT East Nippon Expressway Company Limited Taiheiyō Materials Corporation, Taiheiyō Cement Corporation JFE Engineering Corporation JFE Steel Corporation Shutoko Engineering Company Limited University of Tokyo Niigata City Japan Construction Information Center Japan Road Association CTI Engineering Company Limited

Note: MLIT = Ministry of Land, Infrastructure, Transport and Tourism

**Table 2-5 Name of the Participants in the 1<sup>st</sup> Training in Japan**

Organization	Name	Position and Affiliation
Department of Bridge	Ms. Yin Yin Swe	Director, Quality Control & Safety
	Ms. Sandar Win	Deputy Director, International Relations & Legal Sub-Division
	Ms. Phyo Thandar Win	Staff Officer, Taungoo Township Office, DRRD
	Mr. Thein Wai Aung	Assistant Director, Bridge Design

	Mr. Kyaw Myo	Deputy Director, Bridge Special Unit-9
	Ms. Than Aye	Assistant Director, Bridge Planning
	Ms. Ei Htwe San	Deputy Director, Bridge Design
	Ms. Nant Tha Hmwe	Deputy Director, Bridge Design
	Ms. Yu Yu Naing	Staff Officer, Bridge Design





**Table 2-6 Name of the Participants in the 2<sup>nd</sup> Training in Japan**

Organization	Name	Position and Affiliation
Department of Highways	Ms. Ei Ei Myo	Director, QA/AC Section (Maintenance)
	Mr. Ko Ko Naing	Staff Officer, QA/AC Section (Construction)
	Mr. Soe Lwin	Assistant Director, Geometric Design
	Mr. Zaw Thu Lin	Assistant Director, Kyaukme District Office
	Ms. Aye Aye Khaing	Staff Officer, QA/QC Section (Construction)
	Ms. Theingi Min Thu	Junior Engineer, Geometric Design
	Ms. Hnin Yu Aung	Staff Officer, Pavement Design


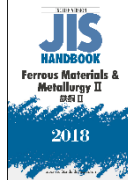



**Table 2-7 Name of the Participants in the 3<sup>rd</sup> Training in Japan**

Organization	Name	Position and Affiliation
Department of Bridge	Mr. Kyaw Linn	Chief Engineer, Construction Division
	Ms. Than Yi	Director, Human Resource Development and Information Division
	Ms. Ei Ei Nyein	Deputy Director, Planning and Management Section
	Mr. Shin Thant Htut	Assistant Director, Bridge Special Unit 6
	Mr. Myo Thet Tun	Assistant Director, Bridge Design Section
	Ms. Myo Min Aye	Assistant Director, Quality Control Section
	Ms. Cho Mar Oo	Assistant Director, Quality Control Section (Yangon)
	Mr. Tin Mg Htwe	Assistant Director, Construction Unit 1, New Myaungmya Bridge Construction Project
	Ms. Theint Han Su Kyaw	Assistant Director, Research and Training Section
	Ms. Khin Moe Moe	Staff Officer, Quality Control Section (Yangon)
	Mr. Thu Ra Thant	Staff Officer, Bridge Special Unit 4
	Ms. Tin Thuzar Win	Staff Officer, Bridge Special Unit 12
	Ms. Thwe Thwe Tun	Staff Officer, Bridge Design Section
Department of Highways	Ms. Aye Tar Tar Htut	Assistant Director, Project Inspection and Quality Control Section (Maintenance)
	Ms. Moe Moe Khaing	Assistant Director, Project Inspection and Quality Control Section (Maintenance)
	Mr. Soe Thiha	Staff Officer, Research and Development Section
	Ms. Thae Phyu Phyu Moe	Staff Officer, Research and Development Section

**Table 2-8 List of Equipment**

Item	Q'ty	Location	Description / Specification
Compound Machine of Printer-Copier-Scanner	1	MOC	Fuji Xerox (DocuCentre-VC 2263N CPS)
Switching Hub	1	MPT Center	QB1D2FB007242
Laptop Computer	3	MOC	Dell 5559 (i5) Laptop
Database Server	2	MPT Center	CPU (Over 10 Core)×1 Memory (Over 32GB)×1 Network Card (10Gb)×2 Disk (SSD 512GB)×4 RAID Controller (RAID 5)×1 Power Supply (Redundancy)×2
Automatic Voltage Stabilizer (1)	1	MOC	LiOA DR11-3000
Automatic Voltage Stabilizer (2)	2	MOC	LiOA DR11-500
Concrete Air Meter	1	MOC	H-2786C
Grout Flow Cone Set	1	MOC	HC-28345
Chloride Content Test Strip	50	MOC (BRL)	Quantab
			
Database Server	Concrete Air Meter	Grout Flow Cone Set	Chloride Content Test Strip

**Table 2-9 List of Technical Document provided by the Project**

Title	Publisher	Photo
Japan Industrial Standard, Iron Steel-I	JISC	
Japan Industrial Standard, Iron Steel-II	JISC	
Specifications for Design and Construction of Cable-Stayed Bridge and Extradosed Bridge 2012	JPCI	
Guidelines for Maintenance of Prestressed Concrete Cable-Stayed Bridge and Extradosed Bridge 2012	JPCI	
Specifications for Highway Bridges Part I Common, 2012	JRA	
Specifications for Highway Bridges Part II Concrete Bridge, 2012	JRA	
Specifications for Highway Bridges Part III Steel Bridge, 2012,	JRA	
Specifications for Highway Bridges Part IV Substructure, 2012	JRA	
Specifications for Highway Bridges Part V Seismic Design, 2012	JRA	

JISC: Japanese Industrial Standards Committee

JPIC: Japan Prestressed Concrete Institute

JRA: Japan Road Association

## 2.1.2 Input by the Myanmar side (Planned and Actual)

Table 2-10 to Table 2-12 show summary of inputs by Myanmar side to the Project.

**Table 2-10 Summary of Inputs by Myanmar side**

Planned (PDM Ver.0)	Actual	Remarks
<p>1. Counterpart</p> <p>(1) Project Director General</p> <p>(2) Project Director</p> <p>(3) Project Manager</p> <p>(4) Counterpart Team</p> <p>Department of Bridges, MOC</p> <p>Department of Highways, MOC</p>	<p>1. Counterpart</p> <p>(1) Project Director General</p> <p>(2) Project Director</p> <p>(3) Project Manager</p> <p>(4) Counterpart Team</p> <p>Department of Bridges, MOC</p> <p>Department of Highways, MOC</p>	No change
<p>2. Equipment and Facilities</p> <p>(1) Office space in the building of MOC's HQ for the Road/Bridge Policy Advisor with office furniture and utilities such as internet connection, electricity, air conditioner etc.</p> <p>(2) Office space in the building of MOC's HQ for other Project members with office furniture and utilities such as internet connection, electricity, air conditioner etc.</p>	<p>2. Equipment and Facilities</p> <p>(1) Office space in the building of MOC's HQ for the Road/Bridge Policy Advisor with office furniture and utilities such as internet connection, electricity, air conditioner etc.</p> <p>(2) Office space in the building of MOC's HQ for other Project members with office furniture and utilities such as internet connection, electricity, air conditioner etc.</p>	
<p>3. Local Cost Borne by the Myanmar Side</p> <p>(1) Trainees' and Participants' expenses of workshops/ seminars, trainings in Myanmar including travel expenses, allowance etc.</p> <p>(2) Construction cost of the Pilot Project(s)</p>	<p>3. Local Cost Borne by the Myanmar Side</p> <p>(1) Trainees' and Participants' expenses of workshops/ seminars, trainings in Myanmar including travel expenses, allowance etc.</p> <p>(2) Construction cost of the Pilot Project(s)</p>	



**Table 2-11 Joint Coordination Committee Member List**

<b>No.</b>	<b>Name</b>	<b>Position under the Project</b>	<b>Department</b>
1	U Han Zaw (U Win Khaing)	—	Minister of MOC
2	U Kyaw Linn	—	Vice Minister of MOC
3	U Win Tint	Chairperson	Permanent Secretary of MOC
4	U Ohn Lwin	Member	Director General, DOH
5	U Shwe Lay	Vice Chairperson	Director General, DOB
6	U Aung Myint Oo	Member	Deputy Director General (Planning), DOH
7	U Khin Maung Kyaw	Member	Deputy Director General (Maintenance), DOH
8	U Khin Maung Swe	Project Director	Deputy Director General (Construction), DOB
9	U Kyaw Kaung Cho	Member	Deputy Director General (Maintenance), DOB
10	U Thein Myint Mon (U Paing)	Project Manager	Chief Engineer (Planning), DOB
11	U Thein Aung	Member	Chief Engineer, Maintenance Section, DOB
12	Daw Thein Nu	Member	Chief Engineer, DOB
13	U Kyaw Lynn	Member	Chief Engineer, DOB
14	Daw Than Yi	Member	Director, DOB
15	Daw Htwe Nge Myint	Member	Director, International Relations & Legal Sub-Division, DOB
16	U Thet Zaw Win (Daw Hla Hla Thawe)	Member	Director, DOH (Director, Research and Development, DOH)
17	Daw Ei Ei Myo	Member	Director, Civil, DOH
18	U Aye Ko (U Kyin Ohnn)	Member	Assistant Chief Engineer, YCDC (Deputy Head of Department, YCDC)
19	Dr. Khin Than Yu	Member	Pro: Rector Teaching, YTU

Note: Names in ( ) show before replacement.

**Table 2-12 Core Trainer List**



No.	Name	Position	Department
1	U Myo Thet Tun	Bridge Foundation	Assistant Director, Bridge Special Unit-14, DOB
2	Daw Nant Tha Hmwe	Bridge Foundation	Deputy Director, Bridge Design, DOB
3	Daw Ei Htwe San	Bridge Foundation	Deputy Director, Bridge Design, DOB
4	Daw Yu Yu Naing	Bridge Foundation	Staff Officer, Bridge Design, DOB
5	Daw Yin Yin Swe	Concrete Structure	Director, Quality Control & Safety, DOB
6	Daw Myo Min Aye	Concrete Structure	Assistant Director, QCS, DOB
7	Daw Cho Mar Oo	Concrete Structure	Assistant Director, QCS, DOB
8	Daw Khin Moe Moe	Concrete Structure	Staff Officer, QCS, DOB
9	U Soe Thiha	Concrete Structure	Staff Officer, RRDS, DOH
10	Daw Thae Phyu Phyu Moe	Concrete Structure	Staff Officer, RRDS, DOH
11	Daw Hnin Yu Aung	Concrete Structure	Staff Officer, RRDS, DOH
12	Daw Su Myat Sandi Thaw	Concrete Structure	Staff Officer (Civil), RRDS, DOH
13	U Tin Mg Htwe	PC Bridge	Assistant Director, New Myaung Mya Bridge Project, Construction Unit-1, DOB
14	U Thu Ra Thant	PC Bridge	Staff Officer, Bridge Special Unit-4, DOB
15	Daw Theint Han Su Kyaw	PC Bridge	Assistant Director, Environmental & Social Section (Minister Office's Attached), DOB
16	U Kyaw Myo	Steel Bridge	Deputy Director, Bridge Special Unit-9, DOB
17	U Thet Wai Aung	Steel Bridge	Assistant Director, Bridge Design, DOB
18	Daw Than Aye	Steel Bridge	Assistant Director, Bridge Planning, DOB
19	U Shin Thant Htut	Safety Control	Assistant Director, Bridge Special Unit-6, DOB
20	U Zaw Thu Lin	Safety Control	Assistant Director, Kyaukme District, DOH
21	Daw Thwe Thwe Tun	Safety Control	Staff Officer, Bridge Design Section, DOB
22	U Soe Lwin	Safety Control	Assistant Director, Road & Airfield Design Section, DOH
23	Daw Aye Aye Khaing	Safety Control	Staff Officer, QA/ QC Section (Construction), DOH
24	Daw Theingi Min Thu	Safety Control	Staff Officer, Road & Airfield Design Section, DOH
25	Daw Ei Ei Nyein	Database	Deputy Director, Bridge Planning, DOB
26	Daw Tin Thuzar Win	Database	Staff Officer, Bridge Special Unit 12, DOB
27	Daw Phyo Thandar Win	Database	Assistant Director, Bridge Planning, DOB,
28	Daw Sandar Win	Construction Management	Deputy Director, International Relations & Legal Sub-Division, DOB
29	Daw Ei Ei Myo	Construction Management	Director (Civil), QA/QC Section (Maintenance), DOH
30	Daw Aye Tar Tar Htut	Construction Management	Assistant Director, QA/QC Section (Maintenance), DOH
31	Daw Moe Moe Khaing	Construction Management	Staff Officer (Civil), QA/QC Section (Construction), DOH
32	U Ko Ko Naing	Construction Management	Staff Officer (Civil), QA/QC Section (Construction), DOH

## 2.1.3 Activities (Planned and Actual)

### (1) Output 1



Following activities were undertaken to generate Output 1: Advises to broad policy matters and technical documents on road and bridge sectors are provided.

**Table 2-13 Comparison of Activities (Plan and Actual) for Output 1**

Planned	Actual
<p>1-1. Provide various information on technologies and policy related to the road and bridge sectors in Japan or other countries through workshops/ seminars, trainings etc.</p>	<p>&lt;through Trainings Abroad&gt;</p> <ul style="list-style-type: none"> <li>● Japanese policies and technologies were introduced in the trainings in Japan led by Experts. (written in Table 2-5)</li> <li>● Policies and technologies of other ASEAN countries were introduced in the trainings led by Experts.</li> </ul> <ul style="list-style-type: none"> <li>- Training on road and bridge maintenance for 6 MOC officials in Cambodia in March 2018</li> <li>- Training on road development Policy including PPP for 6 MOC officials in Indonesia January 2019</li> <li>- Training on governmental research function for 8 MOC officials in Thailand in March 2019</li> </ul> <div style="text-align: center;">  <p>1st Training in Japan in May 2017</p> </div> <p>&lt; through Seminars&gt;<sup>1</sup></p> <ul style="list-style-type: none"> <li>● Road development policy including PPP was introduced in the following Seminars: <ul style="list-style-type: none"> <li>- 1<sup>st</sup> Seminar in February 2018</li> <li>- 2<sup>nd</sup> Seminar in March 2019</li> </ul> </li> </ul> <div style="text-align: center;">  <p>1st PPP Seminar in February 2018</p> </div>


<sup>1</sup> Details of the seminars are shown in Appendix 1-3(8).

Planned	Actual
	<ul style="list-style-type: none"> <li>● Hydrological technologies for planning and designing bridges were transferred in the hydrological seminar in November 2018</li> <li>● Japanese rules and regulations regarding safe and efficient use of construction machinery were introduced in the seminar in March 2019</li> <li>● Japanese PC bridge technologies were introduced, and related information was exchanged in JPCI seminar co-organized by the Project. <ul style="list-style-type: none"> <li>- 1<sup>st</sup> Seminar in March 2017</li> <li>- 2<sup>nd</sup> Seminar in October 2018</li> </ul> </li> <li>● Civil engineering technologies were introduced, and related information were exchanged in YTU/MES/JSCE joint seminars which were co-organized by the project. <ul style="list-style-type: none"> <li>- 1<sup>st</sup> Seminar in October 2017</li> <li>- 2<sup>nd</sup> Seminar in June 2018</li> </ul> </li> </ul> <p>&lt; through Governmental Meetings &gt;</p> <ul style="list-style-type: none"> <li>● Japanese policies and technologies needed for MOC were introduced in the Vice-Ministerial Level Meetings between Japan and Myanmar based on the idea of Long-term Experts. <ul style="list-style-type: none"> <li>- Vice-Ministerial Level meeting in March 2017</li> <li>- Vice-Ministerial Level meeting in March 2018</li> <li>- Vice-Ministerial Level meeting in February 2019</li> </ul> </li> </ul> <div> </div> <p style="text-align: center;">Vice-Ministerial Level meeting in March 2017</p> <p>&lt; through Lectures &gt;</p> <ul style="list-style-type: none"> <li>● Lectures about road and bridge policy and technologies were given in MOC training course by JICA Long-term Experts. <ul style="list-style-type: none"> <li>- 1<sup>st</sup> lecture in July 2017</li> <li>- 2<sup>nd</sup> lecture in May 2018</li> <li>- 3<sup>rd</sup> lecture in November 2018</li> </ul> </li> </ul>

Planned	Actual
	 <p>2nd lecture in May 2018</p>
<p>1-2. Provide necessary advice on a various issue related to the road and bridge sectors when consulted based on the information collected.</p>	<p>&lt;Advice in Emergency &gt;</p> <ul style="list-style-type: none"> <li>● Technical advices about reconstruction plan for RC slab were given, when severe damages were found in Pakokku Bridge in February 2017.</li> <li>● Technical advices were given about dismantlement plan for Myaungmya Bridge as well as reconstruction plan for the new bridge, and inspection plan for similar bridges, when it was collapsed in April 2018.</li> <li>● Technical advices were given about countermeasures for abnormal vibration on truss member, when it was found in Magway Bridge in June 2018.</li> <li>● Technical advices were given for reconstruction plan for Swa Chaung Bridge, when its substructure was sunk in September 2018.</li> </ul>  <p>Myaungmya bridge collapsed in April 2018</p> <p>&lt;Advice Daily&gt;</p> <ul style="list-style-type: none"> <li>● Political advices were given to MOC such as road master plan, bridge master plan, logistics master plan, road law, bridge law, road development scheme including PPP, construction machinery regulations, road and bridge numbering system,</li> </ul>

Planned	Actual
	<p>road and bridge data base system, organization enforcement, engineering training, vocational training, research, dispute board, etc., in accordance with MOC requests.</p> <ul style="list-style-type: none"> <li>● Technological advices were given to MOC such as “road planning and design” including geometric design, retaining wall design, road design criteria, and traffic demand forecast, “road maintenance” including traffic safety, road condition index, and road maintenance machinery, “bridge planning and design” including seismic design, hydrological design, wind tunnel testing and painting system, and “bridge maintenance” including inspection check sheet, inspection machinery, countermeasure for over load vehicle, and repainting work, etc., in accordance with MOC requests.</li> </ul>  <p>Site visit for construction machinery center in July 2017</p> <ul style="list-style-type: none"> <li>● Important technical document introduced such as “Specifications for Highway Bridges published by Japan Road Association and other engineering documents were found in bridge design section in MOC.</li> </ul>
<p>1-3. Propose prospective Japanese technical assistance for the road and bridge sectors.</p>	<p>&lt;Proposal for JICA Project for MOC&gt;</p> <ul style="list-style-type: none"> <li>● Suggestions were given to modify a few on-going projects in order to be in accordance with both Japanese assistance policy and realistic MOC needs such as Thilawa access road projects, Dawbon bridge project, Bago river bridge project, EWEC (Phase I and II) project, Yangon outer ring road project, etc.,</li> <li>● Proposals were given to start future projects such as next road and bridge capacity development project, next road and bridge construction project, tunnel construction project, Thuwunna Training Center (Central Training Center = CTC) upgrading</li> </ul>




Planned	Actual
	<p>project, etc., which are essential for MOC sustainable development.</p> <p>&lt; Arrangement with other projects &gt;</p> <ul style="list-style-type: none"> <li>● Arrangements were made to cooperate and avoid overlapping for efficient Japanese assistance with projects such as JICA SATREPS, JICA EEHE, JDS, NPO projects, Japanese private company projects, ADB projects KOICA projects.</li> </ul>  <p>Arrangement meeting with JICA SATREPS and Japanese private companies in December 2016</p>
<p>1-4. Introduce Japanese technical documents through seminars.</p>	<ul style="list-style-type: none"> <li>● Political and Technical documents were introduced in the training abroad, the seminars, the governmental meeting and the lectures (activity 1-1)</li> </ul>

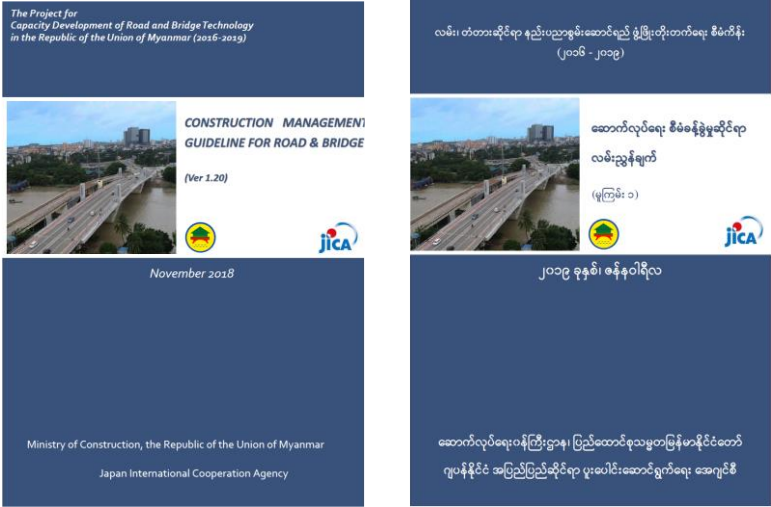
**(2) Output 2**

Following activities were undertaken to generate Output 2: The work process for quality and safety of concrete and bridge construction projects developed and enhanced.

**Table 2-14 Comparison of Activities (Plan and Actual) for Output 2**

Planned	Actual
2-1. Investigate the current condition of the overall capacity and the work process in MOC.	<ul style="list-style-type: none"> <li>● Baseline survey was conducted from May to October 2016.</li> <li>● Construction Management and its work-flow for DOB and DOH were investigated by JICA Expert.</li> <li>● “The Baseline Survey Report” was submitted in October 2016, through many site visits and MOC staff interviews.</li> </ul>
2-2. Introduce the outlines of construction management and the work process in Japan or other countries through workshops/ seminars and trainings.	<ul style="list-style-type: none"> <li>● Japanese guidelines of construction management were introduced in the lecture at CTC in July 2017.</li> <li>● Construction Management using FIDIC documents was introduced in the workshops in June, August, October 2017.</li> <li>● 9 times of Workshops for Construction Management were carried out with 6 CTs.</li> </ul> <div style="text-align: center;">  </div> <p style="text-align: center;">Workshop of Construction Management</p>
2-3. Draft the guideline on construction management methods and the work process to apply the technical documents developed by the Project.	<ul style="list-style-type: none"> <li>● The draft of the construction management guideline was developed and submitted to MOC in November 2017.</li> <li>● Construction management guideline was revised by CTs throughout the pilot project and confirmed by DOH and DOB. The Guideline was finalized after incorporating the comments from DOB and DOH in February 2019.</li> <li>● Work Process to utilize the Construction Management Guideline and Quality/Safety Control Manual were introduced in the Guideline.</li> <li>● The Guideline was translated to Myanmar Language in February 2019.</li> </ul>



	 <p style="text-align: center;"><b>Construction Management Guideline</b></p> <ul style="list-style-type: none"> <li>● The Guideline is authorized to be used by MOC in April 2019.</li> </ul>
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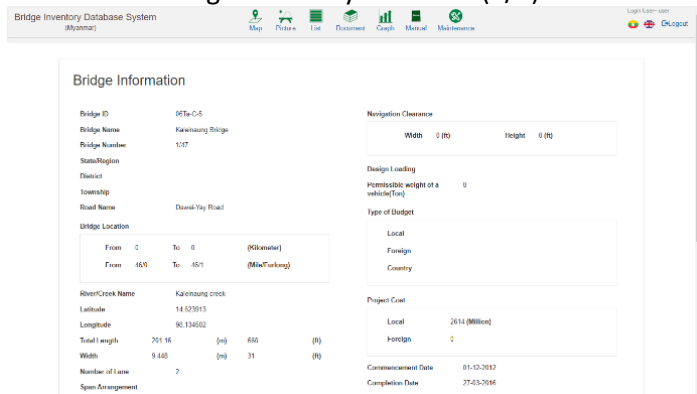
<p>2-4. Develop the bridge inventory (system framework and sample database) to keep documents and data necessary for maintenance.</p>	<ul style="list-style-type: none"> <li>● System for the Bridge Inventory Database was developed in July 2017.</li> <li>● Data server of the Bridge Inventory Database was installed at MPT Data Center in August 2017.</li> <li>● Workshops on how to input the data in the system were held in August 2017 with 3 CTs.</li> <li>● Data-input of bridge basic information was completed in February 2018.</li> <li>● Data-input of additional information such as drawings and completion report were completed in November 2018.</li> <li>● 943 Sample Bridge Data (Length is more than 55m) has been entered with relevant documents and photos.</li> <li>● Some minor modifications in the system have been requested by CTs for actual use for MOC in November 2018. These requests were discussed and incorporated to the current system during Stage-4 of the Project. (to be completed in the end of March 2019)</li> </ul>
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**Training of Bridge Inventory Database**



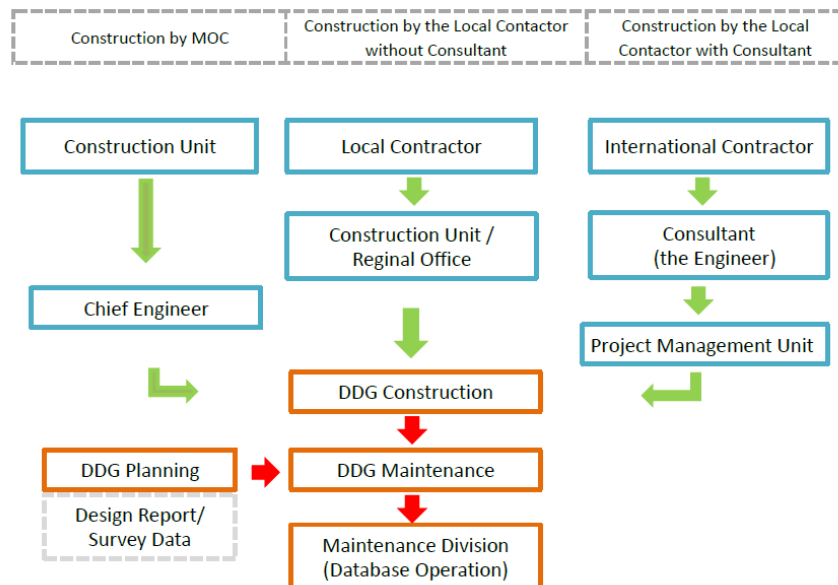
Bridge Inventory Database (1/2)



Bridge Inventory Database (2/2)

2-5. Draft the procedures to hand-over the as-built drawings, etc. from the construction dept. to the maintenance dept. when projects complete.

- Hand-over procedure work flow was introduced in the Construction Management Guideline submitted in November 2018.
- The documents to be handed over to maintenance section such as as-built drawings, completion report and design documents have been introduced in the Construction Management Guideline.



Handing-over Procedure introduced in CM Guideline

- Bridge Inventory Database System was developed to store as-built drawings and related construction document.

<p>2-6. Carry out on-the-job training on the construction management and the work process applying the contents of the procedures utilizing the selected pilot projects.</p>	<ul style="list-style-type: none"> <li>● On-the job training with pilot project was carried out from January 2018 to December 2018 for Concrete Structure, PC Girder, Steel Bridge, Bridge Foundation and Construction Safety.</li> <li>● Work process for quality control and safety control introduced in the guideline/manuals was applied to the Pilot Projects.</li> <li>● Data Recording by using Check List and Inspection Sheet introduced by the Project was applied to use at Pilot Project Site.</li> <li>● Training on Design Check for steel bridge was supplementary conducted during August to September, and November to December 2017.</li> </ul>
<p>2-7. Distribute the guideline and procedures to relevant organizations/offices/engineers through workshops/seminars.</p>	<ul style="list-style-type: none"> <li>● Series of Regional Seminar were carried out and the Guideline was introduced by CT to participants from MOC and other organization such as university and private contractor.</li> <li>● Magway City (February1, 2019) with 63 participants</li> <li>● Mawlamyaing City (February15, 2019) with 157 participants.</li> <li>● Myitkyina City (February 22, 2019) with 105 participants.</li> <li>● Nay Pyi Taw City (March 5, 2019) with 99 participants.</li> <li>● Yangon City as final seminar (April 5, 2019) with 77 participants.</li> </ul> <div> </div> <p>Regional Seminar in Magway</p> <div> </div> <p>Regional Seminar in Mawlamyaing</p>





Regional Seminar in Myitkyina



Regional Seminar in Naypyitaw



Regional Seminar in Yangon

2-8. Monitor the progress of the above activities and attainment & application of the technical contents periodically and report the results

- 5 Monitoring sheets were reported and officially approved by every JCC meeting (1<sup>st</sup> to 6<sup>th</sup>) as following schedule.
  - 1<sup>st</sup> JCC Meeting: November 8, 2018
  - 2<sup>nd</sup> JCC Meeting: June 9, 2017
  - 3<sup>rd</sup> JCC Meeting: November 10, 2017

to JCC.

- 4<sup>th</sup> JCC Meeting: June 19, 2018
- 5<sup>th</sup> JCC Meeting: November 29, 2018
- 6<sup>th</sup> JCC Meeting: April 9, 2019



2<sup>nd</sup> JCC Meeting in June 2017




5<sup>th</sup> JCC meeting in Nov. 2018


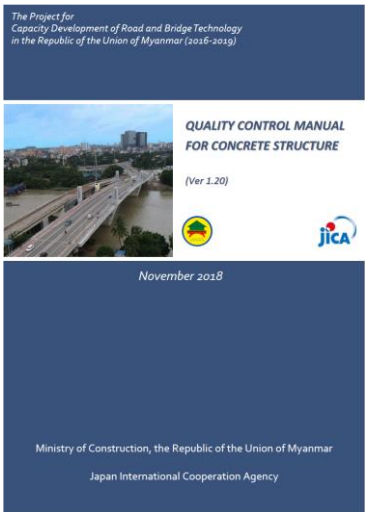

**(3) Output 3**





Following activities were undertaken to generate Output 3: The technical documents on quality and safety control for concrete and bridge construction are developed.

**Table 2-15 Comparison of Activities (Plan and Actual) for Output 3**

Planned	Actual
<p>3-1. Investigate the current condition of the existing technical documents of MOC.</p>	<ul style="list-style-type: none"> <li>● Baseline survey was conducted from May to October 2016.</li> <li>● Existing manuals and standards available at DOB and DOH were investigated by JICA Experts.</li> <li>● “The Baseline Survey Report” was submitted to MOC in October 2016, through several site visits and MOC staff interviews.</li> </ul>
<p>3-2. Introduce the outlines of construction supervision, the technical documents and the technologies used in Japan and other countries through workshops/ seminars and trainings.</p>	<ul style="list-style-type: none"> <li>● Japanese technical documents were introduced through the Workshops for manual development</li> <li>● Other ASEAN countries’ technical documents were also introduced through meetings in MOC.</li> <li>● The workshops on “Concrete Structure” were held fifteen (15) times.</li> <li>● The workshops on “PC Girder” were held thirteen (13) times.</li> <li>● The workshops on “Steel Bridge” were held fifteen (15) times.</li> <li>● The workshops on “Bridge Foundation” were held twenty-three (23) times.</li> <li>● The workshops on “Safety Control” were held seventeen (17) times.</li> <li>● The workshops on “design examination for steel bridge” were held twenty-one (21) times.</li> </ul> <div style="text-align: center;">  <p>Workshop on Safety Control</p> </div>



	 <p style="text-align: center;"><b>Workshop on Quality Control for Concrete Structure</b></p>
<p>3-3. Draft technical documents on construction supervision (quality and safety control for road and bridge construction).</p>	<ul style="list-style-type: none"> <li>• The draft of Quality (Concrete, PC Girder, Steel Bridge and Bridge Foundation) and Safety Control Manual was submitted to MOC in November 2017.</li> <li>• Quality and Safety Control Manuals were revised by CTs throughout the pilot project and confirmed by DOB and DOH. The manuals were finalized after incorporating the comments from DOB and DOC in February 2019 with translation to Myanmar Language.</li> <li>• The Quality and Safety Control Manuals were authorized in April 2019 to be officially used in MOC.</li> </ul> <div style="display: flex; justify-content: space-around;"> <div>  <p style="text-align: center;">November 2018</p> <p style="text-align: center;">Ministry of Construction, the Republic of the Union of Myanmar Japan International Cooperation Agency</p> </div> <div>  <p style="text-align: center;">၂၀၁၉ ခုနှစ်၊ ဇန်နဝါရီလ</p> <p style="text-align: center;">ဆောက်လုပ်ရေးဝန်ကြီးဌာန၊ ပြည်ထောင်စုသမ္မတမြန်မာနိုင်ငံတော် ဂျပန်နိုင်ငံ အပြည်ပြည်ဆိုင်ရာ ပူးပေါင်းဆောင်ရွက်ရေး အေဂျင်စီ</p> </div> </div> <p style="text-align: center;"><b>Quality Control Manual for Concrete Structure (English &amp; Myanmar)</b></p>
<p>3-4. Carry out on-the-job training on construction supervision utilizing the selected pilot project(s).</p>	<ul style="list-style-type: none"> <li>• On-the job training of “Concrete Structure” at pilot project site was held in February, March, and October 2018.</li> <li>• On-the job training of “PC Structure” at pilot project site was held from January to March 2018.</li> <li>• On-the job training of “Steel Structure” at pilot project site was held in March and April 2018.</li> <li>• On-the job training of “Bridge Foundation” at pilot project site was held from January to March 2018.</li> </ul>

	<ul style="list-style-type: none"> <li>● On-the job training of “Safety Control” at pilot project site was held from February to April 2018.</li> </ul> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>OJT for Concrete Structure</p> </div> <div style="text-align: center;">  <p>OJT for PC Girder</p> </div> </div> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p>OJT for Steel Bridge</p> </div> <div style="text-align: center;">  <p>OJT for Safety Control</p> </div> </div>
<p>3-5. Distribute the technical documents to the relevant organizations/offices/engineers through workshops/seminars.</p>	<ul style="list-style-type: none"> <li>● Series of Regional Seminar were carried out and the Guideline was introduced by CT to participants from MOC and other organization such as university and private contractor. (See Activity 2-7)</li> </ul>
<p>3-6. Monitor the progress of the above activities and attainment &amp; application of the technical contents periodically and report the results to JCC.</p>	<ul style="list-style-type: none"> <li>● Monitoring sheet was reported and officially approved by every JCC meeting. (See Activity 2-8)</li> </ul>



## 2.2 Achievement of the Project

### 2.2.1 Approach and Methodologies to Confirm the Achievement

Achievement of the Project was confirmed by and between MOC and JICA Experts by means of interviews to JCC Members, questionnaires/interview to 32 CTs and reviewing Monitoring Sheets (Ver.1 to 6: See Appendix 5). List of interviewees of JOC members is shown as below.

**Table 2-16 List of Interviewee to JCC Members**

Name (Title in JCC)	Position
U Shwe Lay (Vice Chairperson)	Director General, DOB
U Khin Maung Swe (Project Director)	Deputy Director General (Construction), DOB
U Kyaw Kaung Cho (Member)	Deputy Director General (Maintenance), DOB
U Thein Myint Mon (Project Manager)	Chief Engineer (Planning), DOB
Daw Thein Nu (Member)	Chief Engineer, DOB
U Thet Zaw Win (Member)	Director, DOH

### 2.2.2 Outputs and Indicators

Major deliveries under this output were listed in Table 2-17. Each achievement was confirmed in accordance with “Means of Verification” specified in PDM. (Text in [ ] show the Means of Verification.)

**Table 2-17 Major Deliveries under Each Output**

Narrative Summary	Objectively Verifiable Indicator	Achievements
Output 1: Advises to a broad policy matters and technical documents on road and bridge sectors provided.	1-1. The advises and the recommendations to MOC are practical and provided in a timely manner.	<p>[Activity reports, reports submitted to MOC]</p> <ul style="list-style-type: none"> <li>Activities including 11 Seminars, 4 Trainings in 3<sup>rd</sup> Country as well as 3 lectures/workshop which were conducted by Long-term-experts were confirmed through Project Monitoring Sheet (Ver.1~Ver.6) as shown in Appendix 5.</li> </ul> <p>[Interview to C/P]</p> <ul style="list-style-type: none"> <li>According to interview with JCC Members, several policies on PPP, Organization and Maintenance as well as engineering issues were effectively introduced and recommended through the activity of long-term experts, which encouraged the policy making to face current issues in MOC.</li> </ul> <p>[Others]</p> <p>Following daily activities were confirmed with JICA Long-term experts and MOC.</p>

		<ul style="list-style-type: none"> <li>• Political and technical documents including Japanese standard were submitted to MOC as needed.</li> <li>• Site visit reports were used to give advices to point out good and bad point in terms of quality and safety control at construction sites.</li> <li>• Some political and technical advices were given verbally in timely manner during meetings.</li> </ul> <p style="text-align: right;"><b>(Achieved)</b></p>																				
	<p>1-2. MOC increases the knowledge on selected policies and technical documents on road and bridges.</p>	<p>[List of technical documents introduced]</p> <ul style="list-style-type: none"> <li>• Following technical documents were provided under Output-1.</li> </ul> <table border="1"> <thead> <tr> <th>Title</th> <th>Publisher</th> </tr> </thead> <tbody> <tr> <td>Japan Industrial Standard, Iron Steel-I</td> <td>JISC</td> </tr> <tr> <td>Japan Industrial Standard, Iron Steel-II</td> <td>JISC</td> </tr> <tr> <td>Specifications for Design and Construction of Cable-Stayed Bridge and Extradosed Bridge 2012</td> <td>JPCI</td> </tr> <tr> <td>Guidelines for Maintenance of Prestressed Concrete Cable-Stayed Bridge and Extradosed Bridge 2012</td> <td>JPCI</td> </tr> <tr> <td>Specifications for Highway Bridges Part I Common, 2012</td> <td>JRA</td> </tr> <tr> <td>Specifications for Highway Bridges Part I I Concrete Bridge, 2012</td> <td>JRA</td> </tr> <tr> <td>Specifications for Highway Bridges Part I II Steel Bridge, 2012,</td> <td>JRA</td> </tr> <tr> <td>Specifications for Highway Bridges Part I V Substructure, 2012</td> <td>JRA</td> </tr> <tr> <td>Specifications for Highway Bridges Part V Seismic Design, 2012</td> <td>JRA</td> </tr> </tbody> </table> <p>JISC: Japanese Industrial Standards Committee JPIC: Japan Prestressed Concrete Institute JRA: Japan Road Association</p> <ul style="list-style-type: none"> <li>• All presentation data in the trainings abroad, the seminars, the governmental meetings and the lectures (as shown in Table 2-13) were handed over to MOC as technical documents by CD-R.</li> </ul> <p>[Results of post-seminar evaluation]</p> <ul style="list-style-type: none"> <li>• Through the PPP Seminar, not only principles and basic knowledge of PPP, but also practical case studies on expressway projects and housing by municipality in Japan were introduced to understand issues and measures of PPP system in Myanmar. The participants commented the</li> </ul>	Title	Publisher	Japan Industrial Standard, Iron Steel-I	JISC	Japan Industrial Standard, Iron Steel-II	JISC	Specifications for Design and Construction of Cable-Stayed Bridge and Extradosed Bridge 2012	JPCI	Guidelines for Maintenance of Prestressed Concrete Cable-Stayed Bridge and Extradosed Bridge 2012	JPCI	Specifications for Highway Bridges Part I Common, 2012	JRA	Specifications for Highway Bridges Part I I Concrete Bridge, 2012	JRA	Specifications for Highway Bridges Part I II Steel Bridge, 2012,	JRA	Specifications for Highway Bridges Part I V Substructure, 2012	JRA	Specifications for Highway Bridges Part V Seismic Design, 2012	JRA
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Specifications for Highway Bridges Part I V Substructure, 2012	JRA																					
Specifications for Highway Bridges Part V Seismic Design, 2012	JRA																					

		<p>seminar was practical and good reference. According to the JCC Members, the Seminar was practical enough to apply in Myanmar, for example for Yangon inner ring road project which is first PPP project for MOC, because PPP procedure is necessary due to limitation of budget for public works and necessity to speed-up its improvement.</p> <ul style="list-style-type: none"> <li>• Hydrological Seminar provided the hydrological and structural approach to find measures to damages by flood, river bed fluctuation and local scouring through site inspection of 2 actual bridges. Officers of Department of Metrology and Hydrology, Ministry of Transport were invited to discuss an importance of information sharing about meteorology and hydrology. According to the interview, participants commented that this seminar was useful for current situation of Myanmar suffering from heavy rain as well as flood and enhanced the capacity of hydrological approach to bridge planning. They said the related technologies were what MOC really needed and the rainfall analysis system has been used in design section, MOC.</li> <li>• The participants of Construction Machinery Seminar exchanged their opinions on trainings for machine operators and mechanics. Officers from MOC and MOAI, and Japanese private companies were invited. According to the comments from the participants after seminar, they learned the importance of capacity development of operators and mechanics.</li> </ul> <p style="text-align: right;"><b>(Achieved)</b></p>
Output-2: The work process for quality and safety of	2-1 The draft of the work process on quality and safety control for concrete	<p>[Draft of the work process]</p> <ul style="list-style-type: none"> <li>• Draft of the work process was introduced in the Construction Management Guideline and submitted to MOC in November 2018. Workflows</li> </ul>

<p>concrete and bridge construction projects developed and enhanced.</p>	<p>and bridge construction completed, submitted and reviewed.</p>	<p>were introduced in each quality control manual and safety control manual respectively.</p> <p>[Interviews to MOC]</p> <ul style="list-style-type: none"> <li>• It was confirmed through interview that Provisional version of the work process was duly recognized in MOC and its PDF data have been introduced at their official website since March 2019.</li> <li>• According to the questionnaire, 64% of CTs answered that most of the MOC officers at their sections recognized the importance of Manuals/Guideline (see 3.1.5(2)). Also, they answered that 64% of the Road/Bridge Construction Units recognized the importance of manuals as of February 2019. Since the Regional Seminar were held at 5 cities after the said questionnaire, much wider dissemination and recognition of manuals would be expected.</li> </ul> <p>[Samples of the bridge inventory]</p> <ul style="list-style-type: none"> <li>• Sample of Bridge Inventory Data (943 Bridges) together with Construction Data (Completion Report, As-built Drawing) were developed. Whole data input was carried out by CTs of Bridge Inventory Database and the system have been operational (from March 2019).</li> </ul> <p style="text-align: right;"><b>(Achieved)</b></p>
	<p>2-2 Trainings on work process for quality and safety control of concrete and bridge construction are carried out.</p>	<p>[List of participants and result of final examination, observation of his/her work on-site and attendance record etc.]</p> <ul style="list-style-type: none"> <li>• 6 of CTs and 3 extra MOC staff were participated to training of Construction Management as shown in list of workshops with attendance list at Appendix 1-3 (6). 5 of CTs passed final examination with sufficient understanding in February 2019 as shown in Appendix 1-3.(8).</li> <li>• 3 of CTs participated in training for Database Operation. All of them have passed Final Examination/Operation Test in the end March</li> </ul>


		<p>2019.</p> <ul style="list-style-type: none"> <li>• The CTs for Construction Management have performed as trainer at the Regional Seminars in 5 main cities from February to March 2019.</li> <li>• Work Procedure on Quality Control (Concrete Structure, PC Girder, Steel Bridge, Bridge Foundation) and Safety Control were exercised by respective CTs in accordance with workflow introduced in each manual.</li> </ul> <p style="text-align: right;"><b>(Achieved)</b></p>
<p>Output 3 The technical documents on quality and safety control for concrete and bridge construction developed.</p>	<p>3-1 The draft technical documents are completed, submitted and reviewed.</p>	<p>[Draft of the technical documents interview to MOC]</p> <ul style="list-style-type: none"> <li>• Draft of five (5) technical documents (Quality Control Manual for Concrete Structure, PC Girder, Steel Bridge, Bridge Foundation, and Safety Control Manual) were submitted in November 2018 and were approved in April 2019.</li> <li>• It was confirmed through interview that Provisional version of the Quality and Safety Control Manuals were duly recognized in MOC and its PDF data have been introduced at their official website since March 2019.</li> <li>• According to the questionnaire, 64% of CTs answered that most of the MOC officers at their sections recognized the importance of Manuals/Guideline (see 3.1.5(2)). Also, they answered that 64% of the Road/Bridge Construction Units recognized the importance of manuals as of February 2019. Since the Regional Seminar were held at 5 cities after the said questionnaire, much wider dissemination and recognition of manuals would be expected.</li> </ul> <p style="text-align: right;"><b>(Achieved)</b></p>
	<p>3-2 Trainings on construction management for quality and safety</p>	<p>[List of participants and result of final examination, observation of his/her work on-site and attendance record etc.]</p> <ul style="list-style-type: none"> <li>• Workshops was conducted and 24 CTs for</li> </ul>

	<p>control of concrete and bridge construction are carried out.</p>	<p>Concrete Structure, PC Girder, Steel bridge, Bridge Foundation and Construction Safety were trained by JICA Experts as shown in Appendix 1-3 (1) ~ (5).</p> <ul style="list-style-type: none"> <li>● JICA experts observed that CTs have enhanced their knowledge and motivation to improve Quality and Safety Control in MOC by On-site training through Pilot Project as listed in Appendix 1-3 (7). It was also observed through regional seminars carried out in 5 cities that ownership of CTs was remarkably enhanced by improving their presentation by themselves as well as by responding to questions from other MOC staff.</li> <li>● Final Examination was conducted in January and February 2019. All 24 CTs passed their Final Examination with sufficient understanding level as shown in 3.1.2(1).</li> </ul> <p style="text-align: right;"><b>(Achieved)</b></p>
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### 2.2.3 Project Purpose and Indicators

Achievement of the Project Purpose was observed as follows. Texts in [ ] show the Means of Verification specified in PDM.

**Table 2-18 Status of Achievement of Project Purpose**

[Project Purpose]: The capacity of MOC engineers on construction management for bridge and road construction enhanced.	
Indicators	Achievement
<p>1. The technical documents are distributed and ready to be used to all MOC offices.</p>	<p>[1-1 Observation by C/P and the experts]</p> <p>The contents of the technical documents have been finalized, and the provisional edition has been distributed at regional seminars. Draft of technical documents were delivered to all related office for their review. On 19<sup>th</sup> March 2019 MOC official letter signed by the Minister notified that the Construction Units of all over the country apply the Manuals. At the 6<sup>th</sup> JCC Meeting held in April 2019 the Minister of MOC declared the official authorization of the Manuals. In addition, it was agreed that the Manuals shall be applied to road and bridge construction implemented by MOC. PDF version of the Manuals is uploaded in official website of MOC (<a href="http://www.construction.gov.mm/constructionen/">http://www.construction.gov.mm/constructionen/</a>) to be widely applied outside of MOC as well.</p> <div style="border: 1px solid #ccc; padding: 5px; margin: 10px 0;">  </div> <p>[1-2 Record of project supervision]</p> <p>It was confirmed that activities on development of technical documents were described in Project Monitoring Sheet (Ver.2~Ver.6).</p> <p>[1-3 Interview to engineers participated in the workshops/seminars]</p>

<b>[Project Purpose]:</b> The capacity of MOC engineers on construction management for bridge and road construction enhanced.																																																																																							
<b>Indicators</b>	<b>Achievement</b>																																																																																						
	<p>According to the interview and questionnaires to CTs and JCC members, provisional version of the technical documents has been already distributed to regional offices and construction units.</p> <p style="text-align: right;"><b>(Achieved)</b></p>																																																																																						
2. The technical documents are used and applied by the state and regional offices of MOC where the pilot projects have been carried out.	<p>[2-1 Observation by C/P and the experts]</p> <p>The technical documents have been used and applied by all the state and regional offices of MOC where the pilot projects were carried out. Number of locations of the pilot projects was increased by eight (8) locations (11 in total) though original number of location was three (3), to enhance the understanding of CTs.</p> <p style="text-align: center;">Pilot Project Site</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>No.</th> <th>OJT Date</th> <th>Targeted Site</th> <th>Location of Site</th> <th>Purpose</th> </tr> </thead> <tbody> <tr> <td rowspan="3" style="text-align: center;">1</td> <td>Feb. 2018</td> <td>Sittaung Bridge</td> <td>Bago</td> <td>Pile Cap Concreting</td> </tr> <tr> <td>Oct. 2018</td> <td>Thu Ye Chaung Bridge</td> <td>Mandalay</td> <td>Pile Cap Concreting</td> </tr> <tr> <td>Dec. 2018</td> <td>Saw Ke Bridge</td> <td>Ayeyarwady</td> <td>Cross-Beam Concreting</td> </tr> <tr> <td rowspan="8" style="text-align: center;">2</td> <td>Feb 2017</td> <td>Baluchaung Bridge</td> <td>Kayah</td> <td>To check PC Girders</td> </tr> <tr> <td>Mar. 2017</td> <td>Saidu Bridge</td> <td>Magway</td> <td>Prestressing and Grouting</td> </tr> <tr> <td>Feb. 2018</td> <td>Taung Bwe Bridge</td> <td>Bagon</td> <td>Site General Condition</td> </tr> <tr> <td>Feb. 2018</td> <td>Bridge Special Unit (9)</td> <td>Bago</td> <td>Pretesting of Grouting</td> </tr> <tr> <td>Mar. 2018</td> <td>Taung Bwe Bridge</td> <td>Bago</td> <td>To check PC Ducts</td> </tr> <tr> <td>Mar. 2018</td> <td>Bridge Special Unit (9)</td> <td>Bago</td> <td>Pretesting of Grouting</td> </tr> <tr> <td>Mar. 2018</td> <td>Taung Bwe Bridge</td> <td>Bago</td> <td>Prestressing &amp; Grouting</td> </tr> <tr> <td>Nov. 2018</td> <td>Myaung Mya NewBridge</td> <td>Ayeyarwady</td> <td>Grouting Control Checking</td> </tr> <tr> <td rowspan="3" style="text-align: center;">3</td> <td>Mar. 2018</td> <td>Ngawon Bridge</td> <td>Ayeyarwady</td> <td>Steel Girder Erection</td> </tr> <tr> <td>Mar. 2018</td> <td>J&amp;M Steel Factory</td> <td>Yangon</td> <td>Fabrication Work</td> </tr> <tr> <td>Feb. 2019</td> <td>J&amp;M/MEC Steel Factory</td> <td>Yangon</td> <td>Fabrication Work</td> </tr> <tr> <td rowspan="3" style="text-align: center;">4</td> <td>Jan. 2018</td> <td>Taung Bwe Bridge</td> <td>Bago</td> <td>General Safety Measure</td> </tr> <tr> <td>Apr. 2018</td> <td>Ngawon Bridge</td> <td>Ayeyarwady</td> <td>Safety for bridge erection</td> </tr> <tr> <td>Nov. 2018</td> <td>Thilawa Access Road</td> <td>Yangon</td> <td>Safety Patrol List</td> </tr> <tr> <td rowspan="2" style="text-align: center;">5</td> <td>Feb. 2018</td> <td>Myaung Mya New Brg.</td> <td>Ayeyarwady</td> <td>Bored Pile, PC Pile &amp;PHC Pile</td> </tr> <tr> <td>Feb. 2019</td> <td>Attran Bridge (Sapalgu)</td> <td>Mon</td> <td>Bored Pile Works</td> </tr> </tbody> </table> <p>[2-2 Record of Project Supervision]</p> <p>Above activities of OJT through the Pilot Projects were confirmed with Monitoring Sheet (Ver 4 to 5) as shown in Appendix 5.</p> <p>[2-3 Interview to engineers participated in the workshops/ seminars]</p> <p>According to interview to CTs, the Manuals have been already used by some construction units for actual works. In addition, MOC has also been started to utilize the Manuals for their internal promotion examinations in DOB since February 2019.</p> <p style="text-align: right;"><b>(Achieved)</b></p>	No.	OJT Date	Targeted Site	Location of Site	Purpose	1	Feb. 2018	Sittaung Bridge	Bago	Pile Cap Concreting	Oct. 2018	Thu Ye Chaung Bridge	Mandalay	Pile Cap Concreting	Dec. 2018	Saw Ke Bridge	Ayeyarwady	Cross-Beam Concreting	2	Feb 2017	Baluchaung Bridge	Kayah	To check PC Girders	Mar. 2017	Saidu Bridge	Magway	Prestressing and Grouting	Feb. 2018	Taung Bwe Bridge	Bagon	Site General Condition	Feb. 2018	Bridge Special Unit (9)	Bago	Pretesting of Grouting	Mar. 2018	Taung Bwe Bridge	Bago	To check PC Ducts	Mar. 2018	Bridge Special Unit (9)	Bago	Pretesting of Grouting	Mar. 2018	Taung Bwe Bridge	Bago	Prestressing & Grouting	Nov. 2018	Myaung Mya NewBridge	Ayeyarwady	Grouting Control Checking	3	Mar. 2018	Ngawon Bridge	Ayeyarwady	Steel Girder Erection	Mar. 2018	J&M Steel Factory	Yangon	Fabrication Work	Feb. 2019	J&M/MEC Steel Factory	Yangon	Fabrication Work	4	Jan. 2018	Taung Bwe Bridge	Bago	General Safety Measure	Apr. 2018	Ngawon Bridge	Ayeyarwady	Safety for bridge erection	Nov. 2018	Thilawa Access Road	Yangon	Safety Patrol List	5	Feb. 2018	Myaung Mya New Brg.	Ayeyarwady	Bored Pile, PC Pile &PHC Pile	Feb. 2019	Attran Bridge (Sapalgu)	Mon	Bored Pile Works
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[Project Purpose]: The capacity of MOC engineers on construction management for bridge and road construction enhanced.	
Indicators	Achievement
<p>3. The maintenance records of bridges constructed through the pilot projects are submitted to the MOC headquarters for monitoring.</p>	<p>[3-1 Maintenance Record (Records to be used for Maintenance)] The pilot projects were carried out based on technical documents (quality/safety control manuals) and its results were recorded by using formatted inspection sheet/check list attached to the technical documents under the instruction of JICA Experts. These records will be utilized for future maintenance.</p> <p>[3-2 Observation by C/P and experts] The system/procedure for data recording and document controlling has been introduced in the construction guideline to be utilized for maintenance in the future. The data on quality control as well as construction documents such as shop drawings are supposed to be recorded in Database System at Maintenance Section in MOC Head Office in accordance with handing over procedure introduced in the Construction Guideline for future maintenance.</p> <p style="text-align: right;"><b>(Achieved)</b></p>

### 2.3 Revision of PDM

PDM was revised based on the requirement that was confirmed according to progress of the Project. The history of the revision is shown below.

Version	Date	Amendment of PDM
Version 0	17 <sup>th</sup> October 2014	Original
Version 1	8 <sup>th</sup> November 2016	[Amendment] <ol style="list-style-type: none"> <li>1) Objectively Verifiable Indicator for Overall Goal was amended.  “At least XX% of the bridges and concrete structures constructed complying the technical documents.” →  <b>“All bridges and concrete structures constructed after the end of this Project complying the technical documents.”</b></li> <li>2) Means of Verification was amended.  “List and record of bridges and road constructed” →  <b>“List and record of bridges and road constructed as well as their complying technical documents”</b></li> </ol>
Version 2	9 <sup>th</sup> June 2017	[Amendment] Inputs 1. Experts (2) Short-term Experts “Design Examination (Steel Bridge)” was added.
Version 3	10 <sup>th</sup> November 2017	[Amendment] Inputs 1. Experts (2) Short-term Experts “PPP Policy” was added.
Version 4	20 <sup>th</sup> June 2018	[Amendment] Inputs 1. Experts (2) Short-term Experts “River Planning,” “River Structure” and “Bridge Planning” were added.

## Chapter 3 Results of Joint Review

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### 3.1 Results of Review based on DAC Evaluation Criteria

In accordance with the Project Monitoring and Evaluation System of JICA, the Project was evaluated in light of five evaluation criteria of Relevance, Effectiveness, Efficiency, Impact and Sustainability by the joint review used the following categories; Very High, High, Fair, Low. Then the total project evaluation rate would be given by Highly Satisfactory/Satisfactory/Partially satisfactory/Unsatisfactory.

Based on joint evaluation for DAC Evaluation Criteria, the Project was rated as **Highly Satisfactory**.

(Evaluation result of sub-criteria, Relevance: Very High, Effectiveness: High, Efficiency: High, Impact: Very High, Sustainability: High)

#### 3.1.1 Relevance

The Project remained relevant to Myanmar's development policies and Japanese ODA policies. It also corresponds to needs of C/P organizations. Thus, relevance is "**Very High**".

##### (1) Relevance with the Policy of Myanmar

The Government of Myanmar announced "the Myanmar Sustainable Development Plan (MSDP)" in 2018 consists of following 5 Goals, which provides a long-term vision aiming at a peaceful, prosperous and democratic country. Among these goals, one of the strategies is aiming building of a priority infrastructure base that facilitates sustainable growth and economic diversification.

According to National Transportation Master Plan (MYT-Plan) formulated in 2014 with target year 2030, provides corridor-based transportation infrastructure is going to be developed. Especially, the largest investment (11,660 Billion MMK = approximately 7,582 Million USD<sup>2</sup>) up to 2030 has been scheduled for Road Sector for which MOC shall be responsible. In order to develop such huge scale of infrastructure, the capacity development in quality and safety control are highly relevant with the Policy of Myanmar.

##### (2) Relevance with the Assistance Policy of Japan

According to the Country Assistance Policy to Myanmar issued in April 2012, sustainable infrastructure development is one of the priority areas. In addition, Japan-Myanmar Cooperation Program announced in 2016 explained that Japan fully supports Myanmar's policy of promoting "balanced development among states and regions" to provide an economic buttress to national reconciliation, and that 9 major Programs shall be formulated by close coordination with Governments of Japan and Myanmar to find out priority areas and sequences of projects. "Strengthening of transportation infrastructure to connect urban and rural areas" which has been proposed as one of the major programs out of above mentioned 9 Programs, consists of five (5)

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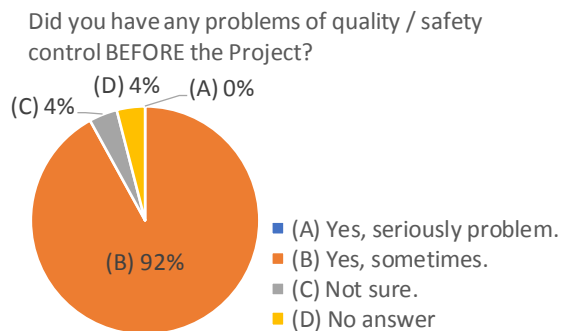
<sup>2</sup> 1USD = 1,537.80 MMK (May 2019)

sub-programs includes “human resource development” for infrastructure. The Project is therefore deemed in-line with the Japanese policy and strategies.

**(3) Relevance with the Needs of C/P**

According to the questionnaire by the Project Team, 92% of CTs feel that they had problems of quality/safety control before the Project (see Figure 3-1). Although there were many standard books such as AASHTO, BS and JIS, there was no official guideline specifically for Myanmar. MOC engineers sometimes had to focus on facilitate progress and shorten the time schedule to complete construction work by the instructed period, which caused less priority in quality and safety control.

According to the interview to CTs, some of engineers working at construction site have understood that quality/safety control is not their own responsibility but the responsibility of quality control section of head office including BRL. Thus, quality control as well as safety control were not performed systematically but depending on the skills in engineers at site. The Project was aiming to improve such situation with systematic quality/safety control by using manuals and guidelines, and this output is highly relevant with the needs of MOC.



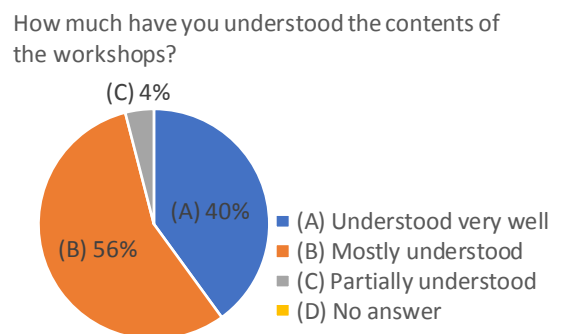
**Figure 3-1 Result of Questionnaire to CTs (1)**

**3.1.2 Effectiveness**

Based on following observation, the Effectiveness of the Project was evaluated as “**High**”.

**(1) Understanding Level of C/P**

According to the questionnaire to CTs, 96% answered, as shown in Figure 3-2, that they understood the contents of the workshops in each field (see Figure 3-2). In addition, many other MOC officials recognize and understand importance of the Manuals (see Figure 3-3, Figure 3-4). The results of final examination to CTs shown their well understandings (85 – 98%) to the contents of the Project (see Table 3-1). Regarding MOC officers other than CTs, also it can be said that the Project was effective due to the Regional Seminar feedback that more than 50% of the participants felt that they found the Manuals and the Guideline were understandable and practical to their work (see Figure 3-5).



**Figure 3-2 Result of Questionnaire to CTs (2)**

How much of the officers at your office have recognized the importance of Manuals / Guideline?

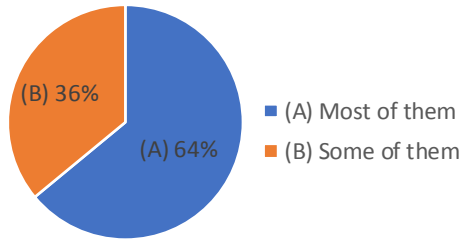


Figure 3-3 Result of Questionnaire to CTs (3)

How much of the Road/Bridge Construction Units have recognized the importance of Manuals / Guideline?

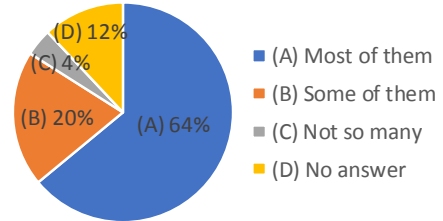
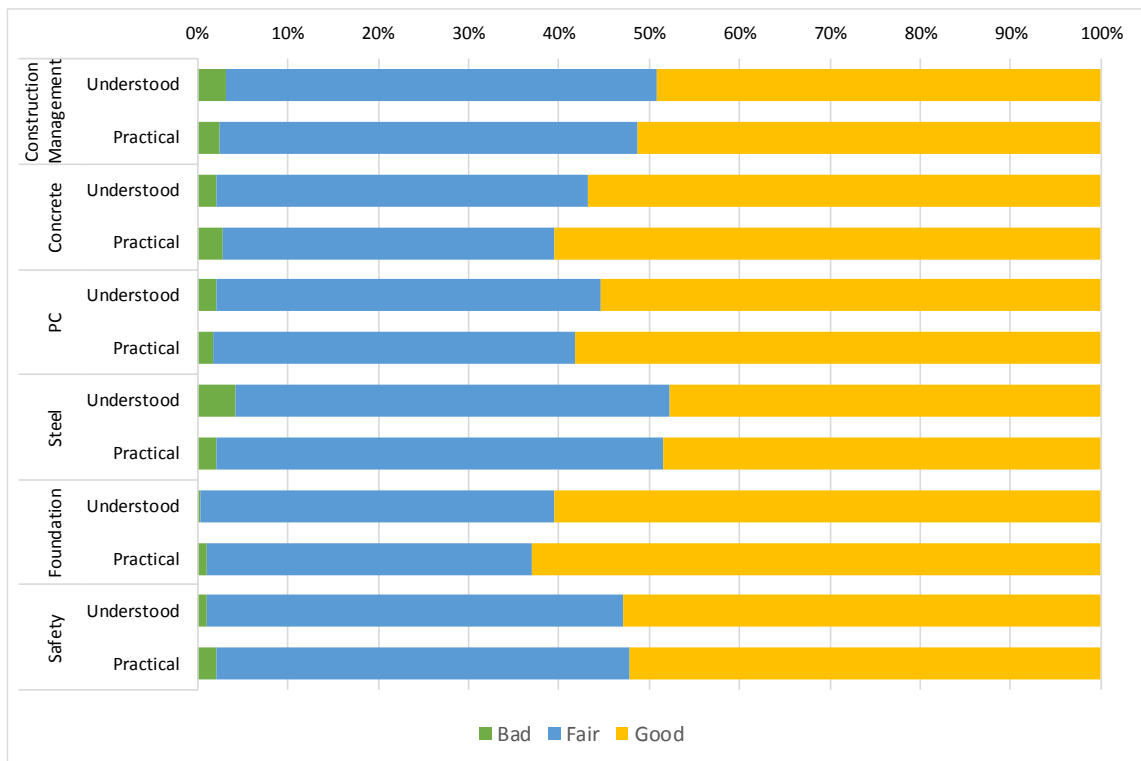


Figure 3-4 Result of Questionnaire to CTs (4)

Table 3-1 Result of Final Examination

No.	Name	Subject	Score	Rate	Average
1	Daw Yin Yin Swe	Concrete Structure	19/20	95	98
2	Daw Myo Min Aye	Concrete Structure	19/20	95	
3	Daw Cho Mar Oo	Concrete Structure	20/20	100	
4	Daw Khin Moe Moe	Concrete Structure	20/20	100	
5	Daw Hnin Yu Aung	Concrete Structure	19/20	95	
6	Daw Thae Phyu Phyu Moe	Concrete Structure	20/20	100	
7	U Soe Thiha	Concrete Structure	20/20	100	
8	Daw Su Myat Sandi Thaw	Concrete Structure	20/20	100	95
9	U Tin Maung Htwe	PC Bridge	20/20	100	
10	Daw Theint Han Su Kyaw	PC Bridge	19/20	95	
11	U Thura Thant	PC Bridge	18/20	90	90
12	U Kyaw Myo	Steel Bridge	17/20	85	
13	U Thet Wai Aung	Steel Bridge	19/20	95	
14	Daw Than Aye	Steel Bridge	18/20	90	96
15	Daw Ei Htwe San	Bridge Foundation	19/20	95	
16	Daw Nant Tar Hmawe	Bridge Foundation	19/20	95	
17	U Myo Thet Tun	Bridge Foundation	19/20	95	
18	Daw Yu Yu Naing	Bridge Foundation	20/20	100	85
19	U Soe Lwin	Safety Control	17/20	85	
20	U Zaw Thu Lin	Safety Control	16/20	80	
21	U Shin Thant Htut	Safety Control	19/20	95	
22	Daw Thwe Thwe Tun	Safety Control	16/20	80	
23	Daw Theingi Min Thu	Safety Control	18/20	90	
24	Daw Aye Aye Khaing	Safety Control	16/20	80	93
25	Daw Ei Ei Myo	Construction Management	20/20	100	
26	Daw Sandar Win	Construction Management	20/20	100	
27	Daw Aye Tar Tar Htut	Construction Management	15/20	75	
28	Daw Moe Moe Khaing	Construction Management	19/20	95	97
29	U Ko Ko Naing	Construction Management	19/20	95	
30	Daw Ei Ei Nyein	Bridge Inventory Database	20/20	100	
31	Daw Phyo Thandar Win	Bridge Inventory Database	19/20	95	
32	Daw Tin Thuzar Win	Bridge Inventory Database	19/20	95	



**Figure 3-5 Result of Questionnaire to Participants of Reginal Seminars<sup>3</sup>**

**(2) Figure Other Effect**

The important fact is that the Manuals (provisional version) were already disseminated not only at Regional Seminars but also to their co-workers by the initiative of the JCC members and CTs beyond of project activity even before its approval. Through these events, it was observed some extra effects beyond of project output through the interview to JCC Members.

- 1) Manual has been already applied at actual construction site other than the pilot project. Many site engineers have already studied these manuals. According to the interview, MOC decided to apply the Manuals to the construction project of Dala Bridge, implemented by Korea.
- 2) CTs from MOC Head Office started to positively point out the issue at the construction site because they are confident on their knowledge on quality/safety control.
- 3) Mind-set of many engineer has been drastically shifted from schedule first to quality/safety first at many construction sites.
- 4) Following changes which is a part of the improvement have been observed by JICA Experts during the Project (see Table 3-2).

<sup>3</sup> Total of the results of 5 seminars

**Table 3-2 Improvement Observed by JICA Experts during the Project**

Work Item	Changes/Improvements
Concrete Work	<ul style="list-style-type: none"> <li>Concrete Pouring Procedure (layer control, joint control) is improved and Pouring Depth is controlled within 50cm.</li> <li>Chloride Contents and Air Contents are newly measured at construction sites.</li> <li>Material stock condition is improved.</li> </ul>
PC Bridge	<ul style="list-style-type: none"> <li>Grouting Quality Test (Flow Corn Test) has been already conducted several construction sites.</li> <li>Stressing Control Chart is utilizing for proper tensioning control.</li> </ul>
Steel Bridge	<ul style="list-style-type: none"> <li>Trial assembling test was initiated at workshop</li> <li>Steel Bridge Inspection Team started inspection for painting, welding and dimension for every steel bridge.</li> <li>MOC staff participate in the test on painting, welding and dimension check.</li> </ul>
Bridge Foundation	<ul style="list-style-type: none"> <li>Bentonite slurry sedimentation is well controlled during drilling for bored pile.</li> <li>Re-bar cage work for CIP pile such as spacer and diaphragm installation was appropriated.</li> <li>Pile head re-bar is protected/coated to prevent the heavy rust.</li> </ul>
Construction Safety	<ul style="list-style-type: none"> <li>PPE of workers at small bridge site is improving very much.</li> <li>Contents of Safety Signboard is changed in accordance with the new manual.</li> </ul>

5) MOC has established Special Inspection Unit for Steel Bridge composed of CTs and Staff of Quality Control Section since 2018. The unit started inspection of every steel bridge at fabrication process, which had been difficult for the Construction Units to carry out.

Based on the situation from 1) to 5) above, it deemed that the Project activity was effectively performed to achieve the project purpose.

**3.1.3 Efficiency**

Efficiency of the Project was evaluated as “High” based on following aspects.

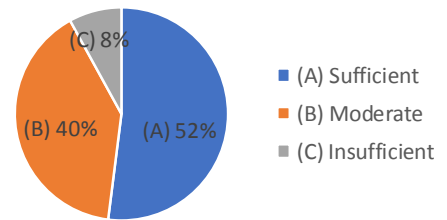
**(1) Efficiency of Inputs from Japanese Side**

Inputs from Japanese side (dispatch of experts and their implementation of the Project and C/P training in Japan, etc.) have been appropriately done in general, in terms of their quantity, quality and timing.

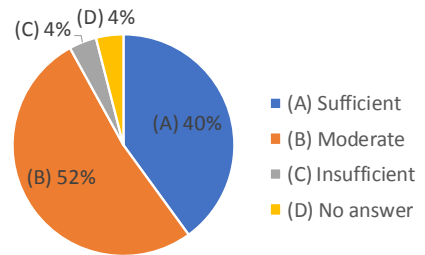
**1) Input of Project Team**

The result of the questionnaire to the CTs shows that more than 90% of them are satisfied with the time taken for workshops and OJT. All CTs answered that communication with the Japanese experts was

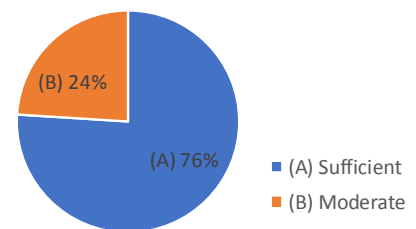
Time for workshops of development of manual / guideline was;



Time for OJT was;



Communication with Japanese experts was;



**Figure 3-6 Result of Questionnaire to CTs (5)**

sufficient or moderate (see Figure 3-6). Many of JCC members interviewed felt that dispatches of their fields of expertise, duration and timing were appropriate. On the other hand, some CTs pointed that assignment of short-term expert was shorter than their expectation so that it was difficult for CTs to communicate with the short-term experts to suffice their interest.

## 2) Collaboration of the Long-term Experts and the Short-term Experts

Two (2) long-term experts dispatched with resident assignments and short-term experts share their roles on capacity development of MOC, which facilitated building up close relationship with MOC. Long-term experts dealt with a number of issues in timely manner due to their daily communication with MOC. They facilitated the short-term experts' activities with adequate discussion with the CTs even when the short-term experts were not assigned on selection of CTs or pre-departure meeting for Japan Training.

Short-term experts, based on advice and information from the long-term experts, implemented the activities such as development of the Manuals or OJT at pilot projects efficiently with their limited assignments.

Since the long-term and short-term experts shared information at all times, they were successful to implement provision of information and technical transfer required from MOC.

## 3) Implementation of the Project in accordance with the 4 Stages of the Project

The Project has been separated into 4 stages according to the target of project activities (see Table 3-3). 1<sup>st</sup> stage was to confirm the current situation and capacity of MOC as Baseline survey. 2<sup>nd</sup> stage was focused on development of manuals and guidelines based on the Baseline survey of 1<sup>st</sup> stage. 3<sup>rd</sup> stage was used for implementation of construction through pilot project to ensure knowledge of CTs would be practical. 4<sup>th</sup> stage was for dissemination of knowledge to other MOC engineers. These time frames were successfully implemented and step by step achievement was periodically confirmed at JCC meeting during the project. Since the goals and outputs of each stage were clearly defined, the 36 months of Project was implemented smoothly with periodical confirmation of progress and achievements.

**Table 3-3 Implementation of the Project in accordance with Each Stage**

Year		2016			2017				2018				2019	
Term		II	III	IV	I	II	III	IV	I	II	III	IV	I	II
Month		4~6	7~9	10~12	1~3	4~6	7~9	10~12	1~3	4~6	7~9	10~12	1~3	4~6
STAGE	[STAGE-1] Baseline Survey													
	[STAGE-2] Development of Construction Supervision System (CSS)													
	[STAGE-3] Implementation of Pilot Project & OJT													
	[STAGE-4] Dissemination of Technology in Construction Supervision													
Milestone		★	★			★					★	★		
		May 2016 Kick Off of the Project	October 2016 Finalization of PDM			November 2017 C/P understands Technical Guidelines.					November 2018 C/Ps are able to perform the CSS according to the Work Flow.		April 2019 CSS is officially approved by MOC in Myanmar	



#### 4) Training of Trainers (TOT) Method

Huge number of employees at DOB and DOH needed to be trained and their capacity had to be developed through the Project. To achieve the accomplishment, Training of Trainers (TOT) Method was introduced to the Project. CTs were selected by MOC for each subject and trained by JICA experts through concentrated training. After that, the CTs took an initiative on OJT of construction supervision under the pilot projects and played a role of the Trainer during regional seminars for introduction of the Manuals developed by the Project. As a result, although the number of CTs directly learned from the JICA experts was 32, the Regional Seminars by TOT method introduced the Manuals to more than 500 engineers. Moreover, CTs already implemented trainings for dissemination of the Manuals even outside of the Project activities. TOT method improved efficiency of the Project with the effects below.

##### <Effects from TOT Method>

- Better understanding for site engineers due to lectures in mother language.
- Understanding of CTs themselves is facilitated due to their presentations.
- Ownership of C/Ps was fostered.
- Contents of the Manuals were transferred to a large number of engineers.
- Sustainable training mechanism in the future was developed.

#### 5) Relation with other JICA Projects in Myanmar

The Project has not only been implemented by itself but also has collaborated with other JICA projects, which resulted in extension of the Project outputs. For example, at the beginning of the Project “Development of a Comprehensive Disaster Resilience System and Collaboration Platform in Myanmar” (SATREPS) and the Project Team shared information each other about bridge inventory database. At YTU-MES-JSCE Joint Seminar organized by “Project for Enhancement of Engineering Higher Education in Myanmar” (EEHE) in Yangon in October 2017 the Project Team introduced summary of the Project and contents of the Manuals. In May 2018 the Project Team and the CTs, collaborated with “Bago River Bridge Construction Project” and “East-West Economic Corridor Improvement Project,” joined Myaung Mya bridge inspection after its collapse accident. CTs of safety control shared information to incorporate the checklist of “the Project for Construction of New Thaketa Bridge” into the Manuals. In November 2018 OJT of “safety patrol by checklist” was implemented at the site of “Infrastructure Development Project in Thilawa Area.”

#### 6) C/P Training in Japan

The Project has implemented three (3) times of training in Japan, based on the following concepts in accordance with the progress of the Project (see Table 3-4).

**Table 3-4 Concepts of Japan Training**

Training	Participants	Concepts
1st Training in November 2017	9	To widely cover general issues on construction quality and safety such as procurement system, construction sites by road administrators and application of precast concrete/steel products to develop the Manuals efficiently.
2nd Training in	7	To recognize the difference between quality/safety control on OJT at the

May 2018		Pilot Project sites and in Japan by widely inspecting Japanese construction sites to learn practical work of quality/safety control at construction sites.
3rd Training in November 2018	17	To learn Japanese institutional systems for quality/safety control for sustainability of the Project outputs. To learn policies and current situation of road and bridge maintenance and repair work in Japan.

After each training the CTs presented what they learned and their action plans at each the JCC meeting. At stage 4, to share these outputs in detail with other CTs, Project Team supported to hold discussion meetings with all CTs to share the presentations in Yangon and Nay Pyi Taw. In addition, the CTs developed a report of Training in Japan to share detail contents that they studied in Japan with all CTs. Moreover, the report was submitted to Director General of DOB and DOH as well as all other MOC officers, because the contents of Japan Training contain introduction of institutional systems in Japan, which shall be referred for development of institutional systems in Myanmar.



Meeting about Japan Training in Yangon



Meeting about Japan Training in Nay Pyi Taw

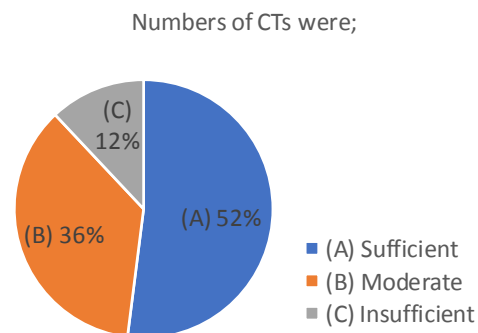
**(2) Efficiency of Inputs from Myanmar Side**

**1) Assignment of Core Trainers**

MOC finally assigned 32 CTs to 6 subjects of capacity development. Totally 88% of them feel that the number of CTs was sufficient (see Figure 3-7).

**2) Pilot Project for OJT**

MOC initially selected three (3) pilot projects directly implemented by MOC for OJT of each capacity development activities. During the 3<sup>rd</sup> Stage of the Project, the 3 sites came out to be insufficient for OJT because of difficulties to arrange the schedule of the JICA Experts, the CTs and the construction sites. Hence, subsequently, MOC determined to increase sites to eleven (11) to enhance the training on site. OJT was enhanced due to this flexible arrangement by MOC.



**Figure 3-7 Result of Questionnaire to CTs (6)**

**3) Project Expenditures**

PDM of the Project states that the Myanmar side inputs local cost; CTs’ expenses of workshops/seminars, trainings in Myanmar including travel expenses, allowance etc. On the other hand, expenses for transportation related to OJTs and regional seminars were sometimes faced difficulties to expenditure due to their account system.

**3.1.4 Impact**

Impact was rated as “**Very High**” due to following observations.

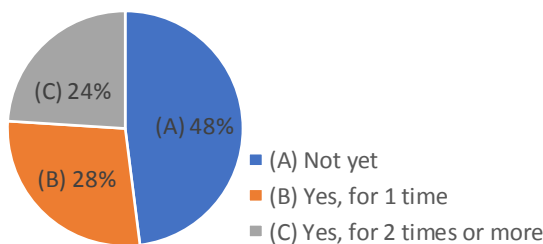
**(1) Prospect for Achievement of Overall Goal**

The biggest impact of the Project to the overall goal is that the Manuals were distributed to all the Construction Units and achieved more diffusion by official authorization at the final JCC Meeting. Besides, even before the authorization, many of the CTs had started dissemination of the Manuals by their own initiatives. As a result, budget for quality/safety control is being increased, especially at new large-scale sites. Moreover, establishment of Steel Inspection Team for factory inspection should be added as one of the big impacts. Core Trainers has already started lectures about the Manuals, at Central Training Center (CTC) and the CTs are in main trainer. According to questionnaire, 32% of CTs already started to disseminate the Manuals even outside of CTC (see Figure 3-8 and Figure 3-9). These aspects would give large impact to the achievement of the Overall Goal. With following aspects impact for overall goal will be satisfied (see Table 3-5).

**Table 3-5 Prospects for Achievement to the Overall Goal**

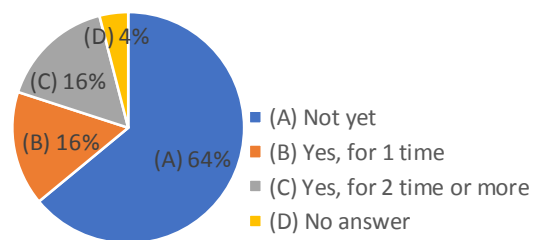
Overall Goal	Impacts to Overall Goal	Conditions to satisfy Overall Goal
Quality of bridges and concrete structures constructed or managed by MOC are improved	The Manuals were authorized.	Condition of contract or technical specification needs to refer the Manuals
	<ul style="list-style-type: none"> <li>● CTs has disseminated their knowledge to almost 500 engineers through Regional Seminars.</li> <li>● Lectures of the Manuals started at CTC.</li> </ul>	Periodical training needs to be continued
	Budget for Quality and Safety Control is being increased.	Systematic cost estimate to secure sufficient budget
	Steel Bridge Inspection Team has been organized for factory inspection.	Keep inspection

Have you had opportunities to give lecture about the Manual / Guideline at Central Training Center?



**Figure 3-8 Result of Questionnaire to CTs (7)**

Have you had opportunities to teach about the Manual / Guideline at OTHER THAN Central Training Center?



**Figure 3-9 Result of Questionnaire to CTs (8)**

**(2) Other Impacts**

The Manuals are supported to be diffused to other central ministries, local governments including YCDC and private sector. Thus, QC will be expected to be applied outside of MOC. According to interview to CTs, it is also possible that some technologies introduced in the Manuals, such and quality control of grout materials, would be applicable for bridge maintenance, which is crucial issue in MOC. Bridge Inventory Database System will be also utilized for the maintenance purpose. In conclusion, the impacts of the Project expanded beyond the improvement of construction quality/safety by MOC.

**3.1.5 Sustainability**

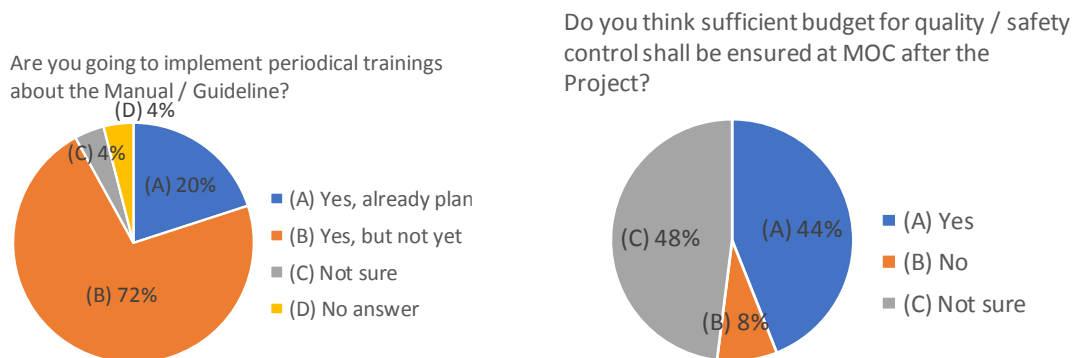
Sustainability of the Project shall be rated as “**High**” based on following observations.

**(1) Policy Aspects**

As introduced in the “Relevance”, the current policy and strategy of Myanmar continues to prioritize the development of road infrastructure. It would not be expected any changes on this policy for time being because of high demand of infrastructure development.

**(2) Institutional and Technical Aspects**

Through Project activities, the Manuals and bridge inventory database system have been developed, and knowledge and skills of C/Ps especially CTs have been enhanced. That is basis for accumulating knowledge/skills already transferred in MOC has been established. 32 CTs have already started to teach the contents of the Manuals and the Guideline at CTC and their own construction sites, meanwhile MOC has already tried to apply the Manuals for textbook of their official promotion examinations. Result of Questionnaire to CTs about the current situation of institutional and technical aspects is shown in Figure 3-10.



**Figure 3-10 Result of Questionnaire to CTs (9)**

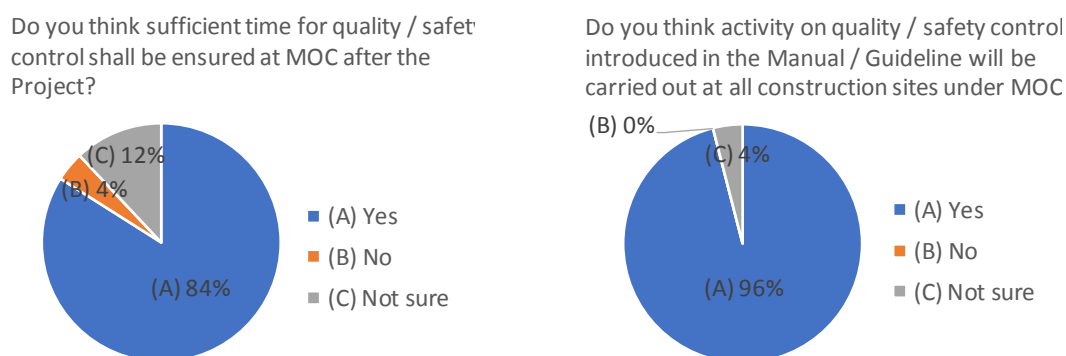
While the Corporatization of Construction Units in MOC has scheduled to start in 2019 is expected to be a big change for institutional system of MOC, the independence of the Employer and the Contractor would improve their construction management system in terms of quality assurance. The Manuals and CTs are expected to sustain the outcomes of the Project. As for the bridge inventory database system, it would be maintained by the Maintenance Section of DOB. MOC is

required to assign the staff to maintain and update the database, and to allocate sufficient budget for the system maintenance, which has been already secured for the fiscal year of 2019.

According to the interview, MOC is planning to newly establish the Research and Training Department, and technical documents, information and manuals would be maintained by this new department. Since each manual was developed by the Project in corroboration with CTs, respective CTs are expected to be core member for future revision/upgrade of the Manuals.

**(3) Financial Aspects**

To ensure the work for quality and safety control, certain amount of budget shall be preferentially secured by MOC for each construction project. Some construction the CTs concerned, have already procured the equipment for quality control newly introduced by the Project such as flow cone test set and chloride content test strip. In addition, according to the interview to JCC member, some construction sites have started to increase budget for safety control, which is approximately 5% of the construction cost. Such information shall be shared in MOC to standardize the required budget/cost for quality and safety control for construction in Myanmar. To allocate the sufficient budget for quality and safety control, MOC needs to collect information on expense for respective activity from construction site. Result of Questionnaire to CTs about financial aspects is shown in Figure 3-11.



**Figure 3-11 Result of Questionnaire to CTs (10)**

**3.2 Key Factors Affecting Implementation and Outcomes**

Followings are the affecting factors observed.

**(1) Quality Control Testing**

Sufficient and accurate quality control testing should be available in timely manner. Necessary equipment was already installed at Bridge Research Laboratory, which has supported quality control testing for the Project as well. Some missing equipment which is essential for quality control at site (Chloride contents test strips, Concrete air meter and grout flow cone set) was purchased under the Project and technical transfer has been implemented. During the Project DOH developed Mini-Laboratories in each state and region. Environment for quality control testing with certain equipment is has been improving.

**(2) Sufficient Budget for Activities to Ensure Quality and Safety Control**

MOC has expensed for activities of the Project, such as travel expenses and accommodation charges, which contributed smooth implementation of the Project.

**(3) Periodical Training by the Myanmar side**

Trainings with the Manual have started at the Central Training Center. Periodical Trainings have already been in implementation started by MOC by themselves.

**(4) Smooth Selecting of Pilot project site**

As stated in 3.1.3 (2), MOC selected 3 pilot projects in timely manner. That smooth selection of pilot project contributed to implement OJT of each capacity development activity in timely manner. In addition, the number of pilot project site was flexibly increased by 11 sites (including factory inspection) responding to requirement of MOC to supplement the lack of on-site training for CTs, which facilitated their understanding of quality and safety control work.

**3.3 Evaluation on the Results of the Project Risk Management**

**(1) Change in personnel in JCC Member**

The Minister and Permanent Secretary, who had supported the kick-off of the Project were transferred and replaced during the Project period. However, there was no negative effect on the project due to continues support by Project Director (DG of DOB) and other JCC members.

**(2) Regional Security Issues**

In Myanmar some of the states and regions have security problems, such as conflicts with ethnic minority in border areas. The Project avoided these areas to implement pilot projects, regional surveys and seminars to exclude such security issues.

**(3) Involvement of DOH**

In accordance with the necessity to enhance DOH's ownership, CTs of DOH were increased in the 2nd year of the Project. Additional workshops were held for them to catch up on forgoing CTs and the long-term and short-term experts followed up their self-study by providing additional workshops.

**3.4 Lessons Learnt**

**(1) Regional Seminar by Core Trainers (CTs)**

Regional seminars for dissemination of the Manuals were held in 5 cities by the CTs to widely disseminate the Manuals in Myanmar. As a result, the seminars have successfully contributed to more than 500 engineers participated to respective regional seminar not only from MOC but other agencies and the private sector<sup>4</sup>. It concludes that the approach for Capacity Development through CTs (TOT Method, stated in 3.1.3(1)4)) would be quite appropriate to develop the capacity of CTs, and to widely disseminate the knowledge to other engineers as well.

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<sup>4</sup> Organization participated: Ministry of Transport and Communications (MOTC), Ministry of Agriculture, Livestock and Irrigation (MALI), Regional Government (YCDC MCDC, NCDC, Magway Regional Government, Mon Regional Government, Kachin Regional Government, Rakhine Regional Government), YTU, MTU and MES (to be updated after final seminar in Yangon)

**(2) Capacity Development for Design Technology**

It is necessary to understand certain level of knowledge in design technology to properly understand quality control. Particularly for steel bridge, quality control points and design issues are closely related to each other. One of the most important quality control in bridge foundation is bearing capacity which shall be estimated by design analysis. The Project has amended PDM to add an expert of Design Examination (Steel Bridge), and TOR for the expert of Quality control (Foundation) has been supplemented by his duty of foundation design. Technical transfer for some of quality control needs to be planned in combination with design technology.

**(3) Feedback from Bridge Maintenance**

Information on design and construction is going to be handed-over to Maintenance Section in accordance with Construction Management Guideline through Bridge Inventory Database System developed under the Project.

On the other hand, it has been reported that several damage/deteriorations due to poor quality control such as deterioration of concrete by chloride contents in mixing water were affecting to bridge maintenance according to past experience of MOC. It is therefore very important that bridge inspection/maintenance results are shared in MOC for feedback to improve the quality control of construction work.

Once the Bridge Inventory Database System is expanded to Bridge Management System by incorporating the bridge inspection/maintenance result, it will help to establish such institutional mechanism to enhance the both capacity of quality control and maintenance.

**(4) Timely Visa Arrangement for Long-term Experts**

Dispatch of long-term experts delayed because of their visa arrangement. Although no negative impact has been given to the Project, it should be arranged in good time well in advance to avoid any adverse effect to future project.





## Chapter 4 For the Achievement of Overall Goals after the Project Completion

### 4.1 Prospects to Achieve Overall Goal

This chapter is prepared by having a joint review meeting between MOC and JICA Project Team on prospects to achieve overall goal of the Project. This shall be evaluated after approximately 3 years of the Project completion.

Overall goal is predetermined in PDM as below.

<p>&lt;&lt;Overall Goal&gt;&gt;</p> <p><b>Quality of bridges and concrete structures constructed or managed by MOC are improved.</b></p> <p>&lt;&lt; Indicator &gt;&gt;</p> <ol style="list-style-type: none"> <li>1) All bridges and concrete structures constructed after the end of this Project comply with the technical documents.</li> <li>2) The strength and appearance of the concrete structure built by MOC is maintained within the requirements stipulated in the technical documents.</li> </ol>
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Based on the discussion with MOC, following prospects to achieve the overall goals for the Project are concluded in Table 4-1.

**Table 4-1 Prospects for Achievement to the Overall Goal**

Indicators	Actual Situation
1) All bridges and concrete structures constructed after the end of this Project complying the technical documents.	Manuals were provide to all the Construction Units of MOC in March 2019 and authorized by MOC in April 2019 for utilization of road and bridge construction under MOC. 32 of Core Trainers were certified for future training for the quality/safety control in MOC. The knowledge on the QC and SC based on the manuals were disseminated through the whole MOC regional offices. Through the project activities, staff in MOC were highly motivated towards the improvement of quality/safety control for road and bridge construction. Based on these circumstances, there are <b>High prospects</b> that all bridges and concrete structures would be constructed in compliance with the technical documents (Manuals).
2) The strength and appearance of the concrete structure built by MOC is maintained within the requirements stipulated in the technical documents.	Result of Quality/Safety Control is not always visually indicated. However, the recording system of the quality/safety control has been enhanced through the OJT based on the technical documents (Manuals). These processes have been introduced in the Construction Management Guideline as well. Achievement in Overall Goal would be confirmed by checking these records on quality/safety control. Since the notification by the Minister indicates official application of the Manuals, it would be <b>High prospects</b> for achievement of the overall goal.

## 4.2 Plan of Operation and Implementation Structure of the Myanmar side to Achieve Overall Goal

Following to the challenges for overall goal, actions to be taken were discussed with MOC as concluded in Table 4-2.

**Table 4-2 Target Setting and Actions to Take for Overall Goal**

Indicators	Target	Actions to be taken by MOC
1) All bridges and concrete structures constructed after the end of this Project complying the technical documents.	<ul style="list-style-type: none"> <li>Continuous Capacity Development of Construction Engineer for Quality/Safety Control</li> </ul>	<ul style="list-style-type: none"> <li>To provide periodic training to the MOC engineers for Quality/Safety Control at CTC based on the technical documents (Manuals). (Once a Year)</li> <li>To conduct periodic training to private or other engineers for Quality/Safety Control through MES. (Once a Year)</li> </ul>
	<ul style="list-style-type: none"> <li>Improvement of Systems on Construction Management</li> </ul>	<ul style="list-style-type: none"> <li>Appropriate budget (minimum 3% of the construction cost) for Quality/Safety control shall be ensured.</li> <li>To stipulate the liability to utilize the Manuals in Contract Document/Work order for each construction.</li> <li>To oblige to prepare and to submit Quality/Safety Control Plan for every bridge construction/concrete structure based on the Manuals.</li> <li>To store the Construction Records in Database System for future maintenance.</li> </ul>
	<ul style="list-style-type: none"> <li>Proper management of the Technical Documents.</li> </ul>	<ul style="list-style-type: none"> <li>To appoint the section to keep and publish the Manuals in MOC to deliver the Manuals nationwide. CTs are expected to take initiative on update and/or upgrading of the Manuals probably after 5-year of the Project. Department of Research and Training which is under discussion to be newly organized by MOC would be appropriate to manage the Manuals.</li> </ul>
2) The strength and appearance of the concrete structure built by MOC is maintained within the requirements stipulated in the technical documents.	<ul style="list-style-type: none"> <li>Materialization of Role and Responsibility in the Quality/Safety Control</li> </ul>	<ul style="list-style-type: none"> <li>To develop Standard Operation Procedure/Scope of authority and responsibility for each section and position related to Quality/Safety Control as MOC regulation.</li> </ul>
	<ul style="list-style-type: none"> <li>Strengthen the Enforcement</li> </ul>	<ul style="list-style-type: none"> <li>To stipulate the role and responsibility of each organization/personnel for Quality/Safety Control in the Work Order to Construction Units, as well as the Contract with private contractor.</li> </ul>
	<ul style="list-style-type: none"> <li>Development of Feed-back system</li> </ul>	<ul style="list-style-type: none"> <li>To report the defects or error in quality control during the construction shall be established in MOC for further improvement of the quality<sup>5</sup>.</li> </ul>

<sup>5</sup> For quality control: To establish a cross-organizational committee in order to share errors and issues on quality control

### 4.3 Recommendations for the Myanmar Side

To keep the sustainable improvement on quality and safety control for the construction work, it is highly required not only to enhance the capability of individual engineers, but also to develop the institutional momentum to achieve the target. Followings are to introduce the recommendations to enhance sustainability of the Project effect.

#### (1) Sharing and Centralization of Information on Engineering Technology

It would be expected that several technical assistance and construction projects are provided by JICA as well as other Donors. The engineering technology learnt from these projects needs to be efficiently centralized and shared within MOC. In this connection, MOC may designate specific section such as Central Training Center (CTC) as the information center to control such engineering information. Particularly scheduled large-scale construction projects contain a lot of information to enhance technology of MOC in terms of quality and safety control as well as construction management. Thus, it is important for MOC to accumulate such information, manuals and experience through these projects, and to effectively utilize this information for further development of capacity in construction technology.

#### (2) Incentive Mechanism for Improvement of Quality and Safety Control

Incentive mechanism would be very important to motivate the engineers for learning and improving quality and safety control. As an example of positive incentive, CPD (Continuing Professional Development) provided by MES to participants will attract much number of engineers to participate the trainings. In case the quality control as well as safety control skills were officially qualified by MOC, MES or the Myanmar Engineering Council for differentiation of engineers, it would create strong positive incentive for engineers to learn the technology. On the other hand, contractual bound to compliance with the manuals as well as to nominate the qualified engineer to each project can be an incentive to facilitate the improvement of quality/safety control for the contractors. Implementation of contractor's performance evaluation system will be also one of incentive for contractors to improve their performance on quality/safety control. It would be recommended to establish such incentive mechanism for further development of quality and safety control with reference to advanced countries.

#### (3) Improvement of Quality in Design

To ensure the initial quality of bridge and concrete structure, quality control in construction is not sufficient. As long as design capacity to ensure the durability of structure has not been developed, initial quality could not be fulfilled. Responding to active demand for infrastructure in Myanmar, it would be important to ensure the initial quality of bridge and concrete structure by improving the capacity in design technology. The situation that the number of design engineer is seriously insufficient in Myanmar should be recommended to improve by developing human resources not only in MOC but in private sector.

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observed by inspection with the sections of design and construction (at least once a year). For safety control: To submit accident report attached in the Manual, to collect information to analyze the number of accidents and the factors at MOC Headquarter and to share it with the section of construction.

**(4) Periodic Update of Manuals**

Technical documents (Manuals) developed under the Project were focused to improve the current issues on construction of bridge and concrete structure. These manuals would be required to upgrade in accordance with the development and diversifying of construction technology in Myanmar. MOC is recommended to review and upgrade the contents of manuals by his own staff in the future. For such purpose, accumulation of data and information of quality/safety control and periodical training would be very important for MOC.

**(5) Update of the Bridge Inventory Database**

The Bridge Inventory Database System was developed to sort the inventory data and any other relevant information such as design document and construction documents. This information should be very important for maintenance of bridge which has been constructed by DOB more or less hundred bridges per year. Since the input of new bridge data and also adding old bridge information would be mandatory to perform by maintenance section of DOB, at least one fulltime database operator shall be assigned to input new data and maintain the database system.

**4.4 Monitoring Plan from the End of the Project to Ex-Post Evaluation**

Monitoring to ex-post evaluation after the Project is recommended to be implemented by JICA Myanmar Office in consultation with JICA Headquarter. Monitoring plan is proposed as Table 4-3.

**Table 4-3 Monitoring Plan (Proposal)**

[Overall Goal] Quality of bridges and concrete structures constructed or managed by MOC improved		
Monitoring Schedule	May 2022 (in 3 year)	
Indicators	Monitoring Method	Monitoring Item
1) All bridges and concrete structures constructed after the end of this Project complying the technical documents.	<ul style="list-style-type: none"> <li>• Training Record of Quality/Safety Control in MOC.</li> <li>• Training Record of Quality/Safety Control in MES.</li> </ul>	<ul style="list-style-type: none"> <li>• Number of Trainings and Trainees</li> </ul>
	<ul style="list-style-type: none"> <li>• To confirm budgetary allocation for the Quality Control/Safety Control</li> <li>• Confirmation of Quality/Safety Control Plans prepared for Construction Project</li> <li>• To check the data in Database System</li> </ul>	<ul style="list-style-type: none"> <li>• Cost Estimate of the Construction Project</li> <li>• Items of Quality/Safety Control and its records</li> <li>• Construction Record stored in Database</li> </ul>
	<ul style="list-style-type: none"> <li>• Interview to the section to manage the manual data</li> </ul>	<ul style="list-style-type: none"> <li>• Number of distributed Manuals</li> </ul>
2) The strength and appearance of the concrete structure built by MOC is maintained within the requirements stipulated in the technical documents.	<ul style="list-style-type: none"> <li>• Site Inspection</li> </ul>	<ul style="list-style-type: none"> <li>• Visual Check of Bridge and Concrete Structure</li> </ul>
	<ul style="list-style-type: none"> <li>• Data Record of Strength Test/Inspection Result</li> </ul>	<ul style="list-style-type: none"> <li>• Strength of Concrete</li> <li>• Inspection data for dimensions</li> </ul>
	<ul style="list-style-type: none"> <li>• To check condition of work order/contract.</li> </ul>	<ul style="list-style-type: none"> <li>• Instruction to follow the manuals</li> </ul>
	<ul style="list-style-type: none"> <li>• To interview to construction section about feed-back activity to improve the future construction quality.</li> </ul>	<ul style="list-style-type: none"> <li>• Activity and its number of feed-back on construction quality/safety</li> </ul>

# Appendix



## **Table of Contents (Appendix)**

Appendix 1 Result of the Project

Appendix 2 List of Products Produced by the Project

Appendix 3 Project Design Matrix and Plan of Operation

Appendix 4 R/D, M/M, Minutes of JCC

Appendix 5 Monitoring Sheet (Version 1 – Version 6)





## **Appendix 1**

### **Result of the Project**



## 1-1 List of JICA Experts

### (1) Long-term Experts

No.	Name	Expertise
1	Mr. MITSUISHI Akira	Road / Bridge Policy Advisor
2	Mr. SENOO Kei	Construction Management / Monitoring and Evaluation / Coordinator

### (2) Project Team

No.	Name	Expertise
1	Mr. OKAZAKI Akio	Team Leader/Quality Control (Concrete-1)
2	Mr. WATANABE Ryohei	Deputy Team Leader/ Quality Control (Concrete-2)
3	Mr. MUKOYAMA Tatsuo	Quality Control (Concrete Bridge)
4	Dr. YASUDA Masahiko	Quality Control (Steel Bridge)
5	Mr. OCHIAI Eiji	Quality Control (Foundation)
6	Mr. ASAKURA Hajime	Construction Management
7	Mr. TONEGAWA Yasunori / Mr. KUGE Takahiro	Safety Control
8	Mr. KUNIKATA Keigo / Mr. Kyaw Moe Aung	Bridge Inventory (1)
9	Dr. TSUCHIDA Takayuki	Bridge Inventory (2)
10	Mr. TAKAGI Nobuhiko	Design Examination (Steel Bridge)
11	Dr. MINATO Takayuki	PPP Road Policy
12	Dr. Jovito Cruz SANTOS	Bridge Planning
13	Mr. TAKATA Satoshi	River Structure
14	Mr. NAGATA Hitoshi	River Planning
15	Ms. NAKAYAMA Makiko	Coordinator/Training Planning

## 1-2 List of Counterparts (C/P)

### (1) Joint Coordination Committee Member List

No.	Name	Position under the Project	Department
1	U Han Zaw (U Win Khaing)		Minister of MOC
2	U Win Tint (UKyaw Linn)	Chairperson	Permanent Secretary, MOC
3	U Ohn Lwin	Member	Director General, DOH
4	U Shwe Lay	Vice Chairperson	Director General, DOB
5	U Aung Myint Oo	Member	Deputy Director General (Planning), DOH
6	U Khin Maung Kyaw	Member	Deputy Director General (Maintenance), DOH
7	U Khin Maung Swe	Project Director	Deputy Director General (Construction), DOB
8	U Kyaw Kaung Cho	Member	Deputy Director General (Maintenance), DOB
9	U Thein Myint Mon (U Paing)	Project Manager	Chief Engineer (Planning), DOB
10	U Thein Aung	Member	Chief Engineer, Maintenance Section, DOB
11	Daw Thein Nu	Member	Chief Engineer, DOB
12	U Kyaw Lynn	Member	Chief Engineer, DOB
13	Daw Than Yi	Member	Director, DOB
14	Daw Htwe Nge Myint	Member	Director, International Relations & Legal Sub-Division, DOB
15	U Thet Zaw Win (Daw Hla Hla Thawe)	Member	Director, DOH (Director, Research and Development, DOH)
16	Daw Ei Ei Myo	Member	Director, Civil, DOH
17	U Aye Ko (U Kyin Ohnn)	Member	Assistant Chief Engineer, YCDC (Deputy Head of Department, YCDC)
18	Dr. Khin Than Yu	Member	Pro: Rector Teaching, YTU

Note: ( ) shows before replacement.

## (2) List of Core Trainers (CTs)

No.	Name	Position	Department
1	U Myo Thet Tun	Bridge Foundation	Assistant Director, Bridge Special Unit-14, DOB
2	Daw Nant Tha Hmwe	Bridge Foundation	Deputy Director, Bridge Design, DOB
3	Daw Ei Htwe San	Bridge Foundation	Deputy Director, Bridge Design, DOB
4	Daw Yu Yu Naing	Bridge Foundation	Staff Officer, Bridge Design, DOB
5	Daw Yin Yin Swe	Concrete Structure	Director, Quality Control & Safety, DOB
6	Daw Myo Min Aye	Concrete Structure	Assistant Director, QCS, DOB
7	Daw Cho Mar Oo	Concrete Structure	Assistant Director, QCS, DOB
8	Daw Khin Moe Moe	Concrete Structure	Staff Officer, QCS, DOB
9	U Soe Thiha	Concrete Structure	Staff Officer, RRDS, DOH
10	Daw Thae Phyu Phyu Moe	Concrete Structure	Staff Officer, RRDS, DOH
11	Daw Hnin Yu Aung	Concrete Structure	Staff Officer, RRDS, DOH
12	Daw Su Myat Sandi Thaw	Concrete Structure	Staff Officer (Civil), RRDS, DOH
13	U Tin Mg Htwe	PC Bridge	Assistant Director, New Myaung Mya Bridge Project, Construction Unit-1, DOB
14	U Thu Ra Thant	PC Bridge	Staff Officer, Bridge Special Unit-4, DOB
15	Daw Theint Han Su Kyaw	PC Bridge	Assistant Director, Environmental & Social Section (Minister Office's Attached), DOB
16	U Kyaw Myo	Steel Bridge	Deputy Director, Bridge Special Unit-9, DOB
17	U Thet Wai Aung	Steel Bridge	Assistant Director, Bridge Design, DOB
18	Daw Than Aye	Steel Bridge	Assistant Director, Bridge Planning, DOB
19	U Shin Thant Htut	Safety Control	Assistant Director, Bridge Special Unit-6, DOB
20	U Zaw Thu Lin	Safety Control	Assistant Director, Kyaukme District, DOH
21	Daw Thwe Thwe Tun	Safety Control	Staff Officer, Bridge Design Section, DOB
22	U Soe Lwin	Safety Control	Assistant Director, Road & Airfield Design Section, DOH
23	Daw Aye Aye Khaing	Safety Control	Staff Officer, QA/ QC Section (Construction), DOH
24	Daw Theingi Min Thu	Safety Control	Staff Officer, Road & Airfield Design Section, DOH

<b>No.</b>	<b>Name</b>	<b>Position</b>	<b>Department</b>
25	Daw Ei Ei Nyein	Database	Deputy Director, Bridge Planning, DOB
26	Daw Tin Thuzar Win	Database	Staff Officer, Bridge Special Unit 12, DOB
27	Daw Phyoe Thandar Win	Database	Assistant Director, Bridge Planning, DOB,
28	Daw Sandar Win	Construction Management	Deputy Director, International Relations & Legal Sub-Division, DOB
29	Daw Ei Ei Myo	Construction Management	Director (Civil), QA/QC Section (Maintenance), DOH
30	Daw Aye Tar Tar Htut	Construction Management	Assistant Director, QA/QC Section (Maintenance), DOH
31	Daw Moe Moe Khaing	Construction Management	Staff Officer (Civil), QA/QC Section (Construction), DOH
32	U Ko Ko Naing	Construction Management	Staff Officer (Civil), QA/QC Section (Construction), DOH

1-3 List of Trainings

(1) Workshop on Quality Control for Concrete Structure

Concrete Structure Final Test (30 <sup>th</sup> Jan. 2019)	•	•	•	•	•	•	•	•
Workshop for Reviewing of Manual (29 <sup>th</sup> January 2019)	•	•	•	•	•	•	•	•
3 <sup>rd</sup> OJT of CS @ Saw Ke Bridge (17 <sup>th</sup> December ~ 19 <sup>th</sup> December 2018)		•		•	•	•		•
2 <sup>nd</sup> OJT of CS @ Thu Ye Chaung Bridge (3 <sup>rd</sup> ~ 6 <sup>th</sup> October 2018)		•	•	•				
Workshop for Additional Items of Manual (2 <sup>nd</sup> October 2018)		•	•	•				
Workshop for Additional Items of Manual (1 <sup>st</sup> October 2018)		•	•	•	•			
1 <sup>st</sup> OJT of CS @ Sittaung Bridge (Myoe Soe) Construction from 15 <sup>th</sup> Feb. to 17 <sup>th</sup> Feb. 2018		•	•	•	•			
Workshop for Reviewing of Manual (14 <sup>th</sup> Feb.)		•		•				
Workshop for Reviewing of Manual (13 <sup>th</sup> Feb.)		•		•				
7 <sup>th</sup> Workshop_5 <sup>th</sup> Day in NPT (8 <sup>th</sup> Dec. 2017)		•	•	•			•	
7 <sup>th</sup> Workshop_4 <sup>th</sup> Day in NPT (7 <sup>th</sup> Dec. 2017)		•	•	•			•	
7 <sup>th</sup> Workshop_3 <sup>rd</sup> Day in NPT (6 <sup>th</sup> Dec. 2017)		•	•	•			•	
7 <sup>th</sup> Workshop_2 <sup>nd</sup> Day in NPT (5 <sup>th</sup> Dec. 2017)		•	•	•			•	
7 <sup>th</sup> Workshop_1 <sup>st</sup> Day in NPT (4 <sup>th</sup> Dec. 2017)	•	•	•	•			•	
6 <sup>th</sup> Workshop (31 <sup>st</sup> Oct. 2017)		•	•					•
5 <sup>th</sup> Workshop (30 <sup>th</sup> Oct. 2017)		•	•		•			•
4 <sup>th</sup> Workshop (14 <sup>th</sup> Jul. 2017)	•	•	•		•	•	•	
3 <sup>rd</sup> Workshop (13 <sup>th</sup> Jul. 2017)	•	•	•	•	•	•	•	
2 <sup>nd</sup> Workshop (23 <sup>rd</sup> Feb. 2017)	•	•	•	•				
1 <sup>st</sup> Workshop (13 <sup>th</sup> Feb. 2017)	•		•	•	•	•		
CTs	Ms. Yin Yin Swe	Ms. Myo Min Aye	Ms. Cho Mar Oo	Ms. Khin Moe Moe	Mr. Soe Thiha	Ms. Thae Phyu Phyu Moe	Ms. Hnin Yu Aung	Ms. Su Myat Sandi Thaw

**(2) Workshop on Quality Control for PC Bridge**

<b>Discussion meeting for pilot Project (13<sup>th</sup> Feb 2018)</b>		•	•
<b>10<sup>th</sup> PC Workshop (25<sup>th</sup> October 2017)</b>	•		•
<b>9<sup>th</sup> PC Workshop (27<sup>th</sup> September 2017)</b>	•		•
<b>8<sup>th</sup> PC Workshop (27<sup>th</sup> July 2017)</b>		•	
<b>7<sup>th</sup> PC Workshop (26<sup>th</sup> July 2017)</b>		•	
<b>6<sup>th</sup> PC Workshop (26<sup>th</sup> June 2017)</b>		•	•
<b>5<sup>th</sup> PC Workshop (23<sup>rd</sup> June 2017)</b>		•	
<b>4<sup>th</sup> PC Workshop (20<sup>th</sup> June 2017)</b>		•	
<b>3<sup>rd</sup> PC Workshop (16<sup>th</sup> June 2017)</b>		•	•
<b>PC rehearsal presentation Workshop (5<sup>th</sup> June 2017)</b>	•	•	
<b>2<sup>nd</sup> Workshop (2<sup>nd</sup> June 2017)</b>		•	•
<b>1<sup>st</sup> Workshop (23<sup>rd</sup> May 2017)</b>		•	
<b>CTs</b>	<b>Mr. Tin Maung Htwe</b>	<b>Ms. Theint Han Su Kyaw</b>	<b>Mr. Thura Thant</b>



<b>(3) Workshop on Quality Control for Steel Bridge</b>	9 <sup>th</sup> Workshop (29.1.2019)			
	Discussion for steel manual @ MEC & J&M (10.9.2018)	•	•	•
	Seminar about seismic and bearing seat (1.9.2018)			•
	Fabrication OJT @ J&M (30.3.2018)	•	•	
	Erection OJT @ Ngawon Bridge (25.3.2018)		•	•
	8 <sup>th</sup> Workshop (26.10.2017)			•
	7 <sup>th</sup> Workshop (16.10.2017)	•		•
	6 <sup>th</sup> Workshop (16.6.2017)	•	•	•
	5 <sup>th</sup> Workshop (26.5.2017)	•	•	•
	4 <sup>th</sup> Workshop (21.2.2017)	•	•	•
	3 <sup>rd</sup> Workshop (17.11.2016)	•		•
	2 <sup>nd</sup> Workshop (8.11.2016)	•		•
	1 <sup>st</sup> Workshop (11.10.2016)	•		•
	CTs	U Kyaw Myo	U Thet Wai Aung	Daw Than Aye

**(4) Workshop on Quality Control for Bridge Foundation**

Reviewing of Manual (Draft) (4 <sup>th</sup> Jun. 2018)	•	•	•	
1 <sup>st</sup> OJT @ Myaungmya Bridge Construction Site (27 <sup>th</sup> Mar. 2018)	•			
1 <sup>st</sup> OJT @ Myaunmya Bridge Construction Site (9 <sup>th</sup> Feb ~ 12 <sup>th</sup> Feb. 2018)		•	•	•
Reviewing of Manual (Draft) (6 <sup>th</sup> Feb. 2018)		•	•	•
Reviewing of Manual (Draft) (5 <sup>th</sup> Feb. 2018)		•	•	•
8 <sup>th</sup> Discussion about Manual (Draft) (20 <sup>th</sup> Dec 2017)	•			
7 <sup>th</sup> Discussion about Manual (Draft) (24 <sup>th</sup> Oct 2017)	•	•	•	•
6 <sup>th</sup> Discussion about Manual (Draft) (17 <sup>th</sup> Oct 2017)	•	•	•	•
5 <sup>th</sup> Discussion about Manual (Draft) (11 <sup>th</sup> Sep 2017)	•		•	•
4 <sup>th</sup> Discussion about Manual (Draft) (4 <sup>th</sup> Sep 2017)	•	•	•	•
3 <sup>rd</sup> Discussion about Manual (Draft) (28 <sup>th</sup> Aug 2017)	•	•	•	•
2 <sup>nd</sup> Discussion about Manual (Draft) (3 <sup>rd</sup> July 2017)	•	•	•	•
1 <sup>st</sup> Discussion about Manual (Draft) (20 <sup>th</sup> June 2017)			•	•
11 <sup>th</sup> Workshop (13 <sup>th</sup> Mar 2017)		•	•	
10 <sup>th</sup> Workshop @ I&H Factory (7 <sup>th</sup> Mar 2017)	•			
8 <sup>th</sup> & 9 <sup>th</sup> Workshop (6 <sup>th</sup> Mar 2017)	•	•	•	
7 <sup>th</sup> Workshop (24 <sup>th</sup> Feb 2017)	•	•	•	
CTs	Mr. Myo Thet Tun	Ms. Ei Htwe San	Ms. Nant Tha Hmwe	Ms. Yu Yu Naing

**(5) Workshop on Safety Control**

Safety Patrol @ Thilawa Access Road		•	•			•	•	
Safety Discussion for Safety Patrol		•	•			•	•	
Safety Seminar @ CTC (27.11.2018)		•	•				•	
Safety Workshop (26.11.2018)		•	•			•	•	•
Safety Discussion with Global Enchanting S/F	<b>Mr. Kuge &amp; Ms. Poe</b>							
Safety Seminar @ MOC (23.8.2018)			•				•	•
Discussion for revising Safety Manual & presentation of 2 <sup>nd</sup> Japan Training (15.8.2018)		•	•			•	•	•
Discussion for comparison of Check List &	•	•	•			•	•	•
12 <sup>th</sup> Workshop (13 <sup>th</sup> Aug 2018)	•	•	•			•	•	•
2 <sup>nd</sup> OJT (day-2) @ Ngawon Bridge (27 <sup>th</sup> Apr)		•	•			•	•	•
2 <sup>nd</sup> OJT (day-1) @ Ngawon Bridge (26 <sup>th</sup> Apr)		•	•			•	•	•
11 <sup>th</sup> Workshop (24 <sup>th</sup> Apr 2018)		•	•			•	•	•
Safety Discussion (23 <sup>rd</sup> Apr 2018)		•	•			•	•	•
1 <sup>st</sup> OJT (day-2) @ Taung Bwe Bridge (19 <sup>th</sup> Jan)		•	•			•	•	•
1 <sup>st</sup> OJT (day-1) @ Taung Bwe Bridge (18 <sup>th</sup> Jan)		•	•			•	•	•
10 <sup>th</sup> Workshop (16 <sup>th</sup> Jan 2018)		•	•			•	•	•
Discussion for OJT (15 <sup>th</sup> Jan 2018)		•	•			•	•	•
9 <sup>th</sup> Workshop (22 <sup>nd</sup> Sept 2017)	•		•			•	•	•
8 <sup>th</sup> Workshop (15 <sup>th</sup> Sept 2017)	•		•			•	•	•
7 <sup>th</sup> Workshop (27 <sup>th</sup> June 2017)	•	•	•	•	•			
6 <sup>th</sup> Workshop (20 <sup>th</sup> June 2017)	•	•	•	•	•			
5 <sup>th</sup> Workshop (15 <sup>th</sup> June 2017)	•	•	•	•	•			
4 <sup>th</sup> Workshop (8 <sup>th</sup> Mar 2017)	•		•					
3 <sup>rd</sup> Workshop (1 <sup>st</sup> Mar 2017)	•		•					
2 <sup>nd</sup> Workshop (23 <sup>th</sup> Feb 2017)	•		•					
CTs	U Zaw Thu Linn	U Shin Thant Htut	Daw Thwe Thwe Tun	U Htun Aung Kyaw	Daw Thin Nu Shwe	U Soe Lwin	Daw Theingi Min Thu	Daw Aye Aye Khaing

**(6) Workshop on Construction Management**

9 <sup>th</sup> CM WS (30 <sup>th</sup> Jan 2019)	•	•							
8 <sup>th</sup> WS (20 <sup>th</sup> Nov 2018)	•			•	•				
7 <sup>th</sup> WS (19 <sup>th</sup> Nov 2018)		•							
6 <sup>th</sup> Workshop				•		•	•		
5 <sup>th</sup> Workshop (18 <sup>th</sup> August 2017)	•	•		•	•	•	•		•
4 <sup>th</sup> Workshop (14 <sup>th</sup> August 2017)	•	•				•	•	•	
3 <sup>rd</sup> Workshop (6 <sup>th</sup> June 2017)	•	•				•	•		•
2 <sup>nd</sup> Workshop (20 <sup>th</sup> Mar 2017)		•	•					•	•
1 <sup>st</sup> Workshop (8 <sup>th</sup> March 2017)		•	•					•	
<b>CTs</b>	<b>Ms. Ei Ei Myo</b>	<b>Ms. Sandar Win</b>	<b>Ms. Ohnmar Hlaing</b>	<b>Ms. Aye Thar Thar Htut</b>	<b>Ms. Moe Moe Khaing</b>	<b>Mr. Ko Ko Naing</b>	<b>Mr. Ye Tun</b>	<b>Ms. Kyi Kyi Nyunt</b>	<b>Ms. Phyo Thandar</b>

**(7) On the Job Training at Pilot Project Sites**

No.	OJT Date	Targeted Site	Location of Site	Purpose
1	Feb. 2018	Sittaung Bridge	Bago	Pile Cap Concreting
	Oct. 2018	Thu Ye Chaung Bridge	Mandalay	Pile Cap Concreting
	Dec. 2018	Saw Ke Bridge	Ayeyarwady	Cross-Beam Concreting
2	Feb 2017	Baluchaung Bridge	Kayah	To check PC Girders
	Mar. 2017	Saidu Bridge	Magway	Prestressing and Grouting
	Feb. 2018	Taung Bwe Bridge	Bagon	Site Condition
	Feb. 2018	Bridge Special Unit (9)	Bago	Pretesting of Grouting
	Mar. 2018	Taung Bwe Bridge	Bago	To check PC Ducts
	Mar. 2018	Bridge Special Unit (9)	Bago	Pretesting of Grouting
	Mar. 2018	Taung Bwe Bridge	Bago	Prestressing & Grouting
	Nov. 2018	Myaung Mya New Bridge	Ayeyarwady	Grouting Control Checking
	Mar. 2018	Ngawon Bridge	Ayeyarwady	Erection
3	Mar. 2018	J&M Steel Factory	Yangon	Fabrication
	Feb. 2019	J&M/MEC Steel Factory	, Yangon	Fabrication Work
	Jan. 2018	Taung Bwe Bridge	Bagon	General Safety Measure
4	Apr. 2018	Ngawon Bridge	Ayeyarwady	Safety for bridge erection
	Nov. 2018	Thilawa Access Road	Yangon	Safety Patrol List
	Feb. 2018	Myaung Mya New Brg.	Ayeyarwady	Bored Pile, PC Pile &PHC Pile
5	Feb. 2019	Attran Bridge (Sapalgu)	Mon	Bored Pile Works

## (8) Record of Seminars / Training under Output 1

### Seminar

<b>S1</b>	<b>Present and Future Road Infrastructure Maintenance in Myanmar and Japan</b>
Date & Time	15 <sup>th</sup> March 2017
Venue	Yangon Technological University
Organization	Ministry of Construction, University of Tokyo, Saitama University Central Nippon Expressway Co., Ltd., Sumitomo Electric Industries Co., Ltd., Kajima Corporation
Participants	130
Presentation	<ul style="list-style-type: none"> <li>• Introduction of SIP Project – Current State of Infrastructure and Future Prospects in Japan and Asian Countries by Dr. Matsumoto, University of Tokyo</li> <li>• Activities of Infrastructure Management Group in SATREPS ANZEN Project by Dr. Nagai, University of Tokyo</li> <li>• Current Situations of Infrastructure Management in Myanmar by Ms. Thein, Ms. Yin, MOC</li> <li>• Introduction of the JICA Project/ Importance of Quality Control by Mr. Akira Mitsuishi, Mr. Kei Senoo, JICA Long-term Experts</li> <li>• Recent Technology of Concrete Bridges in Japan by Professor Mutsuyoshi, Saitama University</li> <li>• Innovative Design and Construction for New Expressway Bridge in Japan by Dr. Sakai, Central Nippon Expressway Co., Ltd.</li> <li>• Application on Accelerated Bridge Construction in Japan by Mr. Kaminaga, Sumitomo Mitsui Construction Co., Ltd.</li> <li>• High Seismic-performance Concrete Bridge Pier Using Ultra High Strength Fiber Reinforced Concrete by Mr. Saito, Kajima Corporation</li> <li>• Introduction of High-durable Prestressing Steel and New Developed Tension Measuring Instrument by Mr. Kido, Sumitomo Electric Industries</li> </ul>
<b>S2</b>	<b>1<sup>st</sup> YTU-MES-JSCE Joint Seminar on Civil Engineering</b>
Date & Time	28 <sup>th</sup> - 29 <sup>th</sup> October 2017
Venue	YTU
Organization	Ministry of Construction (MOC), Ministry of Education, University of Yangon, Associateship of Government Technical Institute in Myanmar, Yangon Technological University (YTU), Mandalay Technological University (MTU), Myanmar Engineering Society (MES), Japan Society of Civil Engineers, University of Tokyo (UT), Kyoto University (KU), CTI Engineering International Co., Ltd., Nippon Koei Co., Ltd.
Participants	150
Presentation	<p>&lt;1<sup>st</sup> Day, 28<sup>th</sup> October 2017&gt;</p> <ul style="list-style-type: none"> <li>• Plenary Session 1, Keynote Speech by Professor Mr. Nyan Myint Kyaw (YTU), Mr. Khin Maung Htay (MES), Mr. Koji Yamada (Nippon Koei)</li> <li>• Plenary Session 2, Keynote Speech by Professor Aye Mya Cho (MTU), Ms. Yin Yin Swe (MOC), Mr. Akio Okazaki (CTI Engineering International, JICA Project Team)</li> <li>• Technical Session 1, Presentation by students of YTU</li> </ul> <p>&lt;2<sup>nd</sup> Day, 29<sup>th</sup> October 2017&gt;</p> <ul style="list-style-type: none"> <li>• Plenary Session 3, Keynote Speech by Professor Kohei NAGAI (UT), Professor Kunitomo SUGIURA(KU)</li> <li>• Technical Session 2, Presentation by students of YTU</li> <li>• Plenary Session 4, Keynote Speech by Professor Mamoru MIMURA (KU),</li> </ul>

	Professor Michio SANJOU (KU) • Technical Session 3, Presentation by students of YTU
S3	Seminar on PPP for Road and Housing Development in Myanmar
Date & Time	28 <sup>th</sup> February 2018
Venue	PARKROYAL Nay Pyi Taw
Organization	Ministry of Construction, University of Tokyo, VDB Loi, Jones Day, JFE Engineering, Urban Renaissance Agency, JEXWAY: Japan Expressway International Co., Ltd.
Participants	85
Presentation	<ul style="list-style-type: none"> <li>• PPP Principles by Dr. Takayuki Minato, University of Tokyo</li> <li>• Presentation on Power Supply Service in Myanmar with PPP and Current Topics of PPP in Myanmar by Mr. Edwin Vanderbruggen, VDB Loi</li> <li>• Model Toll Road Concession Agreement for Use in Myanmar by Mr. James Harris, Jones Day</li> <li>• JFE's Challenge on PPP Global Water Project by Ms. Chiho Miura, JFE Engineering</li> <li>• Public Private Partnership on Housing Project by Mr. Susumu Yukawa, Urban Renaissance Agency</li> <li>• Introduction of PPP Finance and Expressway Projects in Japan by Mr. Yoji Kawai, JEXWAY: Japan Expressway International Co., Ltd.</li> </ul>
S4	2 <sup>nd</sup> YTU-MES-JSCE Joint Seminar on Civil Engineering
Date & Time	23 <sup>rd</sup> June 2018
Venue	YTU
Organization	Ministry of Construction, Ministry of Electricity & Energy Visiting Faculty, Yangon Technological University, Myanmar Engineering Society, Myanmar Engineering Council, Japan Society of Civil Engineers, Japan International Cooperation Agency, Toyo Construction Co., Ltd., Nippon Koei Co., Ltd.
Participants	150
Presentation	<ul style="list-style-type: none"> <li>• Explanation about JSCE International Award by Ms. Yukiko Shibuya</li> <li>• Commemorative Lecture by Mr. Kyaw Linn</li> <li>• Rehabilitation and Conservation Works for Damaged Historical Monuments in the Ancient City of Bagan by Dr. Aung Kyaw Myat</li> <li>• Durability of Cable Bridges and Steel Truss Bridges in Myanmar by Mr. Aung Myat Oo</li> <li>• Retrofitting for Foundation Settlement: Case Study – YTU Clinic Building by Mr. San Kyu</li> <li>• Jetty Construction by Jacket Method in Myanmar by Mr. Hiroki Kohno</li> <li>• An Introduction to Construction Technologies in the Project for Construction of New Thaketa Bridge by Mr. Tetsuro Goda</li> <li>• Introduction of JICA Capacity Development Project and Enforcement of Research and Training Function in Myanmar by Mr. Kei Senoo</li> <li>• Ring Roads in Yangon by Mr. Kyi Zaw Myint</li> <li>• Electricity Planning and Hydropower in Myanmar by Mr. Hein Htet</li> <li>• Structural Stability of Ancient Monuments in Bagan by Mr. Saw Htwe Zaw</li> <li>• Inspection and Risk Evaluation of Slopes along Roads – Technical Cooperation Project in EL Salvador by Dr. Senro Kuraoka</li> </ul>
S5	Seminar on Construction Technologies of Prestressed Concrete Structures in Japan
Date & Time	30 <sup>th</sup> October 2018
Venue	Ministry of Construction

Organization	Ministry of Construction (MOC), University of Tokyo, Saitama University, Kajima Corporation, Sumitomo Mitsui Construction Co., Ltd., P.S. Mitsubishi Construction Co., Ltd., Sumitomo (SEI) Steel Wire Corp., Central Nippon Expressway
Participants	100
Presentation	<ul style="list-style-type: none"> <li>• Safety of Extradosed Bridges with Cables Loss - Case Study on Dawbon Bridge by Ms. Hsu Mon Khin and Dr. Hiroshi Mutsuyoshi, MOC, Saitama University</li> <li>• Current Practice Prestressed Concrete Girder Design in Ministry of Construction by Ms. Thandar Tun, MOC</li> <li>• Historical Overview of Prestressed Concrete Bridge Technology in Japan by Mr. Hidekatsu Sekiguchi, Kajima Corporation</li> <li>• Introduction of Prestressed Concrete Bridges with Precast Segmental Construction by Mr. Masamichi Yoshino, Sumitomo Mitsui Construction Co., Ltd.</li> <li>• State of the Art Report on Corrugated Steel Web PC Bridges in Japan by Mr. Nobumasa Suzuki, P. S. Mitsubishi Construction Co., Ltd. <ul style="list-style-type: none"> <li>• Experience of Heavy Trucks Passed on PC Girder Bridge by Ms. Hay Man Myint Maung and Ms. Hay Mar Htay, MOC</li> </ul> </li> <li>• Introduction of Epoxy Coated Prestressing Steel Strand by Mr. Toshiro "Tiger" Kido, Sumitomo (SEI) Steel Wire Corp.</li> <li>• Maintenance of Cable-stayed Bridges on Japanese Highway by Mr. Kiyohisa Ono, Central Nippon Expressway</li> </ul>
S6	Seminar on River Engineering and Bridge Planning across a River in Myanmar
Date & Time	16 <sup>th</sup> November 2018 10:00 – 16:40
Venue	Ministry of Construction
Organization	Ministry of Construction, Ministry of Transport and Communications, CTI Engineering International Co., Ltd., JFE Steel Corporation, JFE Engineering Co. Ltd., J&M Steel Solutions Co., Ltd.
Participants	83
Presentation	<ul style="list-style-type: none"> <li>• Summary on Flood Control Plan and Data Availability by Mr. Kazuhiro Nakamura</li> <li>• Hydrological Activities of Department of Meteorology and Hydrology in Myanmar by Ms. Khin Wah Wah Win</li> <li>• Hydraulic and Hydrological Study for Bridge Planning and Design by Mr. Hitoshi Nagata, Makoto Kudo</li> <li>• Introduction of River Structure Design: Measure against Scour by Mr. Satoshi Takata</li> <li>• Planning of River Bridge Crossing by Dr. Jovito C. Santos</li> <li>• Cross River Bridge Foundation Design by Ms. Marina Kawai</li> <li>• Relation between Bridge Type and Span. Bridge Construction Method</li> </ul>
S7	Stud Bolt Seminar
Date & Time	13 <sup>th</sup> March 2019 12:30 – 15:30
Venue	Meeting Hall, J&M Solutions Co., Ltd.
Organization	Ministry of Construction, J&M Solutions Co., Ltd., SHINSHO Cooperation, Nippon Stud Welding Co., Ltd., XX
Participants	30
Presentation	<ul style="list-style-type: none"> <li>• Lecture for Steel Bridge by J&amp;M Solutions Co., Ltd.</li> <li>• Lecture for Stud Bolts by Nippon Stud Welding Co., Ltd.</li> <li>• Demonstration of Stud Bolts by Nippon Stud Welding Co., Ltd.</li> </ul>
S8	Construction Machinery Seminar
Date & Time	14 <sup>th</sup> March 2019 09:30 – 16:00
Venue	Ministry of Construction



Organization	<ul style="list-style-type: none"> <li>• Ministry of Construction</li> <li>• Ministry of Agriculture and Irrigation</li> <li>• National Skills Standards Authority</li> <li>• Chiyoda &amp; Public Works Co., Ltd.</li> <li>• Tokyu Construction Co., Ltd.</li> <li>• Diamond Rental Co., Ltd.</li> </ul>
Participants	100
Presentation	<ul style="list-style-type: none"> <li>• General outline of Mechanical Sections in MOC</li> <li>• Current Situation of Machine Operators and Mechanics Training in MOC</li> <li>• Current Situation of Machine Operators Training and Mechanics Training in MOAI</li> <li>• Purpose and target of standardization of skills</li> <li>• Measure of Myanmar Government on HRD and NSSA, Activities</li> <li>• Experiences in past Myanmar projects</li> <li>• Background of the issues</li> <li>• Introduction of Japanese Administration of Construction Equipment</li> <li>• Experiences of on-going projects/ past projects in Myanmar</li> <li>• Future large-scale public infrastructure works</li> <li>• Outline/General Feature if equipment rental companies</li> <li>• Outline of rental business in Myanmar</li> <li>• Business issues</li> <li>• Case Study</li> </ul>
S9	Bridge Seminar
Date & Time	21 <sup>st</sup> March 2019 9:30 – 12:00
Venue	Ministry of Construction
Organization	Ministry of Construction, Ministry of Land, Infrastructure, Transport and Tourism in Japan, University of Tokyo, Nippon Koei Co., Ltd.
Participants	50
Presentation	<ul style="list-style-type: none"> <li>• Current Situation of Bridge Maintenance in Myanmar by Dr. Matsumoto</li> <li>• Report of Field Survey and Results of Dynamic Response Analysis by Mr. Miyazasa</li> <li>• Japanese Technology for Cable Stayed Bridge and Suspension Bridge by Mr. Nozue</li> </ul>
S10	2 <sup>nd</sup> Workshop in Myanmar on Joint Research on Road Technologies for ASEAN Cross-Border Corridors
Date & Time	21 <sup>st</sup> March 2019 10:00 – 15:30
Venue	PARKROYAL Nay Pyi Taw
Organization	Ministry of Construction, Infrastructure Development Institute in Japan, Nippon Road Co., Ltd., ASEAN experts (tentative)
Participants	80
Presentation	<ul style="list-style-type: none"> <li>• Interim Report of Joint Research on Road Technologies for ASEAN Cross-Border Corridors by Mr. Gotanda</li> <li>• Pavement Construction by Mr. Endo</li> <li>• Presentation from ASEAN Member States by ASEAN expert</li> <li>• Presentation from Myanmar by Myanmar expert</li> </ul>

S5	PPP Seminar
Date & Time	22 <sup>nd</sup> March 2019
Venue	Yangon Technological University
Organization	Ministry of Construction, University of Tokyo, King Mongkut's University of Technology
Participants	130
Presentation	<ul style="list-style-type: none"> <li>• Key Note Lecture: Infrastructure Transition as “A Way to Democracy” by Dr. Minato</li> <li>• PPP Analytical Framework: Kick-off Toward Socio-Economic Transition in Myanmar by Mr. Kyaw Linn</li> <li>• Case Study for Yangon Outer Ring Road to apply new PPP Analytical Framework by Mr. Kyi Zaw Myint</li> <li>• Introduction of PPP Project with Information Technology by Dr. Santi</li> <li>• Introduction of PPP Smart Community Project by Mr. Fujiwara</li> <li>• Introduction of Road PPP Project in Indonesia by Ms. Thazin Khin Mg San</li> </ul>

**Lectures/Workshops**

<b>L1</b>	1 <sup>st</sup> Lecture about Road and Bridge Policy and Technologies
Date & Time	25 <sup>th</sup> July 2017 14:00 – 15:50, 26 <sup>th</sup> July 2017 9:00 – 11:50
Venue	Ministry of Construction
Organization	Ministry of Construction, Long-term experts
Participants	70
Presentation	Introduction of Japanese Bridge Inspection by Mr. Akira Mitsuishi and Mr. Kei Senoo
<b>L2</b>	2 <sup>nd</sup> Lectures about Road and Bridge Policy and Technologies
Date & Time	25 <sup>th</sup> May 2018 9:00 – 10:50
Venue	Ministry of Construction
Organization	Ministry of Construction, Long-term experts
Participants	70
Presentation	Introduction of Japanese Bridge Inspection by Mr. Kei Senoo
<b>L3</b>	3 <sup>rd</sup> Lecture about Road and Bridge Policy and Technologies
Date & Time	1 <sup>st</sup> November 2018 11:00 – 11:50, 13:00 – 13:50
Venue	Ministry of Construction
Organization	Ministry of Construction, Long-term experts
Participants	70
Presentation	Introduction of Japanese Bridge Inspection by Mr. Akira Mitsuishi

### 3<sup>rd</sup> Country Trainings

<b>T1</b>	Training on Road and Bridge Maintenance in Cambodia
Date & Time	15 <sup>th</sup> - 17 <sup>th</sup> March 2018
Organization	Ministry of Public Works and Transport (MPWT) in Cambodia, JICA Cambodia office, JICA Policy Advisor for MPWT, JICA Long-Term Expert for Road Maintenance Project
Participants	4 MOC Officials
Presentation	<ul style="list-style-type: none"> <li>• Introduction of General Road and Bridge Policy in Cambodia by Mr. Kume, JICA Long-term Expert in Cambodia</li> <li>• Introduction of JICA Project in Cambodia (Road and Bridge Maintenance Project) by Mr. Ogawa, JICA Long-term Expert in Cambodia</li> <li>• The Project for Strengthening Capacity for Maintenance of Roads and Bridges Project Digest by officials of MPWT</li> </ul>
<b>T2</b>	Training on Road Development Policy including PPP in Indonesia
Date & Time	9 <sup>th</sup> - 13 <sup>th</sup> January 2019
Organization	JICA Indonesia Office, JICA Long-Term Expert for PPP Policy, Tolled Road Department under MOC (BPJT), State-owned Road Operation Company (Jasa Marga)
Participants	6 MOC Officials
Presentation	<ul style="list-style-type: none"> <li>• Finance Schemes of Infrastructure in Indonesia by Mr. Eiji KOGA, JICA Long-term Expert in Indonesia</li> <li>• Jasa Marga's Activities and Toll Road Development in Indonesia by Mr. Adrian Priohutomo, Jasa Marga</li> <li>• Badan Pengatur Jalan Tol (BPJT) (Indonesia Toll Road Authority) by Mr. Herry T. Azuna, BPJT</li> </ul>
<b>T3</b>	Training on Government Research Function in Thailand
Date & Time	19 <sup>th</sup> - 21 <sup>st</sup> March 2019
Organization	Asian Institute of Technology (AIT), King Mongkut's University of Technology (KMUT), Central Laboratory of the Department of Highways (DOH)
Participants	9 MOC Officials
Presentation	General Information, Research Program, Operation and Maintenance Plan of the Institute by Prof. Pennung Warnitchai (AIT), Dr. Sutat Leelatarawat (KMUT), Mr. Punya Chupaint (DOH)

## **Appendix 2**

### **List of Products Produced by the Project**



## 1. Manuals and Guideline

- Quality Control Manual for Concrete Structure
- Quality Control Manual for Prestressed Concrete Bridge
- Quality Control Manual for Steel Bridge
- Quality Control Manual for Bridge Foundation
- Safety Control Manual for Road and Bridge Construction
- Construction Management Guideline for Road and Bridge

## 2. Progress Report (Baseline Survey)

## 3. Bridge Inventory Database





## **Appendix 3**

### **Project Design Matrix and Plan of Operation**



## Project Design Matrix

Form 3-2 PDM

Version 5

Dated November 29, 2018

The Project for Capacity Development of Road and Bridge Technology

MOC

Department of Bridges, Department of Highways

3.5 years (including 0.5 year for preparation)

Nay Pyi Taw and whole country of Myanmar

Project Title:

Implementing Agency:


Target Group:

Period of Project:

Project Site:

Model Site:

Narrative Summary	Objectively Verifiable Indicator (Within 5 years after the project completes, )	Means of Verification	Important Assumption	Achievement	Remarks
<p><b>Overall Goal</b></p> <p>Quality of bridges and concrete structures constructed or managed by MOC improved</p>	<p>1. All bridges and concrete structures constructed after the end of this Project complying the technical documents. 2. The strength, and appearance of the concrete structure built by MOC is maintained within the requirements stipulated in the technical documents.</p>	<p>List and record of bridges and road constructed as well as their complying technical documents Record of bridge post completion inspection</p>	<p>MOC continues to revise and update the technical documents MOC support promotion and dissemination of the technical documents to construction engineers in Myanmar</p>		
<p><b>Project Purpose</b></p> <p>The capacity of MOC engineers on construction management for bridge and road construction enhanced</p>	<p>(Upon completion of the Project.) 1. The technical documents are distributed and ready to be used to all MOC offices. 2. The technical documents are used and applied by the state and regional offices of MOC where the pilot projects have been carried out. 3. The maintenance records of bridges constructed through the pilot projects are submitted to the MOC headquarters for monitoring.</p>	<p>1-1 Observation by C/P and the experts 1-2 Record of project supervision 1-3 Interview to engineers participated in the workshops/seminars 2-1 Observation by C/P and the experts 2-2 Record of project supervision 2-3 Interview to engineers participated in the workshops/ seminars 3-1 maintenance record 3-2 Observation by C/P and experts</p>	<p>The current policy on quality assurance for construction remain unchanged.  Quality assurance activities carried out continuously after the project completes</p>		
<p><b>Outputs</b></p> <p>Output 1. Advises to a broad policy matters and technical documents on road and bridge sectors provided</p>	<p>1-1 The advises and the recommendations to MOC are practical and provided in a timely manner 1-2 MOC increases the knowledge on selected policies and technical documents on road and bridges.</p>	<p>1-1 Activity reports, reports submitted to MOC, interview to C/P 1-2 List of technical documents introduced, results of post-seminar evaluation</p>	<p>Sufficient and accurate testing services for quality control are available in a timely manner</p>		
<p>Output 2. The work process for quality and safety of concrete and bridge construction projects developed and enhanced</p>	<p>2-1 The draft of the work process on quality and safety control for concrete and bridge construction completed, submitted and reviewed 2-2 Trainings on work process for quality and safety control of concrete and bridge construction are carried out</p>	<p>2-1 Draft of the work process, interviews to MOC, samples of the bridge inventory 2-2 List of participants, result of final examination/ observation of his/her work on-site and attendance record, etc. 3-1 Draft of the technical documents interview to MOC 3-2 List of participants, result of final examination/ observation of his/her work on-site and attendance record, etc.</p>	<p>Sufficient budget for activities to ensure quality and safety control is allocated  Organizational arrangement for implementation remains no significant changes</p>		
<p>Output 3. The technical documents on quality and safety control for concrete and bridge construction developed</p>	<p>3-1 The draft technical documents are completed, submitted and reviewed 3-2 Trainings on construction management for quality and safety control of concrete and bridge construction are carried out</p>		<p>Training carried out regularly and continuously by the Myanmar side</p>		

Activities	Inputs	The Myanmar Side	Sufficient number of counterparts with appropriate expertise are assigned to the Project
<p>1-1 Provide various information on technologies and policy related to the road and bridge sectors in Japan or other countries through workshops/seminars, trainings etc.</p> <p>1-2 Provide necessary advise on a various issues related to the road and bridge sectors when consulted based on the information collected.</p> <p>1-3 Propose prospective Japanese technical assistance for the road and bridge sectors.</p> <p>1-4 Introduce Japanese technical documents through seminars.</p> <p>2-1 Investigate the current condition of the overall capacity and the work process in MOC.</p> <p>2-2 Introduce the outlines of construction management and the work process in Japan or other countries through workshops/seminars and trainings.</p> <p>2-3 Draft the guideline on construction management methods and the work process to apply the technical documents developed by the Project.</p> <p>2-4 Develop the bridge inventory (system framework and sample database) to keep documents and data necessary for maintenance.</p> <p>2-5 Draft the procedures to hand-over the as-built drawings, etc. from the construction dept. to the maintenance dept. when projects completes.</p> <p>2-6 Carry out on-the-job training on the construction management and the work process applying the contents of the procedures utilizing the selected pilot projects.</p> <p>2-7 Distribute the guideline and procedures to relevant organizations / offices / engineers through workshops / seminars.</p> <p>2-8 Monitor the progress of the above activities and attainment &amp; application of the technical contents periodically and report the results to JCC.</p> <p>3-1 Investigate the current condition of the existing technical documents of MOC.</p> <p>3-2 Introduce the outlines of construction supervision, the technical documents and the technologies used in Japan and other countries through workshops/ seminars and trainings.</p> <p>3-3 Draft technical documents on construction supervision (quality and safety control for road and bridge construction).</p> <p>3-4 Carry out on-the-job training on construction supervision utilizing the selected pilot project(s).</p> <p>3-5 Distribute the technical documents to the relevant organizations / offices / engineers through workshops/ seminars.</p> <p>3-6 Monitor the progress of the above activities and attainment &amp; application of the technical contents periodically and report the results to JCC.</p>	<p>The Japanese Side</p> <p>1. Experts (1) Long-term Experts Road / Bridge Policy Advisor Construction Management / Monitoring and Evaluation / Coordinator (2) Short-term Experts Quality control (Concrete) Quality control (Steel bridge) Quality control (PC bridge) Quality control (Foundation) Safety control Bridge Inventory / Work Process Design Examination (Steel Bridge) PPP Road Policy <b>River Planning, River Structure and Bridge Planning</b> (3) Lecturers of the Seminars</p> <p>2. Training in Japan 3 times (1 time / year)</p>	<p>The Myanmar Side</p> <p>1. Counterpart (1) Project Director General (2) Project Director (3) Project Manager (4) Counterpart Team Department of Bridges, MOC Department of Highways, MOC</p> <p>2. Equipment and Facilities (1) Office space in the building of MOC's HQ for the Road/Bridge Policy Advisor with office furniture and utilities such as internet connection, electricity, air conditioner etc. (2) Office space in the building of MOC's HQ for other Project members with office furniture and utilities such as internet connection, electricity, air conditioner etc.</p> <p>3. Local Cost Borne by the Myanmar Side (1) Trainees' and Participants' expenses of workshops/ seminars, trainings in Myanmar including travel expenses, allowance etc. (2) Construction cost of the Pilot Project(s)</p> <p>4. TAG (1) Expenses of Myanmar side of TAG which is regularly held to invite relevant organizations, such as BRL, RRL, YCDC, YTU etc.</p>	<p>Sufficient number of counterparts with appropriate expertise are assigned to the Project</p>
			





## **Appendix 4**

**R/D, M/M, Minutes of JCC**





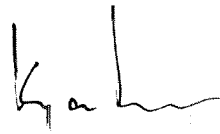
**RECORD OF DISCUSSIONS**  
**ON**  
**THE PROJECT FOR CAPACITY DEVELOPMENT**  
**OF ROAD AND BRIDGE TECHNOLOGY**  
**IN**  
**THE REPUBLIC OF THE UNION OF MYANMAR**  
**AGREED UPON BETWEEN**  
**MINISTRY OF CONSTRUCTION**  
**AND**  
**JAPAN INTERNATIONAL COOPERATION AGENCY**

6 January 2016, Nay Pyi Taw



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Keiichiro NAKAZAWA  
Chief Representative  
Myanmar Office  
Japan International Cooperation  
Agency (JICA)



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Kyaw Linn  
Permanent Secretary  
Ministry of Construction  
The Republic of the Union of  
Myanmar

Based on the minutes of meetings on the Detailed Planning Survey on the Project for Capacity Development of Road and Bridge Technology (hereinafter referred to as "the Project") signed on March 31<sup>st</sup>, 2015 between former Public Works (hereinafter referred to as "PW"), Ministry of Construction (hereinafter referred to as "MOC"), and the Japan International Cooperation Agency (hereinafter referred to as "JICA"), JICA held a series of discussions with PW and relevant organizations to develop a detailed plan of the Project.

Both parties agreed the details of the Project and main points discussed as described in the Appendix 1 and the Appendix 2, respectively, and to request their respective governments to proceed with the necessary procedures for implementation of the Project.

Both parties also agreed that MOC, the counterpart personnel to JICA, will be responsible for the implementation of the Project in cooperation with JICA, coordinate with other relevant organizations and ensure that the self-reliant operation of the Project is sustained during and after the implementation period in order to contribute toward social and economic development of the Republic of the Union of Myanmar.

The Project will be implemented within the framework of the Note Verbales to be exchanged between the Government of Japan (hereinafter referred to as "GOJ") and the Government of Myanmar (hereinafter referred to as "GOM").

Appendix 1: Project Description

Appendix 2: Main Points Discussed

## PROJECT DESCRIPTION

Both parties confirmed that there is no change in the Project Description agreed on in the minutes of meetings on the Detailed Planning Survey on the Project signed on March 31<sup>st</sup>, 2015.

### **I. BACKGROUND**

Since the beginning of the structural reform program, the Myanmar economy has been growing rapidly with annual growth rate of 7.8% in both Fiscal Year 2014 (ending 31 March 2015) and in FY2015. Such growth is supported by rising investments by improved business environment, commodity exports, rising production of natural resources, tourism, and credit growth supported by the reform program. Though proper investment to meet the rapid economic growth is a foundation for healthy economy, roads and bridges in Myanmar are not fully meeting with growing traffic and the sizes and the loads of the means of transportation. Accordingly, there is a strong need of establishing technical standards consisting of the latest technologies for roads and bridges to meet such rapidly changing situations in Myanmar.

In particular, the bridge construction in Myanmar has been carried out steadily by the Public Work (PW) of the Ministry of Construction (MOC) utilizing technical capacity derived from the past technical cooperation project (TCP), especially the Bridge Training Center (BTC) Project carried out between 1979 and 1985. The selection of bridge type is, however, still narrow because of the limitation to access the most updated information and technologies on bridge design and construction during the seclusion. In addition, training and development of young engineers engaging the road and the bridge sectors is difficult due to the constraints for the adequate capacity in instruction of the related technologies, such as bridge design and supervision suitable to local environment. As a result, a variety issues related to operation and maintenance of structures become apparent to PW. If no appropriate actions would be taken in immediate future, the operation and maintenance of newly built road and bridges recently developed through on-going road and bridge development strategy would not be operated and maintained in a proper manner.

In light of such situation, JICA has been cooperating with PW in the implementation of the TCP "Project for the Improvement of Road Technology in Disaster Affected Area in the Republic of the Union of Myanmar" since July 2012. The project is aimed at road technologies with specific focus on soft soil stabilization commonly observed in the region. The scope of the project, however, is limited to the improvement of road construction within the Ayeyarwady region, a broad impact affecting the whole sectors of road and bridges in Myanmar is among the highest priority of upgrading the technologies for meeting the economic growth.

Under such circumstances, the Government of Myanmar requested a new TCP, "The Project for Capacity Development of Road and Bridge Technology" to the Government of Japan in January 2014. The request of the TCP includes establishment of the technical standards of road and bridge, improvement of construction supervision, instruction on operation and maintenance, repairing work for salt-damaged bridges. Considering the fact that the design and supervision of major roads and bridges are carried out by engineers of PW, and that some grant aid projects, such as "The Project for Construction of New Thaketa Bridge" are in progress, the enhancement of the capacity of PW shall be taken into the consideration.

In response to the request, JICA held a series of discussions with the authorities concerned of Myanmar and determined to transfer the technology in order to facilitate the improvement of the quality of bridges and concrete structures constructed or managed by PW.

## **II. OUTLINE OF THE PROJECT**

The details of the Project are described in the tentative Logical Framework (Project Design Matrix: PDM) (Annex 1) and the tentative Plan of Operation (PO) (Annex 2).

### **1. Project Title**

The Project for Capacity Development of Road and Bridge Technology

### **2. Duration of the Project**

Based on the discussion on the Plan of Operation (hereinafter referred to as "PO") in ANNEX II, it was agreed that the duration of the Project would be three and half (3.5) years including half (0.5) year for preparation. The starting date will be further consulted before signing of R/D.

### **3. Project Site(s) and Beneficiaries**

#### **(1) Project Site**

The main activities of the Project will be implemented at MOC's headquarters in Nay Pyi Taw.

#### **(2) Direct-beneficiaries**

Direct beneficiaries of the Project will be the staff of the Department of Bridge and the Department of Highways of MOC.

#### **(3) Indirect-beneficiaries**

Indirect beneficiaries are road and bridge users.

### **4. Master Plan**

Through the series of discussions, the both sides reached the agreement on the framework of the Project as follows. Details are shown in the Project Design Matrix (hereinafter referred to as "PDM") in ANNEX I. It was understood that the attached PDM is provisional, and both sides will further review and revise the matrix as necessary in an early stage of the Project implementation if necessary

upon mutual agreement.

(Overall Goal)

Quality of bridges and concrete structures constructed or managed by MOC improved

(Project Purpose)

The capacity of MOC engineers on construction management for bridge and road construction enhanced

(Outputs)

1. Advises to a broad policy matters and technical documents on road and bridge sectors provided
2. The work process for quality and safety of concrete and bridge construction projects developed and enhanced
3. The technical documents on quality and safety control for concrete and bridge construction developed

5. Input

(1) Input by JICA

Input by JICA is as follows:

(a) Dispatch of Experts

(i) Long-term experts

- Road / Bridge Policy Advisor
- Construction Management / Monitoring and Evaluation / Coordinator

(ii) Short-term experts

- Quality control (Concrete)
- Quality control (Steel bridge)
- Quality control (PC bridge)
- Quality control (Foundation)
- Safety control
- Bridge Inventory / Work Process

(iii) Lecturers of the Seminars

(b) Trainings in Japan

3 times (1 time / year)

In case of importation, the machinery, equipment and other materials under II-1 (1) (c) above will become the property of the GOM upon being delivered C.I.F. (cost, insurance and freight) to the Myanmar authorities concerned at the ports and/or airports of disembarkation. Input other than indicated above will be determined through mutual consultations between JICA and MOC during the implementation of the Project, as necessary.

(2) Input by the Myanmar Side

MOC will take necessary measures to provide at its own expense:

(a) Services of MOC's counterpart personnel and administrative personnel as following:

- (i) Project Director General
  - (ii) Project Director
  - (iii) Project Manager
  - (iv) Counterpart Team
    - Department of Bridges, MOC
    - Department of Highways, MOC
- (b) Equipment and Facilities
- (i) Office space in the building of MOC's HQ for the Road/Bridge Policy Advisor with office furniture and utilities such as internet connection, electricity, air conditioner etc
  - (ii) Office space in the building of MOC's HQ for other Project members with office furniture and utilities such as internet connection, electricity, air conditioner etc.
- (c) Local cost Borne by the Myanmar Side
- (i) Trainees' and Participants' expenses of workshops, seminars, trainings in Myanmar including travel expenses, allowance etc.
  - (ii) Construction cost of the Pilot Project(s)
- (d) Technical Advisory Group (TAG)  
Expenses of Myanmar side of TAG which is regularly held to invite relevant organizations, such as BRL, RRL, YCDC, YTU, regional government, etc.

## 6. Implementation Structure

The Project organization chart is given in the Annex 3. The roles and assignments of relevant organizations are as follows:

### (1) MOC

#### (a) Project Director General / Chairperson of Joint Coordinating Committee (JCC)

Permanent Secretary (PS) of MOC will be responsible for overall administration and implementation of the Project.

#### (b) Vice Chairperson of JCC

Director General (DG) of Department of Bridges in MOC will assist PS for overall administration and implementation of the Project.

#### (c) Project Director

Deputy DG of Department of Bridges in MOC will be responsible for the implementation of the Project

#### (d) Counterparts

Relevant officers from following departments and offices in MOC will be responsible for the managerial and technical matters of the Project, and at least one of the counterparts from the Department of Bridge and the Department of Highways shall be respectively dedicated.

- Department of Bridges, MOC
- Department of Highways, MOC

(2) JICA Experts

The JICA experts will give necessary technical guidance, advice, and recommendations to MOC on any matters pertaining to the implementation of the Project.

(3) Joint Coordinating Committee (JCC)

JCC will be established in order to facilitate inter-organizational coordination. JCC meeting will be held at least once a year and whenever deems it necessary. JCC will approve an annual work plan, review overall progress, conduct evaluation of the Project, and exchange opinions on major issues that arise during the implementation of the Project. A list of proposed members of JCC and RAM-WG is shown in the Annex 4.

7. Reports

JICA will prepare and submit the following reports to MOC in English.

(1) Inception Report at the commencement of the Project

MOC and JICA experts will jointly prepare the following reports in English.

(1) Monitoring Sheet on semiannual basis until the project completion.

(2) Project Completion Report at the time of completion.

8. Environmental and Social Considerations

MOC agreed to abide by JICA Guidelines for Environmental and Social Considerations in order to ensure that appropriate considerations will be made for the environmental and social impacts of the Project

**III. UNDERTAKINGS OF MOC**

1. MOC and GOM will take necessary measures to:

(1) ensure that the technologies and knowledge acquired by the Myanmar nationals as a result of Japanese technical cooperation contributes to the economic and social development of Myanmar, and that the knowledge and experience acquired by the personnel of Myanmar from technical training as well as the equipment provided by JICA will be utilized effectively in the implementation of the Project; and

(2) grant privileges, exemptions and benefits to the JICA experts referred to in II-1 (1) above and their families, which are no less favorable than those granted to experts and members of the missions and their families of third countries or international organizations performing similar missions in Myanmar.

2. MOC and GOM will take necessary measures to:

(1) provide security-related information as well as measures to ensure the safety of the JICA experts; and

(2) permit the JICA experts to enter, leave and sojourn in Myanmar for the duration of their assignments therein and exempt them from foreign registration

requirements and consular fees.

Other privileges, exemptions and benefits will be provided in accordance with the Agreement between the GOJ and the GOM.

#### **IV. MONITORING AND EVALUATION**

JICA and the MOC will jointly and regularly monitor the progress of the Project through the Monitoring Sheets based on the Project Design Matrix (PDM) and Plan of Operations (PO). The Monitoring Sheets shall be reviewed every six (6) months.

Also, Project Completion Report shall be drawn up one (1) month before the termination of the Project.

JICA will conduct the following evaluations and surveys to mainly verify sustainability and impact of the Project and draw lessons. The MOC is required to provide necessary support for them.

1. Ex-post evaluation three (3) years after the project completion, in principle
2. Follow-up surveys on necessity basis

#### **V. PROMOTION OF PUBLIC SUPPORT**

For the purpose of promoting support for the Project, MOC will take appropriate measures to make the Project widely known to the people of Myanmar.

#### **VI. MISCONDUCT**

If JICA receives information related to suspected corrupt or fraudulent practices in the implementation of the Project, MOC and relevant organizations shall provide JICA with such information as JICA may reasonably request, including information related to any concerned official of the government and/or public organizations of Myanmar.

MOC and relevant organizations shall not, unfairly or unfavorably treat the person and/or company which provided the information related to suspected corrupt or fraudulent practices in the implementation of the Project.

#### **VII. MUTUAL CONSULTATION**

JICA and MOC will consult each other whenever any major issues arise in the course of Project implementation.

#### **VIII. AMENDMENTS**

The record of discussions may be amended by the minutes of meetings between JICA and MOC.

The minutes of meetings will be signed by authorized persons of each side who may be different from the signers of the record of discussions.



- Annex 1 Logical Framework (Draft Project Design Matrix:PDM)
- Annex 2 Tentative Plan of Operations
- Annex 3 Project Organization Chart
- Annex 4 A List of Proposed Members of Joint Coordinating Committee

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## Project Design Matrix

Project Title:

The Project for Capacity Development of Road and Bridge Technology

Version 0.0

Implementing Agency:

道路橋梁技術能力強化プロジェクト

Dated June XX, 2015

Target Group:

MOC  
Department of Bridges, Department of Highways

Period of Project:

3.5 years (including 0.5 year for preparation)

Project Site:

Nay Pyi Taw and whole country of Myanmar

Model Site:

Narrative Summary	Objectively Verifiable Indicator ( Within 5 years after the project completes, )	Means of Verification	Important Assumption	Achievement	Remarks
Overall Goal Quality of bridges and concrete structures constructed or managed by MOC improved	<p>( Within 5 years after the project completes, )</p> <p>1. At least XX% of the bridges and concrete structures constructed complying the technical documents</p> <p>2. The strength, and appearance of the concrete structure built by MOC is maintained within the requirements stipulated in the technical documents.</p>	<p>List and record of bridges and road constructed</p> <p>Record of bridge post completion inspection</p>	<p>MOC continues to revise and update the technical documents</p> <p>MOC support promotion and dissemination of the technical documents to construction engineers in Myanmar</p>		
Project Purpose The capacity of MOC engineers on construction management for bridge and road construction enhanced	<p>( Upon completion of the Project, )</p> <p>1. The technical documents are distributed and ready to be used to all MOC offices.</p> <p>2. The technical documents are used and applied by the state and regional offices of MOC where the pilot projects have been carried out.</p> <p>3. The maintenance records of bridges constructed through the pilot projects are submitted to the MOC headquarters for monitoring.</p>	<p>1-1 Observation by C/P and the experts</p> <p>1-2 Record of project supervision</p> <p>1-3 Interview to engineers participated in the workshops/ seminars</p> <p>2-1 Observation by C/P and the experts</p> <p>2-2 Record of project supervision</p> <p>2-3 Interview to engineers participated in the workshops/ seminars</p> <p>3-1 maintenance record</p> <p>3-2 Observation by C/P and experts</p>	<p>The current policy on quality assurance for construction remain unchanged.</p> <p>Quality assurance activities carried out continuously after the project completes</p>		

<p>Outputs</p> <p>Output 1. Advises to a broad policy matters and technical documents on road and bridge sectors provided</p>	<p>1-1 The advises and the recommendations to MOC are practical and provided in a timely manner</p> <p>1-2 MOC increases the knowledge on selected policies and technical documents on road and bridges.</p>	<p>1-1 Activity reports, reports submitted to MOC, interview to C/P</p> <p>1-2 List of technical documents introduced, results of post-seminar evaluation</p>	<p>Sufficient and accurate testing services for quality control are available in a timely manner</p>	
<p>Output 2. The work process for quality and safety of concrete and bridge construction projects developed and enhanced</p>	<p>2-1 The draft of the work process on quality and safety control for concrete and bridge construction completed, submitted and reviewed</p> <p>2-2 Trainings on work process for quality and safety control of concrete and bridge construction are carried out</p>	<p>2-1 Draft of the work process, interviews to MOC, samples of the bridge inventory</p> <p>2-2 List of participants, result of final examination/ observation of his/her work on-site and attendance record, etc.</p>	<p>Sufficient budget for activities to ensure quality and safety control is allocated</p> <p>Organizational arrangement for implementation remains no significant changes</p>	
<p>Output 3. The technical documents on quality and safety control for concrete and bridge construction developed</p>	<p>3-1 The draft technical documents are completed, submitted and reviewed</p> <p>3-2 Trainings on construction management for quality and safety control of concrete and bridge construction are carried out</p>	<p>3-1 Draft of the technical documents interview to MOC</p> <p>3-2 List of participants, result of final examination/ observation of his/her work on-site and attendance record, etc.</p>	<p>Training carried out regularly and continuously by the Myanmar side</p>	

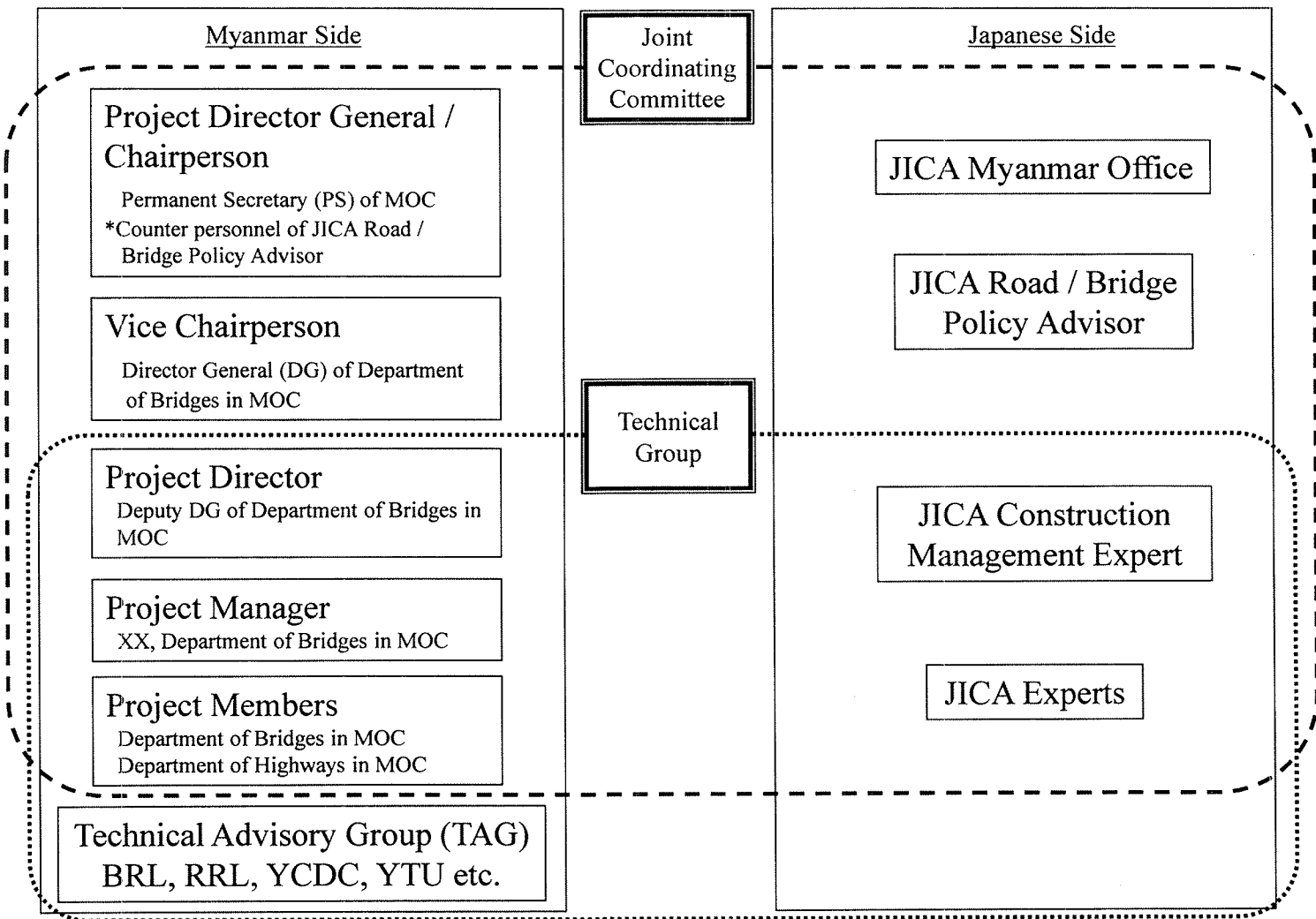
Activities	Inputs		Pre-Conditions
	The Japanese Side	The Myanmar Side	
<p>1-1 Provide various information on technologies and policy related to the road and bridge sectors in Japan or other countries through workshops/seminars, trainings etc.</p> <p>1-2 Provide necessary advise on a various issues related to the road and bridge sectors when consulted based on the information collected.</p> <p>1-3 Propose prospective Japanese technical assistance for the road and bridge sectors.</p> <p>1-4 Introduce Japanese technical documents through seminars.</p>	<p>1. Experts (1) Long-term Experts Road / Bridge Policy Advisor Construction Management / Monitoring and Evaluation / Coordinator</p> <p>(2) Short-term Experts Quality control (Concrete) Quality control (Steel bridge) Quality control (PC bridge) Quality control (Foundation) Safety control Bridge Inventory / Work Process</p> <p>(3) Lecturers of the Seminars</p> <p>2. Training in Japan 3 times (1 time / year)</p>	<p>1. Counterpart (1) Project Director General (2) Project Director (3) Project Manager (4) Counterpart Team Department of Bridges, MOC Department of Highways, MOC</p> <p>2. Equipment and Facilities (1) Office space in the building of MOC's HQ for the Road/Bridge Policy Advisor with office furniture and utilities such as internet connection, electricity, air conditioner etc.</p> <p>(2) Office space in the building of MOC's HQ for other Project members with office furniture and utilities such as internet connection, electricity, air conditioner etc.</p> <p>3. Local Cost Borne by the Myanmar Side (1) Trainees' and Participants' expenses of workshops/ seminars, trainings in Myanmar including travel expenses, allowance etc. (2) Construction cost of the Pilot Project(s)</p> <p>4. TAG (1) Expenses of Myanmar side of TAG which is regularly held to invite relevant organizations, such as BRL, RRL, YCDC, YTU etc.</p>	<p>Sufficient number of counterparts with appropriate expertise are assigned to the Project</p>
<p>2-1 Investigate the current condition of the overall capacity and the work process in MOC.</p> <p>2-2 Introduce the outlines of construction management and the work process in Japan or other countries through workshops/seminars and trainings.</p> <p>2-3 Draft the guideline on construction management methods and the work process to apply the technical documents developed by the Project.</p> <p>2-4 Develop the bridge inventory (system framework and sample database) to keep documents and data necessary for maintenance.</p> <p>2-5 Draft the procedures to hand-over the as-built drawings, etc. from the construction dept. to the maintenance dept. when projects completes.</p> <p>2-6 Carry out on-the-job training on the construction management and the work process applying the contents of the procedures utilizing the selected pilot projects.</p> <p>2-7 Distribute the guideline and procedures to relevant organizations / offices / engineers through workshops / seminars.</p> <p>2-8 Monitor the progress of the above activities and attainment &amp; application of the technical contents periodically and report the results to JCC.</p>			
<p>3-1 Investigate the current condition of the existing technical documents of MOC.</p> <p>3-2 Introduce the outlines of construction supervision, the technical documents and the technologies used in Japan and other countries through workshops/ seminars and trainings.</p> <p>3-3 Draft technical documents on construction supervision (quality and safety control for road and bridge construction).</p> <p>3-4 Carry out on-the-job training on construction supervision utilizing the selected pilot project(s).</p> <p>3-5 Distribute the technical documents to the relevant organizations / offices / engineers through workshops/ seminars.</p> <p>3-6 Monitor the progress of the above activities and attainment &amp; application of the technical contents periodically and report the results to JCC.</p>			



Tentative Plan of Operation

Project Title: The Project for Capacity Development of Road and Bridge Technology		Tentative Plan of Operation																
		Year		1st Year				2nd Year				3rd Year				4th Year		
Sub-Activities			I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
<b>Output 1. Advise to a broad policy matters and technical documents on road and bridge sectors provided</b>		Plan																
1-1 Provide various information on technologies and policy related to the road and bridge sectors in Japan or other countries through workshops/seminars, trainings etc.		Actual																
1-2 Provide necessary advise on a various issues related to the road and bridge sectors when consulted based on the information collected.		Plan																
1-2 Provide necessary advise on a various issues related to the road and bridge sectors when consulted based on the information collected.		Actual																
1-3 Propose prospective Japanese technical assistance for the road and bridge sectors.		Plan																
1-3 Propose prospective Japanese technical assistance for the road and bridge sectors.		Actual																
1-4 Introduce Japanese technical documents through seminars.		Plan																
1-4 Introduce Japanese technical documents through seminars.		Actual																
<b>Output 2. The work process for quality and safety of concrete and bridge construction projects developed and enhanced</b>		Plan																
2-1 Investigate the current condition of the overall capacity and the work process in MOC.		Actual																
2-2 Introduce the outlines of construction management and the work process in Japan or other countries through workshops/seminars and trainings.		Plan																
2-2 Introduce the outlines of construction management and the work process in Japan or other countries through workshops/seminars and trainings.		Actual																
2-3 Draft the guideline on construction management methods and the work process to apply the technical documents developed by the Project.		Plan																
2-3 Draft the guideline on construction management methods and the work process to apply the technical documents developed by the Project.		Actual																
2-4 Develop the bridge inventory (system framework and sample database) to keep documents and data necessary for maintenance.		Plan																
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2-5 Draft the procedures to hand-over the as-built drawings, etc. from the construction dept. to the maintenance dept. when projects completes.		Actual																
2-6 Carry out on-the-job training on the construction management and the work process applying the contents of the procedures utilizing the selected pilot projects.		Plan																
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2-7 Distribute the guideline and procedures to relevant organizations / offices / engineers through workshops / seminars.		Plan																
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2-8 Monitor the progress of the above activities and attainment & application of the technical contents periodically and report the results to JCC.		Plan																
2-8 Monitor the progress of the above activities and attainment & application of the technical contents periodically and report the results to JCC.		Actual																
<b>Output 3. The technical documents on quality and safety control for concrete and bridge construction developed</b>		Plan																
3-1 Investigate the current condition of the existing technical documents of MOC.		Actual																
3-2 Introduce the outlines of construction supervision, the technical documents and the technologies used in Japan and other countries through workshops/ seminars and trainings.		Plan																
3-2 Introduce the outlines of construction supervision, the technical documents and the technologies used in Japan and other countries through workshops/ seminars and trainings.		Actual																
3-3 Draft technical documents on construction supervision (quality and safety control for road and bridge construction).		Plan																
3-3 Draft technical documents on construction supervision (quality and safety control for road and bridge construction).		Actual																
3-4 Carry out on-the-job training on construction supervision utilizing the selected pilot project(s).		Plan																
3-4 Carry out on-the-job training on construction supervision utilizing the selected pilot project(s).		Actual																
3-5 Distribute the technical documents to the relevant organizations / offices / engineers through workshops/ seminars.		Plan																
3-5 Distribute the technical documents to the relevant organizations / offices / engineers through workshops/ seminars.		Actual																
3-6 Monitor the progress of the above activities and attainment & application of the technical contents periodically and report the results to JCC.		Plan																
3-6 Monitor the progress of the above activities and attainment & application of the technical contents periodically and report the results to JCC.		Actual																
<b>Duration / Phasing</b>		Plan																
<b>Duration / Phasing</b>		Actual																

## Organization chart of the Project



## LIST OF PROPOSED MEMBERS OF JOINT COORDINATING COMMITTEE

Chairperson: Permanent Secretary of Ministry of Construction (MOC)

Vice Chairperson: Director General (DG) of Department of Bridges in MOC

Members:

### (1) Myanmar Side

- 1) Project Director: Deputy DG of Department of Bridges in MOC
- 2) Project Manager: XX(Name), XX(Position), Department of Bridges in MOC
- 3) Department of Bridges:
  - XX (Name), XX (Position), MOC
  - XX (Name), XX (Position), MOC
  - XX (Name), XX (Position), MOC
- 4) Department of Highways:
  - XX (Name), XX (Position), MOC
  - XX (Name), XX (Position), MOC
- 5) Relevant personnel accepted by the Chairperson, if necessary.

### (2) Japanese Side

- 1) JICA Myanmar Office
  - Chief Representative
  - Representative
  - Program Officer in charge of the Project
- 2) JICA Experts (Long-term)
  - Road / Bridge Policy Advisor
  - Construction Management / Monitoring and Evaluation / Coordinator
- 3) JICA Experts (Short-term)
  - Quality Control (Concrete)
  - Quality Control (Steel Bridge)
  - Quality Control (PC Bridge)
  - Quality Control (Foundation)
  - Safety Control
  - Bridge Inventory / Work Process
- 4) Other personnel accepted by JICA, if necessary

JCC will be scheduled based on the maximum availability of the members listed above.

## MAIN POINTS DISCUSSED

### **1. MAIN CONTENTS OF THE PROJECT**

The JICA Mission proposed and both sides agreed that the main contents of the Project include (1) advisory on policies and technical documents of the road and bridge sectors, (2) work process for quality and safety control of concrete and bridge construction, and (3) technical documents on quality and safety control of road and bridge construction.

### **2. PROJECT TITLE**

Both sides confirmed that the Project title is "The Project for Capacity Development of Road and Bridge Technology".

### **3. RECORD OF DISCUSSIONS**

Both sides agreed that the Record of Discussions (R/D), the draft of which is attached hereto, will determine the framework of the Project. R/D will be signed after the formal approval of both sides.

### **4. PROJECT DESIGN MATRXX (PDM)**

Both sides agreed on the contents of the tentative Logical Framework (Project Design Matrix: PDM) and the tentative Plan of Operations (PO) as shown in Annex 1 and 2 of the draft R/D. The PDM and PO are to be flexibly revised according to the progress and the achievement of the Project, upon mutual agreement between MOC and JICA by signing a Minutes of Meetings, according to the draft R/D.

### **5. COUNTERPART**

Both sides agreed that necessary counterparts as described in II.1 (2) and Annex-1 (PDM) of the draft R/D shall be assigned and informed to JICA before the signing of the R/D, and at least one of the counterparts from the bridge department and the road department shall be respectively dedicated.

### **6. PROJECT OFFICES**

Both sides agreed necessary two (2) office spaces as described in II.1 (2) and Annex-1 (PDM) of the draft R/D shall be prepared by MOC in the building of MOC's HQ including office furniture and utilities such as internet connection, electricity, air conditioner etc. before commencement of the Project. The arrangement plan will be informed to JICA before the signing of the R/D. An estimated number of members to be accommodated is

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approximately two (2) for office of the road / bridge policy advisor and twenty (20) for office of other Project members.

#### **7. TRANSLATION OF TECHNICAL DOCUMENTS INTO MYANMAR LANGUAGE**

MOC requested to the JICA Mission, the technical documents of 1) Quality control of Bridge, 2) Quality Control of Concrete and 3) Safety Control as the output of the Project will be translated into Myanmar Language (Burmese).

Basically the JICA Mission agreed to it, however the outputs of the Project shall be the English version and Burmese version shall be the reference for Myanmar engineers, because native check cannot be carried out by Japanese side. MOC agreed to it.

#### **8. INTRODUCTION OF OTHER JAPANESE TECHNICAL DOCUMENTS**

MOC requested to the JICA Mission, the Japanese technical documents of 1) Bridge Design, 2) Bridge Maintenance, 3) Quality Control of Soil Structures and 4) Quality Control of Pavement, will be translated into English and introduced to Myanmar engineers with seminar(s). The JICA Mission basically agreed to it.

#### **9. IMPREMENTATION OF ON-THE-JOB-TRAINING**

Both sides agreed that on-the-job training(s) of construction management of bridges and concrete structures will be carried out at selected pilot project(s)' site in the Project, and the schedule of the on-the-job training(s) and the selection of the pilot project(s) will be decided through the mutual consultation by both sides.

And also both sides agreed that the construction cost and the local expenses such as travel expenses and daily allowance for MOC engineers etc. and overall responsibility for the on-the-job training(s) shall be borne by the Myanmar side and MOC shall prepare enough budget for the on-the-job training(s).

In addition, the JICA mission team requested that the pilot project(s) sites shall be selected from areas where safety for Japanese experts is secured.

#### **10. TECHNICAL ADVISORY GROUP (TAG)**

Both sides agreed that the Technical Advisory Group (TAG) will be held regularly during the Project at least once a year to report the progress of the Project, technical findings and ask opinions from relevant organizations such as Bridge Research Laboratory (BRL), Road Research Laboratory (RRL), Yangon City Development Committee (YCDC) and Yangon Technological University (YTU) etc.

And both sides confirmed necessary local expenses such as travel expenses and daily

allowance for TAG shall be borne by the Myanmar side.

**11. TAX OR LEVY**

Both sides confirmed that in case any tax or levy is imposed for equipment provided by Japanese side, MOC shall be borne the equivalent amount of the tax or levy on import.

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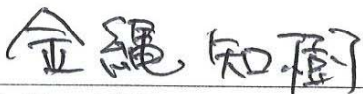
**MINUTES OF MEETING  
BETWEEN  
JAPAN INTERNATIONAL COOPERATION AGENCY  
AND  
PUBLIC WORKS, MINISTRY OF CONSTRUCTION  
ON  
JAPANESE TECHNICAL COOPERATION PROJECT  
FOR  
THE PROJECT FOR CAPACITY DEVELOPMENT  
OF ROAD AND BRIDGE TECHNOLOGY**

In response to the official request of the Republic of the Union of Myanmar (hereinafter referred to as "Myanmar"), the Detailed Planning Survey Team (hereinafter referred to as "the Team") organized by Japan International Cooperation Agency (hereinafter referred to as "JICA") headed by Mr. Tomoki Kanenawa, visited Myanmar from March 22 to April 3, 2015 for the purpose of working out the details of the technical cooperation programme concerning "the Project for Capacity Development of Road and Bridge Technology" (hereinafter referred to as "the Project").

During its stay in Myanmar, the Team exchanged views and had a series of discussions for the purpose of working out the framework and contents of the Project with Myanmar authorities concerned of Public Works (hereinafter referred to as "PW"), Ministry of Construction (hereinafter referred to as "MOC").

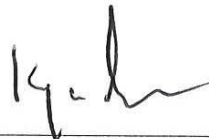
As a result of the discussions, JICA and PW agreed upon the matters referred to in the document attached hereto.

Nay Pyi Taw, March 31st, 2015



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Mr. Tomoki Kanenawa  
Leader  
Detailed Planning Survey Team,  
Japan International Cooperation Agency



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Mr. U Kyaw Linn  
Managing Director  
Public Works, Ministry of Construction

**ATTACHED DOCUMENT**

**RECORD OF DISCUSSIONS**

Both sides agreed that the Record of Discussions (R/D), the draft of which is attached hereto, will determine the framework of the Project. The R/D will be signed after the formal approval by both sides.

Attachment Draft Record of Discussions

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**DRAFT RECORD OF DISCUSSIONS**

**ON**

**THE PROJECT FOR CAPACITY DEVELOPMENT  
OF ROAD AND BRIDGE TECHNOLOGY**

**IN**

**THE REPUBLIC OF THE UNION OF MYANMAR**

**AGREED UPON BETWEEN**

**PUBLIC WORKS, MINISTRY OF CONSTRUCTION**

**AND**

**JAPAN INTERNATIONAL COOPERATION AGENCY**

Nay Pyi Taw, [date]

\_\_\_\_\_  
[Representative of JICA]

\_\_\_\_\_  
[Representative of implementing  
agency]

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Based on the minutes of meetings on the Detailed Planning Survey on the Project for Capacity Development of Road and Bridge Technology (hereinafter referred to as "the Project") signed on March 31st, 2015 between Public Works (hereinafter referred to as "PW"), Ministry of Construction (hereinafter referred to as "MOC"), and the Japan International Cooperation Agency (hereinafter referred to as "JICA"), JICA held a series of discussions with PW and relevant organizations to develop a detailed plan of the Project.

Both parties agreed the details of the Project and main points discussed as described in the Appendix 1 and the Appendix 2, respectively, and to request their respective governments to proceed with the necessary procedures for implementation of the Project.

Both parties also agreed that PW, the counterpart personnel to JICA, will be responsible for the implementation of the Project in cooperation with JICA, coordinate with other relevant organizations and ensure that the self-reliant operation of the Project is sustained during and after the implementation period in order to contribute toward social and economic development of the Republic of the Union of Myanmar.

The Project will be implemented within the framework of the Note Verbales to be exchanged between the Government of Japan (hereinafter referred to as "GOJ") and the Government of Myanmar (hereinafter referred to as "GOM").

Appendix 1: Project Description

Appendix 2: Main Points Discussed

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## PROJECT DESCRIPTION

Both parties confirmed that there is no change in the Project Description agreed on in the minutes of meetings on the Detailed Planning Survey on the Project signed on March 31<sup>st</sup>, 2015.

### I. BACKGROUND

Since the beginning of the structural reform program, the Myanmar economy has been growing rapidly with annual growth rate of 7.8% in both Fiscal Year 2014 (ending 31 March 2015) and in FY2015. Such growth is supported by rising investments by improved business environment, commodity exports, rising production of natural resources, tourism, and credit growth supported by the reform program. Though proper investment to meet the rapid economic growth is a foundation for healthy economy, roads and bridges in Myanmar are not fully meeting with growing traffic and the sizes and the loads of the means of transportation. Accordingly, there is a strong need of establishing technical standards consisting of the latest technologies for roads and bridges to meet such rapidly changing situations in Myanmar.

In particular, the bridge construction in Myanmar has been carried out steadily by the Public Work (PW) of the Ministry of Construction (MOC) utilizing technical capacity derived from the past technical cooperation project (TCP), especially the Bridge Training Center (BTC) Project carried out between 1979 and 1985. The selection of bridge type is, however, still narrow because of the limitation to access the most updated information and technologies on bridge design and construction during the seclusion. In addition, training and development of young engineers engaging the road and the bridge sectors is difficult due to the constraints for the adequate capacity in instruction of the related technologies, such as bridge design and supervision suitable to local environment. As a result, a variety issues related to operation and maintenance of structures become apparent to PW. If no appropriate actions would be taken in immediate future, the operation and maintenance of newly built road and bridges recently developed through on-going road and bridge development strategy may not be operated and maintained in a proper manner.

In light of such situation, JICA has been cooperating with PW in the implementation of the TCP "Project for the Improvement of Road Technology in Disaster Affected Area in the Republic of the Union of Myanmar" since July 2012. The project is aimed at road technologies with specific focus on soft soil stabilization commonly observed in the region. The scope of the project, however, is limited to the improvement of road construction within the Ayeyarwady region, a broad impact affecting the whole sectors of road and bridges in Myanmar is among the highest priority of upgrading the technologies for meeting the economic growth.

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Under such circumstances, the Government of Myanmar requested a new TCP, "The Project for Capacity Development of Road and Bridge Technology" to the Government of Japan in January 2014. The request of the TCP includes establishment of the technical standards of road and bridge, improvement of construction supervision, instruction on operation and maintenance, repairing work for salt-damaged bridges. Considering the fact that the design and supervision of major roads and bridges are carried out by engineers of PW, and that some grant aid projects, such as "The Project for Construction of New Thaketa Bridge" are in progress, the enhancement of the capacity of PW shall be taken into the consideration.

In response to the request, JICA held a series of discussions with the authorities concerned of Myanmar and determined to transfer the technology in order to facilitate the improvement of the quality of bridges and concrete structures constructed or managed by PW.

## **II. OUTLINE OF THE PROJECT**

The details of the Project are described in the tentative Logical Framework (Project Design Matrix: PDM) (Annex 1) and the tentative Plan of Operation (PO) (Annex 2).

### 1. Project Title

The Project for Capacity Development of Road and Bridge Technology

### 2. Duration of the Project

Based on the discussion on the Plan of Operation (hereinafter referred to as "PO") in ANNEX II, it was agreed that the duration of the Project would be three and half (3.5) years including half (0.5) year for preparation. The starting date will be further consulted before signing of R/D.

### 3. Project Site(s) and Beneficiaries

#### (1) Project Site

The main activities of the Project will be implemented at PW's headquarters in Nay Pyi Taw.

#### (2) Direct-beneficiaries

Direct beneficiaries of the Project will be the staff of the Bridge Department and the Road Department of PW.

#### (3) Indirect-beneficiaries

Indirect beneficiaries are road and bridge users.

### 4. Master Plan

Through the series of discussions, the both sides reached the agreement on the framework of the Project as follows. Details are shown in the Project Design Matrix (hereinafter referred to as "PDM") in ANNEX I. It was understood that the attached PDM is provisional, and both sides will further review and revise the matrix as necessary in an early stage of the Project implementation if necessary

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upon mutual agreement.

(Overall Goal)

Quality of bridges and concrete structures constructed or managed by PW improved

(Project Purpose)

The capacity of PW engineers on construction management for bridge and road construction enhanced

(Outputs)

1. Advises to a broad policy matters and technical documents on road and bridge sectors provided
2. The work process for quality and safety of concrete and bridge construction projects developed and enhanced
3. The technical documents on quality and safety control for concrete and bridge construction developed

5. Input

(1) Input by JICA

Input by JICA is as follows:

(a) Dispatch of Experts

(i) Long-term experts

- Road / Bridge Policy Advisor
- Construction Management / Monitoring and Evaluation / Coordinator

(ii) Short-term experts

- Quality control (Concrete)
- Quality control (Steel bridge)
- Quality control (PC bridge)
- Quality control (Foundation)
- Safety control
- Bridge Inventory / Work Process

(iii) Lecturers of the Seminars

(b) Trainings in Japan

3 times (1 time / year)

(2) Input by the Myanmar Side

PW will take necessary measures to provide at its own expense:

(a) Services of PW's counterpart personnel and administrative personnel as following:

(i) Project Director General

(ii) Project Director

(iii) Project Manager

(iv) Counterpart Team

- Bridge Department, PW
- Road Department, PW

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(b) Equipment and Facilities

- (i) Office space in the building of PW's HQ for the Road/Bridge Policy Advisor with office furniture and utilities such as internet connection, electricity, air conditioner etc
- (ii) Office space in the building of PW's HQ for other Project members with office furniture and utilities such as internet connection, electricity, air conditioner etc.

(c) Local cost Borne by the Myanmar Side

- (i) Trainees' and Participants' expenses of workshops, seminars, trainings in Myanmar including travel expenses, allowance etc.
- (ii) Construction cost of the Pilot Project(s)

(d) Technical Advisory Group (TAG)

Expenses of Myanmar side of TAG which is regularly held to invite relevant organizations, such as BRL, RRL, etc.

6. Implementation Structure

The Project organization chart is given in the Annex 3. The roles and assignments of relevant organizations are as follows:

(1) PW

(a) Project Director General / Chairperson of Joint Coordinating Committee (JCC)

Managing Director of PW will be responsible for overall administration and implementation of the Project.

(b) Vice Chairperson of JCC

Deputy Managing Director (Bridge) of PW in MOC will assist Managing Director for overall administration and implementation of the Project.

(c) Project Director

Chief Engineer, Bridge Department of PW in MOC will be responsible for the implementation of the Project

(d) Counterparts

Relevant officers from following departments and offices in PW will be responsible for the managerial and technical matters of the Project, and at least one of the counterparts from the bridge department and the road department respectively shall be dedicated to the Project.

- Bridge Department of PW
- Road Department of PW

(2) JICA Experts

The JICA experts will give necessary technical guidance, advice, and recommendations to PW on any matters pertaining to the implementation of the Project.

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(3) Joint Coordinating Committee (JCC)

JCC will be established in order to facilitate inter-organizational coordination. JCC meeting will be held at least once a year and whenever deems it necessary. JCC will approve an annual work plan, review overall progress, conduct evaluation of the Project, and exchange opinions on major issues that arise during the implementation of the Project. A list of proposed members of JCC and is shown in the Annex 4.

7. Reports

JICA will prepare and submit the following reports to PW in English.

(1) Inception Report at the commencement of the Project

PW and JICA experts will jointly prepare the following reports in English.

(1) Monitoring Sheet on semiannual basis until the project completion.

(2) Project Completion Report at the time of completion.

8. Environmental and Social Considerations

PW agreed to abide by JICA Guidelines for Environmental and Social Considerations in order to ensure that appropriate considerations will be made for the environmental and social impacts of the Project

**III. UNDERTAKINGS OF PW**

1. PW and GOM will take necessary measures to:

(1) ensure that the technologies and knowledge acquired by the Myanmar nationals as a result of Japanese technical cooperation contributes to the economic and social development of Myanmar, and that the knowledge and experience acquired by the personnel of Myanmar from technical training as well as the equipment provided by JICA will be utilized effectively in the implementation of the Project; and

(2) grant privileges, exemptions and benefits to the JICA experts referred to in II-5 (1) above and their families, which are no less favorable than those granted to experts and members of the missions and their families of third countries or international organizations performing similar missions in Myanmar.

2. PW and GOM will take necessary measures to:

(1) provide security-related information as well as measures to ensure the safety of the JICA experts; and

(2) permit the JICA experts to enter, leave and sojourn in Myanmar for the duration of their assignments therein and exempt them from foreign registration requirements and consular fees.

Other privileges, exemptions and benefits will be provided in accordance with the Agreement between the GOJ and the GOM.

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#### **IV. MONITORING AND EVALUATION**

JICA and the PW will jointly and regularly monitor the progress of the Project through the Monitoring Sheets based on the Project Design Matrix (PDM) and the Plan of Operation (PO). The Monitoring Sheets shall be reviewed every six (6) months. Also, Project Completion Report shall be drawn up one (1) month before the termination of the Project.

JICA will conduct the following evaluations and surveys to mainly verify sustainability and impact of the Project and draw lessons. The PW is required to provide necessary support for them.

1. Ex-post evaluation three (3) years after the project completion, in principle
2. Follow-up surveys on necessity basis

#### **V. PROMOTION OF PUBLIC SUPPORT**

For the purpose of promoting support for the Project, PW will take appropriate measures to make the Project widely known to the people of Myanmar.

#### **VI. MISCONDUCT**

If JICA receives information related to suspected corrupt or fraudulent practices in the implementation of the Project, PW and relevant organizations shall provide JICA with such information as JICA may reasonably request, including information related to any concerned official of the government and/or public organizations of Myanmar.

PW and relevant organizations shall not, unfairly or unfavorably treat the person and/or company which provided the information related to suspected corrupt or fraudulent practices in the implementation of the Project.

#### **VII. MUTUAL CONSULTATION**

JICA and PW will consult each other whenever any major issues arise in the course of Project implementation.

#### **VIII. AMENDMENTS**

The record of discussions may be amended by the minutes of meetings between JICA and PW.

The minutes of meetings will be signed by authorized persons of each side who may be different from the signers of the record of discussions.

- Annex 1 Tentative Logical Framework (Draft Project Design Matrix:PDM)
- Annex 2 Tentative Plan of Operation
- Annex 3 Project Organization Chart
- Annex 4 A List of Proposed Members of Joint Coordinating Committee

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