Minutes of Discussion

4th JCC for "The Project on Improvement of Service and Safety of Railway in Myanmar"

1. DATE 29 Sept. 2014 13:30~15:30
2. PLACE Meeting Room of Myanma Railways Headquarters
3. ATTENDANTS

3.1 Myanmar side

Managing Director	U Thurein Win
General Manager(Technical&Admin.Support)	U Saw Valentine
General Manager(Civil)	U Tin Soe
General Manager(Mechanical&Electrical)	U Aung Win
General Manager(Finance)	U Maung Maung Lwin
Deputy General Manager(Planning)	U Sai Thaw Lin
Deputy General Manager(Operating)	U Htay Myint Aung
Deputy General Manager(Civil)	U Maung Maung Thwin
Deputy General Manager(Civil)	U Than Htay
Deputy General Manager(Signalling&Communication)	U Khin Maung Thein
Assistant General Manager(Planning)	U Thein Myint
Assistant General Manager(Civil)	U Maung Maung Than
Assistant General Manager(Operating)	U Zaw Pe Sein
Manager(Passenger)	U Arkar Min Thu
Assistant Engineer(Civil)	U Zaw Ye Myint
Assistant Engineer(Civil)	U Min Aung
Assistant Manager(Planning)	U Than Htun Aung

3.2 Japan side

JICA Head Office	Mr. K.Imai, Mr. K.Kuramoto
JICA Myanmar Office	Mr. M.Morikawa
JICA Expert Team	Dr. S.Kuroda(Leader:Track maintenance),
	Mr. N.Matsuo(Sub-leader:Maintenance planning),
	Mr. H.Komatsu(Operation maintenance),
	Mr. R. Mitani(Signal&telecom),
	Mr. M.Ishikawa(Rolling Stock)
	Mr. M. Takami(Coordinator)

Observer Sumitomo Corporation Asia & Oceania Pte, Ltd.
Mr.M.Yamato (General Manager Nay Pay Taw Office)
U Tun Tun Kyaw

Interpreter U Kyaw Soe Thu

4.SUBJECT Explanation and discussion of Progress Report

5.HANDOUTS (1)Project Progress Report(ppt digest)
(2) Project Progress Report(file)
(3)Appendix-1.Report of Proposals of Recommendation on Technical standards of MR and Short-,Medium-, and Long-Term Railway facilities Improvement Plan
2.Minutes of Meeting, August 11, 2014,at NayPyiTaw
3.Workshop Report (in Japan)

6.Agenda

6.1 Opening Speech by Chairman U.Thurein Win ,Managing Director

This project is the first technical support by JICA, and one year has passed since commence of the training in the pilot section between Yangon and Bago.

This JCC is the 4th one.

Workshops in Japan have already been implemented for 2 groups, and we are arranging to dispatch one more group in October.

We highly appreciate JICA for supporting safety and service level improvement of MR.

We will continue to cooperate with JICA Expert Team.

6.2 Speech by Mr. Imai, JICA Head Quarter

The progress of the Project up to now was explained by Managing Director of MR.

Today, we will explain the present circumstances of the Project.

I have been informed that technical level of MR staff is improving. Improvement of their ability is the basis of safety and management upgrading of MR.

Please listen to reporting of the Project by JICA Expert Team.

After the Project reporting, I would like to talk about another topic.

6.3 Presentation of Progress Report by JICA Expert Team (Leader S.Kuroda & Deputy Leader N.Matsuo)

6.4 Discussion by all JCC members

（1） MR

This Project will be completed in May 2015. In case the Project is continued further beyond May 2015, kindly include the training for rolling stock and signal. If some trainings can be added to this Project, please consider to add the trainings for rolling stock and signal.

JICA

Regarding the request for formulation of another technical cooperation project for rolling stock and signal similar to the present Project, we cannot answer it here at this moment. We will convey your request to Japanese government.

（2） MR

We would like to have a training of more detailed track maintenance. (Advanced training course)

JICA

We understand the significance of advanced training course. However, the training of fundamental track maintenance technologies is very important.

Besides the track maintenance technology under the ongoing training, technologies for soft ground improvement and level crossing track improvement are also considered to be the fundamental ones for track maintenance.

In this context, if we add the trainings for soft ground improvement and level crossing track improvement to the ongoing training for track maintenance, it can be considered that JICA's technology transfer of track maintenance to MR will be almost achieved.

In this regard, we would like to recommend that in addition to the current training for track maintenance, trainings for soft ground improvement and level crossing track improvement should be implemented, and for completing the trainings, a summarizing training should be implemented on a certain appropriate line. As for this line, we consider that Thilawa line is most suitable, because the line has not so many number of train operations allowing sufficient time for training and includes the suitable locations for recommended training.

This recommendation is based on the professional experiences of railway technical cooperation.

（3） MR

(a) The ongoing training of manual based track maintenance is very useful for MR. However, we would like to request JICA to extend the training for mechanized track maintenance and managing large sized track maintenance machines. Mechanized track maintenance is effective for executing the maintenance of the track stretched over a

long distance.

We have a plan to outsource the track maintenance work. In case of outsourcing the mechanized track maintenance work, MR itself must have the knowledge about details of mechanized track maintenance,

We are also wishing that the current trainees become the trainers for other MR staff.

(b)We would like to learn the bridge maintenance technology.

Kindly consider to provide us with a short (2～3 months) bridge maintenance training course for a selected small group.

(c)We are now going to have many LWR installation projects.

Kindly provide us with a training for LWR technology.

JICA

(a)We understand the various needs of MR. We also understand the significance of mechanized track maintenance. However, soft ground improvement and level crossing track improvement are the most fundamental track maintenance technologies.

With respect to the outsourcing of track maintenance work, it is considered that the most important thing is that MR staff can judge whether the contractor has completed the contracted work precisely as required by the contract.

(b).As for the training for bridge maintenance, we must examine whether the current JICA Expert Team can manage the training. We may need another group of JICA experts.

From tomorrow, we are going to have the workshops for manager level staff.

Upgrading the level of staff at site is also very important. As mentioned above, we would like to request MR to consider our recommendation that in addition to the ongoing training of track maintenance, trainings for soft ground improvement and level crossing track improvement should be implemented and a summarizing training should be implemented on Thilawa line.

Kindly give your response to our recommendation by Oct.15 to JICA Yangon Office.

（4） MR

We would like to request for a training of locomotive, rolling stock and DMU.

We have questions about 5 items of recommendation on technical standard which were explained in Progress Report.

JICA Expert Team

We will discuss them fully at the workshop starting from tomorrow.

（5） MR

The workshop of accident prevention held in February was very useful. We would like to have another one.

Signal equipments of MR are very old. We would like to request for workshop about new signal technique.

JICA

We are planning to hold signal workshop as a part of OCC Project.

7 Closing speech

U Thurein Win, Managing Director, MR

We appreciate various fruitful discussions in the JCC. Please consider the various requests of MR.

Mr. Imai , JICA Headquarters

We appreciate many significant discussions of JCC members.

Please consider the recommendation made by JICA fully.

October 2nd , 2014 Nay Pyi Taw

U Thurein Win
Managing Director
Myanma Railways

Dr. S.Kuroda
Leader of JICA Expert Team

Minutes of Discussion

5th JCC for "The Project on Improvement of Service and Safety of Railway in Myanmar"

1. DATE 19 Dec. 2014 10:30~13:00
2. PLACE Meeting Room of Myanma Railways Headquarters
3. ATTENDANTS

3.1 Myanmar side

U Saw Valentine	Advisor
U Maung Maung Lwin	G.M (Finance)
U Htaung Sian Khan	D.G.M(Planning)
U Than Htun Aung	D.G.M(Inspection)
U Maung Maung Thwin	D.G.M(Civil)
U Win Naing	D.G.M(Mechanical)
U Nyi Nyi Swe	D.G.M(Commercial)
U Aung Myint	D.G.M(Electrical)
U Han Nyunt	A.G.M(Signaling)
U Kyaw Soe Lin	Manager(Operating)
U Phyo Htet Kyaw	Manager(IR)
U Than Htun Aung	Assistance Manager
Mr. M.Higashi	Advisor

3.2 Japan side

JICA Myanmar Office	Mr. A.Sanjyo (Senior Representative)
JICA Expert Team	Dr. S.Kuroda(Leader:Track maintenance), Mr. N.Matsuo(Sub-leader:Maintenance planning), Mr. H.Komatsu(Operation maintenance) Mr. S.Morihara(Operation) Mr. R. Mitani(Signal&telecom), Mr. M.Ishikawa(Rolling Stock) Mr. M. Takami(Coordinator)
Observer	Sumitomo Corporation Asia & Oceania Pte, Ltd. Mr.Y.Taniguchi (Nay Pay Taw Office) U Tun Tun Kyaw Ms. M.Saito (JICA Trainee)
Interpreter	Sonny

4.SUBJECT Explanation and discussion of Progress Report for 5th JCC

5.HANDOUTS (1)Project Progress Report(ppt digest)

(2) Project Progress Report(file)

(3)Appendix-1 Revised Report of Proposals of Recommendation on Technical Standards of MR and Short-,Medium-, and Long-term Railway Facilities Improvement Plan

2 Summary of Discussion in the Workshop for Recommendation on Technical Standards and for Drawing up Short-, Medium-, and Long-term Railway Facilities Improvement Plan.

3 Workshop Report of the Institutional Management Improvement Course in Japan

6 Opening Speech by Chairman U Saw Valentine

The Project is the first technical corporation by JICA for MR, and about one year has passed since the technology transfer of track maintenance started in October, 2013 in the Pilot Section located between Yangon and Bago. Up to now, four JCCs have been held, and we are now holding 5th JCC.

JICA has provided MR with trainings in Japan 3 times. Technology transfer of track maintenance has been executed with the use of modern maintenance equipment/ tools, and it has contributed to improvement of track maintenance technology of MR.

MR appreciates very much for the cooperation of JICA and JICA experts for improving safety and service level of MR

MR would like to cooperate as much as possible for effective implementation of the Project.

7 Presentation of Progress Report by JICA Expert Team (Leader S.Kuroda & Deputy Leader N.Matsuo)

8 Discussion by all JCC members

(1) MR

- We would like to request for JICA Expert Team to make various advices to MR on what is necessary for MR based on the recognition of the current situation of MR.
- In the last JCC, we requested the training for track maintenance, bridge maintenance and rail welding. This time we would like to request JICA to consider the cooperation with respect to the following items.

① Training for rolling stock maintenance, how to install sanitation system in coaches, training for DMU and DEMU maintenance.
② Training of maintenance of signaling
③ Train protection system at level crossing
④ Training facilities of CITC and RTTC
⑤
   a Training of track maintenance by use of large sized maintenance machines
   b Advice on the procedure of outsourcing the track maintenance work
   c Updating the track maintenance manual based on the current situation of MR
   d Continued training for track maintenance of Yangon – Mandalay line and Yangon Circular line.
   e Training of maintenance of bridge (upper structure and sub structure)
   f Training for rail welding
⑥ Training for new systems (OCC, ATS etc), and training for modernized train protection system at level crossing
⑦ Advice for planning an appropriate railway network connecting Yangon ports, Thilawa Special Economic Zone, Dry Port

（2） JICA

We know that 6 items for cooperation were requested by the letter dated Oct, 16, 2014. These requests are now under examination by JICA. Today, further, there were many requests which belong to the category of technical cooperation and also to other categories.

Kindly provide JICA with a letter in which the requests should be described, and the requests should be limited to the ones belonging only to the category of technical cooperation, but excluding such requests as construction of buildings, provision of large sized machines/ equipment ; and then put the order of priority on the requests. Also please exclude such requests as could be implemented under the on-going Project.

Kindly provide us with the letter as soon as possible.

（3） MR

The request for provision of equipment necessary for improving RTTC and CITC should be kindly considered. MR would issue the letter.

S.K.

(4) JICA

We are waiting for receiving the letter.

JCCs have already been held 5 times during this one year and half. There are no other projects such as this Project for which JCCs are held with such frequency. It means that MR officials are very earnest in implementing this Project. JICA would like to pay his respect to the earnestness of MR.

(5) MR

It is important to teach the public how to make use of railway facilities and trains safety and properly. Kindly provide MR with advices on how to educate the public on this matter based on the Japanese experience.

(6) JICA Expert Team

JICA's Grant AID Project Team gives the following aid for signaling & telecommunications in MR.

① Concentrated Electronic Interlocking device for Yangon and Pazundaung stations

② Centralized Train Monitoring System for Yangon – Pyuntaza sections

③ Automated level crossing alarm facilities for Kyan Sit Thar Level Crossing.

Related with this aid, we think we can meet needs of MR to some extent through work of soft component. However we cannot afford to revise the current technical standards.

(7) MR

Modernized signaling system is going to be introduced in the section between Yangon and Mandalay. Kindly give an advice to us about the maintenance organization chart.

(8) JICA Expert Team

Strengthening the organization to cope with electrifying and modernizing the signal and telecommunication facilities was experienced lastly more than 40 years ago in Japan. With respect to an appropriate organization for MR case, we would like to make suitable advices based on Japanese experiences after receiving the questionnaire.

(9) JICA Expert Team

At the beginning, technology transfer of track maintenance started for 30 trainees in the Pilot Section of 20km located in the section between Yangon and Bago. At present, accumulated number of trainees amounts to 300, and the various situations relating to

S. K.

technology transfer have been changed. Further, in order to implement the training efficiently, trainings are sometimes repeated in the same place, and also on Dagon line.

In this regard, we would like to consult with MR about various matters including the suitable change of the length of the Pilot Section.

We are planning to give trainings of track maintenance on two railway steel bridges. The joints of rail are very bad. The current MR rail welding technology should be improved for producing long welded rail.

We would like to consider how to give training on rail welding while we are giving training of rail replacement. We are also considering to provide advice on improvement of rail fastening devices. Further we would like to plan to add the training for improvement of level crossing and rail grinding to the current trainings. Up to this March, the above trainings will be suitably considered. Also we would like to plan to give trainings including training for improvement of weak roadbed, with due consideration on selecting the training locations not only in the Pilot Section but also on the Circular line, Dagon line, Thilawa line etc.

7 Closing Speech by Chairman

In this JCC, the progress of the Project has been reported, and various useful proposals and discussions have been presented aiming at the effective implementation of the Project. I appreciate all the JCC members for their earnest discussions.

MR would continue the cooperation with the effective implementation of the Project as much as possible. MR would like to express the appreciation for the effort of JICA and JICA Expert Team to improve the safety and service level of MR.

December 24th, 2014 Nay Pyi Taw

U Thurein Win
Managing Director
Myanma Railways

Sadaaki Kuroda

Dr. S.Kuroda
Leader of JICA Expert Team

Minutes of Discussion

6th JCC for "The Project on Improvement of Service and Safety of Railway in Myanmar"

1. DATE 13 March, 2015 14:00~16:00
2. PLACE Meeting Room of Myanma Railways Headquarters
3. ATTENDEES

3.1 Myanmar side

U Thurein Win	Managing Director
U Saw Valentine	Advisor
U Maung Maung Lwin	G.M (Finance)
U Tin Soe	G.M(Civil)
U Win Oo	G.M(Mechanical and Electrical)
U Maung Maung Thwin	D.G.M(Civil)
U Khin Maung Thein	D.G.M(Signal & Telecommunication)
U Nyi Nyi Swe	D.G.M(Passenger)
U Sai Thaw Lin	D.G.M(Inspection)
Daw Khin Mar Thi	Assistant Manager(Supply)
U Kyaw Soe Lin	Manager(Operating)
U Phyo Htet Kyaw	Manager(IR)

3.2 Japan side

JICA Expert Team	Dr. S.Kuroda(Leader:Track maintenance),
	Mr. N.Matsuo(Sub-leader:Maintenance planning),
	Mr. H.Komatsu(Operation maintenance)
	Mr. M. Takami(Coodinator)
Observer	Sumitomo Corporation Asia & Oceania Pte, Ltd.
	Mr.Y.Taniguchi (Nay Pay Taw Office)
	Mr. Tun Tun Kyaw
Interpreter	Mr. Soe Min

4. SUBJECT Explanation and discussion of Progress Report for 6th JCC
5. HANDOUTS (1)Project Progress Report(ppt digest)
   (2) Project Progress Report(file)
   (3)Appendix
   1. PDM
   2. Flow chart of project implementation
   3. Detailed implementation plan

4. Records of JICA experts dispatching
5. Records of training in Japan
6. Records of procurement of the required equipment/ tools
7. Minutes of Discussion of JCC (1st , 2nd , 3rd, 4th ,and 5th)
8. Other activities
8.1 Additional Questions by MR and Answers by JICA Experts relating to the Workshop for Recommendation on Technical Standards and for Drawing up Short-, Medium-, and Long-term Railway Facilities Improvement Plan
8.2 Summary of Discussions Made during the Summarizing Workshop for Recommendation on Technical Standards and for Drawing up Short-, Medium-, and Long-term Railway Facilities Improvement Plan
8.3 Existing situations of RTTC
8.4 Existing situations of CITC

6. Opening Speech

6.1 Chairman, Managing Director, U Thurein Win

This project is the first technical cooperation for MR by JICA. Technology transfer of track maintenance in the Pilot Section started in October 2013. In order to execute the Project smoothly, JCCs were held as shown below.

1st JCC: August 28, 2013
2nd JCC: January 27, 2014
3rd JCC: May 28, 2014
4th JCC: September 29, 2014
5th JCC: December 19, 2014

Today we are going to hold 6th JCC. All the members of JCC are kindly requested to discuss about the progress and the various plans of the Project.

3 teams consisting of 11 trainees each, 33 trainees in total, participated in the training programs in Japan. At Nay Pyi Taw, 19 trainees participated in the training program for analysis of cause of accidents/ low service level, and establishment of countermeasures. Further in the Pilot Section, 345 trainees in total participated in the track maintenance training. Track maintenance training with use of modern maintenance equipment/ tools has been very useful for MR. We, MR, would like to express appreciation to JICA and JICA Expert Team for their earnest cooperation.

6.2 JICA Expert Team, Leader, Dr.S.Kuroda

Today, Mr. Sanjo, senior representative of JICA Myanmar Office, was supposed to attend the JCC, but due to unavoidable reasons, he cannot attend the JCC. Instead, I will make a speech on behalf of JICA Expert Team.

About 21 months have elapsed since the Project started in June 2013. We, JICA Expert Team, would like to express their sincere appreciation to Managing Director and all other officials of MR for their kind cooperation.

Today we, JICA Expert Team, present the Progress Report of the Project. We should be grateful, if all the members of JCC could kindly discuss the Progress Report and could present advices on the effective implementation of the Project.

7. Presentation of Progress Report by JICA Expert Team (Leader, Dr. S.Kuroda & Deputy Leader, Mr. N.Matsuo)

8. Discussion by all the JCC members

(1) MR

- JICA Expert Team is now revising the track maintenance manuals of MR. We would like to request that the revised manuals should be fully discussed between MR staff and JICA experts. Through discussion, misunderstanding of MR trainees, if any, about the track maintenance technology for which they were trained, could be suitably corrected.
- JICA Expert Team is now translating the revised track maintenance manuals into Myanmar language. Kindly show us the draft one before completing the translation. MR can contribute to correction of wrong translation, if any, of technical terms into Myanmar language.
- On the 21st page of the presentation PPT, JICA Expert Team presented the advice that the lecture should be provided not only for bridge maintenance, but also for tunnels, earth structures etc. We appreciate that advice. Instructors giving such lectures are only a few in MR. Kindly consider to give such lectures of about two weeks, making use of the training rooms contributed by Sumitomo Corporation.
- GM(Civil) visited RTRI of JR group. It is an integrated research institute. MR would like to establish a research institute. We would like to get the financial support from Japan for establishing a research institute.

JICA Expert Team

- Track maintenance manuals translated into Myanmar language have already been handed over to MR side. They have been submitted to Headquarters of MR. They have been also provided to the training rooms contributed by Sumitomo Corporation.
- MR track maintenance trainees who completed the training in the Pilot Section have returned back to their own gangs, and are doing track maintenance by themselves. Referring to the train derailment accident on Thilawa line in the last January, MR is advised to try to level up track maintenance technology further.
- As a next step of technology transfer of track maintenance following the two years training, which JICA is now under examination, training on track and tack maintenance suitable for 100km/h train running speed would be one of the appropriate subjects.

JICA Expert Team

- Instead of planning to establish a research institute like JR's RTRI at a single step, it is advisable to start with a small research unit as recommended in the Progress Report.

(2) MR

- As requested by the Managing Director's letter submitted to JICA in January 2015,we would like to have a training for rolling stock maintenance. Training of locomotive drivers is also necessary.
- We appreciate various advices by JICA experts on upgrading of educational institutes of MR. We would like to upgrade the following four trainings sufficiently.
  -Training of managers or supervisors of rolling stock maintenance
  -Levelling up of working skill of maintenance staff
  -Training of instructors
  -Training of locomotive drivers
  In upgrading the above trainings, training rooms contributed by Sumitomo Corporation could be effectively made use of.
- New locomotive depot at Nay Pyi Taw was completed, and a space for training was secured in the depot. MR would like to get Japanese support in installing sufficient training facilities there.
- MR does not have sufficient training facilities/ equipment for modernized signaling system. We would like to get Japanese support for this matter.

S.K.

(3) MR

・This Project does not provide sufficient training of operation and commercial staff such as station master or station staff for levelling up safety and service of MR. If the commercial staff loads too much cargo on the wagons, it may cause dangerous situations. We would like to have trainings for commercial staff for levelling up safety and service of MR.

JICA Expert Team

・We explained to MR's trainees how commercial staff of JR East are tackling with train operation safety in "Institutional Management Improvement Course" held in Japan. Further the interview survey of customer's satisfaction level about MR's passenger transport was executed in the last February on the express and local trains between Yangon and Nay Pyi Taw, and the results are presented in the Progress Report, May 2014. These may be usefully referred to with respect to how the commercial staff should be trained for improving safety and service level of MR.

(4) MR

・We appreciate various advices by JICA experts on how to upgrade RTTC and CITC. RTTC was established about 30 years ago, and CITC was founded in 1972 at Yangon and shifted to Meiktila about 35 years ago. We want to upgrade these institutes. Deputy Minister of Railway Transportation is planning to upgrade CITC. The president of CITC is a very senior person, at the same level as Managing Director of MR or the rector of an university. With respect to RTTC, Germany's GIZ (the former GTZ) is scheduled to visit RTTC this March for examining upgrading of RTTC in Ywataung Locomotive Workshop.

・We are planning to establish training facilities in Insein Workshop. These training facilities would be used not only for training of rolling stock maintenance, but also for training of handling/ maintenance of various kinds of machinery and electric equipment.

・There are many kinds of track maintenance machines. We would like to be advised on which machines are most suitable for MR.

・We submitted the letter signed by Managing Director to JICA, in which various requests are listed with priority, such as maintenance of rolling stock, how to install sanitary system in coaches, advice for planning an appropriate railway network connecting Yangon Port, Thilawa Special Economic Zone, Dry Port, and mechanization for track maintenance, etc. We should be grateful, if JICA could kindly explain the future possible cooperation with respect to these requests.

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9. Closing Speech

9.1 Chairman, Managing Director, U.Thurein Win

In this JCC, the members discussed the progress of the Project and also the future possible cooperation relating to the Project. We, MR, would like to express appreciation to all the members concerned of JICA and MR for their earnest cooperation for implementing this Project. MR would like to continue improving safety and service level of MR under close cooperation with JICA and JICA experts.

9.2 JICA Expert Team, Leader, Dr.S.Kuroda

It is expected that cooperation between MR and Japanese railway experts would be continued for 10-20 years from now on, through execution of the modernization projects of Yangon-Mandalay line and Yangon Circular line. In this regard, we, Japanese railway experts would like to continue close cooperation with MR experts hereafter. In this JCC, various requests to JICA have been presented. These requests will be recorded in the Minutes of Discussion, and will be conveyed to JICA. Lastly we would like to express appreciation to all the members of JCC for their useful discussion.

March 19th, 2015 Nay Pyi Taw

U Thurein Win
Managing Director
Myanma Railways

Dr. S.Kuroda
Leader of JICA Expert Team

Minutes of Discussion
7th JCC for "The Project on Improvement of Service and Safety of Railway in Myanmar"

1. DATE 17 July, 2015 10:00am～12:20am

2. PLACE Meeting Room of Myanma Railway Headquarters

3. ATTENDANTS

3.1 Myanmar side

Myanma Railways

Managing Director	U Thurein Win
GM (Technical &Admin)	U Aung Win
GM (Civil)	U Tin Soe
GM (Mechanical & Electrical)	U Win Oo
GM (Commercial)	U Aung Myint Hlaing
Deputy GM (Admin & Planning)	U Htaung Sian Kan
Deputy GM (Civil)	U Than Htay
Deputy GM (Civil)	U Maung Maung Thwin
Deputy GM (Operating)	U Htay Myint Aung
Deputy GM (Signal & Telecommunication)	U Khin Maung Thein
Deputy GM (Finance)	Daw Thi Thi New
Assistant GM (Planning)	U Thein Myint
Assistant GM (Operation/Division-7)	U Tint Wai
Assistant GM (Civil/Division-7)	U Tin Myint
Assistant GM (Mechanical/Division-7)	U Aung Kyaw Naing
Manager (International Relationship)	U Phyo Htet Kyaw
Railway Policy Advisor	Mr. M.Higashi

3.2 Japan side

JICA Headquarters	Ms. S.Tanaka(Director)
	Mr. K.Kuramoto
JICA Myanmar Office	Ms.Ayumi KIKO
JICA Expert Team	Mr. N.Matsuo(Leader)
	Mr. M.Takami(Deputy leader, Bridge maintenance)
	Mr. H.Komatsu(Track maintenance),
Interpreter	U Than Daing Soe

M.T

4. SUBJECT Explanation and Discussion of Progress Report

5. HANDOUTS Progress Report
Power Point for explanation

6. Opening Speech by Chairman U Thurein Win

This project is the first technical support by JICA, and two years have passed since commence of the training in the pilot section between Yangon and Bago. We have hold JCC 6 times till now. This JCC is the 7th.

Workshops in Japan have already been implemented for 3 groups, 33 persons, and in Myanmar have already trained over 500 persons.

We appreciate JICA for supporting safety and service level improvement of MR.

We will continue to cooperate with JICA Expert Team.

7. Speech by Tanaka

Yesterday I went to see track maintenance site. This project is highly regarded in JICA and extended to March in 2016. Continuation of track maintenance, outsourcing of track maintenance work and bridge maintenance are added as new items. I hear the number of trainee of track maintenance will be 600.

I hope to be well by themselves in each division.

8. Presentation of progress report by JICA Expert Team (Leader N.Matsuo & Deputy Leader M.Takami)

9. Discussion by all JCC Members

MR : We are very useful for track maintenance and lectures and would like to support for trainees.

When can we get results of strain gauge at the speed increasing test ?

JICA : It takes two months to analyze speed increasing test. It is important to exam how much speed we can operate safely by 75lb Rail. We may show the result of outline at next JCC and we can show detailed results about the speed increasing at last JCC. Weak point of 75lb Rail is strength of fishplate. We are planning to prepare new fishplate. We would like to show proper speed in this test. And we would like to prove limited maximum speed at turnout.

MR : It is no problem to have a meeting once a month about outsourcing. Which is good

place to have a meeting, Yangon or Nay Pyi Taw ?

JICA : Yangon is better. We would like to connect with counterpart in detail.

MR : Are Inwa, Sittaung and Gote Htate all pilot bridges ?

JICA : These are not pilot bridges. The express of power point is not good. Later, we will change new one. Pilot bridge is only one.
Regarding Inwa, Sittaung and Gote Htate, we only plan to survey and investigate for grasp of the soundness of the bridge and suggestion of maintenance method.

MR : There are 3 type of bridges, Truss, Plate Girder and PC. About Truss and Plate Girder, there are more than 100 bridges which were constructed over 100 years ago. We want you to choose No.13 bridge(Ngamoyeik).

JICA : No.13 bridge had already surveyed before at other project. The purpose of technical transfer is not construction but level up of bridge maintenance. So we think that pilot bridge is small one whose structure is typical in MR near Malwagon Bridge factory. We are planning that trainees will be able to judge how to maintain by themselves.

MR : We want to add DGM Maung Maung Than as a counterpart.

JICA : We agreed that counterpart on site is Tin Myint and counterpart of headquarters is Maung Maung Than.

MR : We think that there is no difference of 50N Rail and UIC54 (EN54) Rail. We are planning that we use the rail of UIC Standard, too. In using UIC54 (EN54) Rail, we would like to consult for advice. But Rehabilitation Project between Yangon and Mandalay cannot help using all 50N Rail because of Yen Loan. (At first, we adopted 37kg Rail between Bago and Tatkon.)

JICA : We shall discuss this matter.

MR : We hope to have a lecture not only sanitary system but also making rolling stock clean.

JICA : We would like discuss this matter another chance .

MR : We want to expand technique of safety and service to each division about track maintenance. Bridge maintenance has been mainly conducted by visual inspection and painting. We have more than 10,000 bridges and want to learn how to

M.T

maintain. We want to improve the condition of discharge about sanitary system.

JICA : Budget and period are limited because this technical cooperation project is free of charge. There are many requests. But we think track maintenance is the first priority of this project. In addition to this project, there are OCC, rehabilitation of Y-M and Circular line. JICA project is proceeding in Myanmar. So we want to conduct step by step with deciding priority. First of all, we try to get maximum effects concerning this project about additional items. We want to exam what we can do about bridge and sanitary system on rolling stock. Please consult with JICA Expert Team.

10. Closing speech by chairman

MR would continue the cooperation with the effective implementation of the Project as much as possible MR would like to express the appreciation for the effort of JICA and JICA Expert Team to improve the safety and service level of MR.

July 17th , 2015 Nay Pyi Taw

21.7.2015

M. Takami

For Managing Director
U Aung Win
General Manager
Myanma Railways

For Leader of JICA Expert Team
M.Takami
Deputy Leader of JICA Expert Team

Minutes of Discussion
8th JCC for "The Project on Improvement of Service and Safety of Railway in Myanmar"

1. DATE 29th October , 2015 14:00～16:20

2. PLACE Meeting Room of Myanma Railway Headquarters

3. ATTENDANTS

3.1 Myanmar side

Myanma Railways

GM (Technical &Admin)	U Aung Win
GM(Inspection)	U Ba Myint
DGM (Civil)	U Than Htay
DGM (Civil)	U Mg Mg Thwin
DGM (Signal & Telecommunication)	U Khin Maung Thein
DGM (Coaches)	U Win Naing
DGM (Passenger)	U Kyaw Kyaw Myo
DGM (Finance)	Daw Thi Thi Nwe
AGM (Operating)	U Tint Wai
AGM-Division7 (Civil)	U Tin Myint
AGM-Division7 (Mechanical & Electrical)	U Aung Kyaw Naing
AGM(Division)	U Kyaw Htoo
ATM-Division7 (Operating)	U Nyi Nyi Lwin

3.2 Japan side

JICA Myanmar Office	Mr. Akihito SANJYO
	Ms. Ayumi KIKO
JICA Expert Team	Mr. Nobuyuki .MATSUO (Leader)
	Mr. Mitsuru TAKAMI (Sub-leader, Bridge maintenance)
	Mr. Hiroshi KOMATSU (Track maintenance)
	Mr. Tomohiro AIZUKI (Equipment)
Sumitomo Corp.	Mr. Yuichi TANIGUCHI
Interpreter	U Than Daing Soe

4. SUBJECT Explanation and Discussion of Progress Report

5. HANDOUTS Progress Report
Power Point for explanation
Appendix-1, 2, 3

6. JICA Expert Team (Explanation)

Matsuo, Takami and Komatsu explained activities with ppt.

Main Contents

- Sanitary system on Rolling Stock
- Track record (From July to Oct.)
- Measurement of rail stress and Train Running Test (Including prompt result)
- Outsourcing of track Maintenance (Contents of meeting)
- Bridge Maintenance (Lecture and survey on site, etc.)
- Additional equipment (Tie Tamper, Rail Jack, etc.)
- Schedule plan (We will conduct track training (Especially turnout) near Yangon Sta. till December.)

7. Main Q&A

(1) MR

- Toilets in Myanmar are discharging. There are problems about sanitation and bridge maintenance. So we would like to consider continuously.
- We inspect bridges regularly. We learned that priority rank of maintenance is needed.
- 2 years have passed since this project began. There are many problems yet. We want to consult how to proceed.
- Over 500 people have participated in track maintenance and effects have appeared. We are going to use machine. People with higher position in each division participate in track maintenance, too.
- We will contract about outsourcing.

About fishplate

JICA Ex : We will give the drawing and want MR to make fishplate in Myanmar.

MR : We understand that fishplate from Japan is stronger than existing one.
In case of production, data, drawing and spec of iron are needed.

JICA Ex : We will submit them with data of test running.

MR : Do you bring these fishplates for BS75 rail in Myanmar ?

JICA Ex : Yes, we do.

About turnout

MR : We are planning that passing speed of turnout will be 100km/h in the future.

JICA Ex : we thought that parts of sharpening rail in main line was weak points. As a result of test, there were no differences by speed. We think that there are no problems of production of turnout. We will write a report that which turnout is better.

About vibration test

MR : As a result of 60km/h, vibration is big. Which is the reason, short length rail or less rail pad ?

JICA Ex : Influence of joint by short length rail is big. Except 50N Rail section, BS75 Rail are used and we think influence may appear in this section. If you change from existing rail to new one, vibration will be little. We didn't measure roadbed under the ballast. We felt roadbed was soft. We made drain in some parts of soft ground. Roadbed must need to be inspected at the speed up.

MR : Size of ballast is inappropriate. There are less rail pad. There are many junctions. These are all weak points. We are thinking that rail joint will be welded.

About outsourcing

MR : We begin to outsource track maintenance between Bago and Mawlamyine. This case is Joint Venture of Myanmar and China. Machine is made of Europe. We are glad to get advice from Japan.

About equipment

MR : We deeply appreciate additional equipment and also requested for achieving Portable Track Recording Equipment for MR.

Others

JICA Ex : We would like to set up a meeting about technical matter another time. We want many MR staff to use machine because new equipment will arrive in Myanmar. We are going to proceed training of track maintenance till December.. We want MR to prepare ballast, clip, wooden sleeper and PC sleeper. (Especially, ballast and wooden sleeper)

MR: We will prepare them.

MR : There are many accidents in Myanmar. So we hope to happen no accidents. There was a machine which could measure track quality. Now there is no one. So we want such a machine.

JICA : We are very glad to discuss every time. There are many requests from MR. It is very important to hear opinion. We would like to hear requests separately. We feel that it is important to train human resources through technical cooperation.
We think that it is good way to make a presentation from MR next time.

29th Oct. 2015
Nay Pyi Taw

U Thurein Win
Managing Director
Myanma Railways

Nobuyuki MATSUO
Leader of JICA Expert Team

Minutes of Discussion
9th JCC (Final JCC) for "The Project on Improvement of Service and Safety of Railway in Myanmar"

1. DATE 29th January , 2016 10:00～12:30

2. PLACE Meeting Room of Myanma Railway Headquarters

3. ATTENDANTS

3.1 Myanmar side

Myanma Railways

Managing Director	U Thurein Win
GM (Technical &Admin)	U Aung Win
GM (Civil)	U Tin Soe
GM (Finance)	U Maung Maung Lwin
DGM (Civil)	U Maung Maung Thwin
DGM (Planning)	U Htaung Shian Khan
AGM (M & E)	U San Aung
AGM (Operation)	U Tint Wai
AE(S & T)	U Thet Naung Win
Manager (planning)	U Phyo Htat Kyaw

3.2 Japan side

JICA Head Office	Ms. Satoko TANAKA
	Mr. Yusuke Taguchi
	Ms Maki TSUMAGARI (IMG)
JICA Expert Team	Mr. Nobuyuki .MATSUO (Leader)
	Mr. Mitsuru TAKAMI(Deputy Leader / Bridge Maintenance)
	Mr. Hiroshi KOMATSU (Railway Administration and Management)
	Mr. Tomohiro AIZUKI (Procurement of Equipment and Materials)
Sumitomo Corp.	Mr. Yuichi TANIGUCHI
Interpreter	Ko Sonny

4. SUBJECT Explanation and Discussion of Draft Final Report
Sign of Evaluation Report

5. HANDOUTS Draft Final Report
Power Point for explanation

6. Opening speech by U Aung Win

・Instead of Managing Director, I'll make an opening speech.
・This project is the 1st support for MR from Japanese Government.
・It has been 2 years and 4 months since training began at the pilot section.
・This is the 9th JCC, and we hold JCC to implement the project smoothly.
・We delegated 33 persons(11persons, 3times) to Japan to learn maintenance and management of railway.
・45 persons of MR staffs received workshop and training of safety and service.
・574 persons of MR staffs received on-the-job training for track maintenance.
・Three kinds of textbooks were made in both Japanese and Burmese and distributed to 60 staffs.
・Each staff finished OJT went back to his workplace and utilizes technique.
・We hope to discuss freely at this JCC.
・MR is going to tackle with rehabilitation of Yangon-Mandalay line and Yangon Circular line by making effective use of this project.
・We deeply appreciate technical support in this project.

7. Speech by Ms. Tanaka

・This project is very important for MR to improve safety and service.
・The period of this project was 2 years from May 2013 and then extended for 10 months.
・The other day, track maintenance on site finished by follow-up training.
・The purpose of this JCC is the explanation of Draft Final Report and Terminal Evaluation.
・At the time of Terminal Evaluation, JICA is supposed to evaluate whether or not the project purpose set up at the beginning can be accomplished at the end of the project.
・Therefore, JICA organized a Joint Evaluation Team, and Ms. Tsumagari came to Myanmar and interviewed with the MR staffs concerned.
・Members of the Joint Evaluation team are U Aung Win, U Tin Soe, U Maung Maung Thwin (on Myanmar side), Ms. Tanaka, Mr. Taguchi and Ms. Tsumagari (on Japanese side).
・The evaluation result is good and positive.
・JICA want to ask MR for the following 2 points.
① We strongly request MR to distribute additional equipment to each division so that the trainees all over Myanmar can surely use them.

② We want MR to collect and arrange indexes of safety and service condition continuously to confirm the effect of this project.

・I want to sign Evaluation Report with Managing Director at the end of JCC.
・I express gratitude for MR and JICA Expert Team.
・We hope that the trainees who completed the training course are doing well in their fields, and the results of this project are utilized in rehabilitation and modernization of Yangon-Mandalay line and Yangon Circular line as U Aung Win said.

8. JICA Expert Team (Explanation)

Matsuo explained activities from May 2013 to now with ppt.

Main Contents

- Basic plan of Project Implementation

(We explained index of overall goal and want MR to confirm them continuously)

- Project Implementation Organization
- Final Reporting of the Project
  - Recommendation of technical standards relating to administrative and maintenance aspect and drawing up railway facilities improvement plan to improve service and safety level
  - Technology transfer of track maintenance technology to improve the level of service and safety through implementation of the Pilot Project
  - Bridge maintenance training
  - Others
- Major issues to be tackled with, good schemes for better implementation, lessons obtained through implementation

9. Discussion by all JCC members

U Tin Soe

- This project's Workshop and equipment about civil engineering are our treasures.
- These things had not be conducted for 30 years of my carrier in MR.
- Books, textbooks and equipment are useful for us.
- We want to keep equipment preciously.
- We want to teach the contents of this project to engineers from management-level to on-site workers all over Myanmar.
- The number of Bridge engineers is not sufficient for enough maintenance.
- There are more than 1,000 bridges which are more than 60 feet long.

- These bridges are maintained by Malwagon Bridge Depot engineers.
- We couldn't inspect all bridges but some bridges per year.
- There are some inspection records for main bridges.
- Though inspection as Japan does can't be implemented, simple checks with eyes have been completed.
- Now, the number of engineers is not sufficient, so that bridges can't be maintained in good condition.
- If serious deterioration is found through inspection, we cannot help restricting train operation speed because of lack of budget.
- Budget of bridge above mentioned is 30-40 million Kyat. Not all the bridges can be repaired in one year. We are going to request more budget next year.
- In the above-mentioned situation, bridge maintenance trainees were glad to participate in the training, I gave staff instructions to keep continuing.
- The persons who have rich experience of civil engineering training (U Tin Soe, U Maung Maung Thwin, and U Myint Lin (former Vice President of CITC)) would try to educate other civil engineers.
- If problem arises, we would like to ask for Japan's support.
- We are going to try to level up bridge maintenance for civil engineers of 500 persons in MR.
- We want to make management level engineers receive workshop for training.
- There are no places to teach railway technology in Myanmar, so that new employees don't know railway technology at all. They learn it through their actual work.
- We want JICA to teach instructors in Meiktila and engineers from upper to lower if possible.
- I have 60 subordinates of engineer. But only 3 subordinates can teach technique.
- MR staffs who had been in Japan for 2 and a half months know very well.
- If we have enough money next year, we would like to buy equipment.
- We are very glad if there are supports from JICA before this.
- There are 70 track maintenance groups in the whole country. 4 pieces of Tie Tamper are 1 unit. So we would like to ask for 280 pieces of Tie Tamper to distribute all groups if possible.

U Aung Win

- Safety and Service are very important items.
- 139 years have passed since railway opened in Myanmar.
- Facilities and equipment in all fields are aged.

・Length of commercial line was 3,100 km in 1988, but it is more than 6,000 km now.
・On the other hand, the number of employees has been decreasing. The number of staffs in every 4 miles changed from 10 to 4.
・We couldn't buy equipment.
・MR has been spending its budget on new line construction, so that maintenance for existing railways was weakened.
・We had been using wooden sleepers, but wooden sleepers were changed to PC sleepers recently. MR should buy new machines for PC sleepers.
・I feel relieved by the level of inspection, after more than 500 trainees received maintenance technology through the workshop of this project.
・We want to make efforts to use textbook in future projects.
・I would like to request workshops about machines such as hand tie tamper for management-level engineers as well.
・I thank Sumitomo Corporation and JICA Expert Team for their supports for 50N Rail.
・I think MR needs long-term support from JICA Expert for the future.

Mr. Komatsu

・Bridge conditions are not as bad as I thought.
・The reason of slowing down is that girder and wooden sleeper are not fixed by hook bolt.
・Hook bolt is often used for turnout, but not so much for bridge.
・We introduced 50N Rail and examined speed confirmation test in October.
・Test section such as this time, we think that PC sleepers can endure the axis load of 20t.
・In detail, we will explain about this at the workshop next week.
・We are thinking that speed-up can be accomplished by MR itself.

Mr. Takami

・The bridge conditions are not as bad as I expected, but some of them are in bad conditions.
・I appreciate MR trainees' earnest and positive attitudes, such as repairing bridges by themselves more than JICA Expert Team taught, and textbook translation into Myanmar language with adding some points JICA Expert Team orally taught .
・I hope MR uses the textbook that U Myat Lin compiled for bridge maintenance training because it is suitable for MR's current conditions.
・I hope this training helps MR to try its best for improving their bridge maintenance

technology based on their original technology.

・I strongly recommend that MR should modernize equipment and tools in order to improve the bridge maintenance technology, with referring to the Draft Final Report I wrote.

Ms. Tanaka

・I am glad to receive the words "Treasure" from U Aung Win and U Tin Soe. MR is an important partner for JICA.

・We would like to discuss with MR about what kind of support we can do.

・I think MR staffs are earnest, highly conscious and exhibit a positive attitude. I hope MR can do more by itself as Mr. Komatsu said.

・It would be better not only implementing the technology which MR had acquired through this training in actual work, but increasing budget for maintenance.

・We want MR to formally request assistance which is highly prioritized, such as the training for managerial staffs, as MR mentioned.

10. Sign of Evaluation Report

11. Closing Speech by U Thurein Win

・Altogether, I am satisfied with JCC meeting.

・We are going to maintain equipment for a long time and distribute them to all the divisions for sure.

・It was very important to teach what MR staffs should do throughout the project (to collect information, look up problems, take countermeasures and implement, etc.)

・As a result, I think this project was very effective for MR.

・There are still insufficient fields in MR, and we hope that Japan supports us continuously.

29th Jan. 2016
Nay Pyi Taw

N. Matsuo

U Thurein Win
Managing Director
Myanma Railways

Nobuyuki MATSUO
Leader of JICA Expert Team

31/1/2016

Appendix-8 Reports of whole JCC

Reports and Presentations for each JCC are as followings.

・Appendix-8-1
Inception Report (1st JCC), August 2013

・Appendix-8-2
Progress Report for 2nd JCC, February 2014

・Appendix-8-3
Project Progress Report (3rd JCC), May 2014

・Appendix-8-4
Project Progress Report (4th JCC), September 2014

・Appendix-8-5
Project Progress Report (5th JCC), December 2014

・Appendix-8-6
Project Progress Report (6th JCC), March 2015

・Appendix-8-7
Project Progress Report (7th JCC), July 2015

・Appendix-8-8
Project Progress Report (8th JCC), October 2015

・Appendix-8-9
Draft Final Report (9th JCC), January 2016
* Draft final report is omitted because its contents are same as this report.

Myanma Railways (MR)
Japan International Cooperation Agency (JICA)

PROJECT ON IMPROVEMENT OF SERVICE AND SAFETY OF RAILWAY IN MYANMAR

INCEPTION REPORT

August 2013

JAPAN INTERNATIONAL CONSULTANTS FOR TRANSPORTATION CO., LTD
ORIENTAL CONSULTANTS CO., LTD
SUMITOMO CORPORATION

Index

1. Project Summary

1.1 Project background

The Republic of the Union of Myanmar has a totally non-electrified meter-gauge railway network spreading as long as 5,934 km. Most of the network is single-tracked, with double-tracked sections limited to (1) the Yangon–Mandalay section (approximately 620 km in length) crossing the central plain and (2) urban railway lines centering on the Yangon circular section. The yearly number of passengers is 53.8 million (or approximately 147,000 per day) as of fiscal 2012. The Myanma Railways (hereinafter referred to as MR) under the Ministry of Rail Transportation centralizes all aspects of its management, from construction, operation, and maintenance.

In recent years, MR and Ministry of Rail Transportation have come to recognize the importance of maintenance/repair of existing lines. In the past, however, MR invested more than a half of the budget in the construction of new railway lines, with only a small portion appropriated for the renewal of existing facilities and equipment. As a result, MR is now has crucial subjects how to recover the deteriorated safety level and passenger services. In concrete terms, facilities and equipment have extremely superannuated and machines, tools and materials are running short. Maintenance, and management have not been implemented appropriately in the past. As a matter of fact, 118 accidents including derailment and collision having occurred in fiscal 2011 in the Yangon–Mandalay section. There are a number of problems in the section, such as delays of train operation, lowered train speed and worsened ride comfort.

According to the data of MR, the status of the safety of train operation is as follows. From 2011 through 2012, 118 accidents occurred in the 620.4 km-long Yangon–Mandalay section, of which those attributed to tracks, rolling stock and others accounted for 50, 29 and 21%, respectively. This means that most of the accidents were caused by deteriorated tracks.

The status of services is as follows.
There are a number of factors that govern the service level, such as train speed, punctuality, comfort (ride comfort, cleanliness in the passenger room) and fare and charge. The scheduled speed between Yangon and Mandalay is as low as 39 km/h, with train speed limited at various points. The on-time operation rate of express passenger trains in the same section is as low as 41% during the past three years, with trains delayed 59% by improper track conditions and 22% by malfunction of rolling stock. This means that train delay is caused mostly by deteriorated tracks. Furthermore, trains vibrate excessively and passenger rooms are not clean. MR is required to eliminate these drawbacks and improve passenger services.

1.2 Circumstances led to the project

With the above facts in the background, the government of Myanmar requested the government of Japan to implement a project of technical cooperation, namely "The Project on Improvement of Service and Safety of Railway." Based on this request, JICA delegated a detailed project planning study team in October 2012 and surveyed the present status of the railways around Yangon and in the suburbs of Naypyidaw and also had the consultations with MR.

According to the Record of Discussion (hereinafter referred to as R/D) signed on March 25, 2013, between President of MR and General Manager, JICA office in Myanmar, agreement was reached upon the detailed contents of the Project and cooperation of JICA to be extended thereto.

1.3 Purpose of the Project

Administration and maintenance ability is improved for the enhancement of service and safety of Myanma Railways.

2. Basic Plan of Project Implementation

2.1 Overall goal and Project purpose

Overall goal and Project purpose of this Project and expected outputs are as follows.

Overall goal and Project purpose	
1	Service and safety level of Myanma Railways is improved (Overall goal)
2	Administration and maintenance ability is improved for the enhancement of service and safety of Myanma Railways (Project purpose)

⇩

Expected outputs	
Output1	Based on accident analysis, issues are clarified for the enhancement of service and safety in the administration and maintenance process, and the improvement plan is drawn.
Output2	Technical Transfer of Track Maintenance Technology to improve the level of Service and Safety through implementation of the Pilot Project

2.2 Implementation plan

Implementation plans which accomplish the project purpose are as follows.

Implementation plan for Output1
To survey current situations of track, rolling stock, signal and telecommunication, and operation, and to establish system for collecting information in these various areas above.
To promote familiarization on the investigation and analysis method of accident cause based on the comprehensive factors of track, rolling stock, signal and telecommunication, and operation.
To conduct the investigation and analysis mentioned above with due consideration on hardware (facilities, equipments), and.software (operational and maintenance standards, human errors etc.)
To provide recommendation based on the above analysis on necessary technical standards relating to operational and maintenance aspects to improve service and safety level
To draw up the improvement plan of railway facilities through discussion with the "Working Group of service and safety improvement"

Implementation plan for Output2
To draw up technology transfer plan of track maintenance through OJT in the Pilot Section.
According to the technology transfer plan above, to procure the necessary equipments and materials.
To conduct track maintenance (inspection, planning, work) jointly with MR staff, making use of the equipments and the materials.
To summarize points to be improved obtained during track maintenance operation mentioned above, and to feed back to the successive measures.
To revise the track maintenance manual based on the feedback above.
To conduct seminars, training for technical improvement of the track maintenance

2.3 Project Section

The section between Yangon and Bago in the Yangon suburban area. Pilot section of about 20km shall be selected between Yangon and Bago.

3. Flow Chart of Project Implementation

The flow chart of the Project implementation is shown in figure3-1.

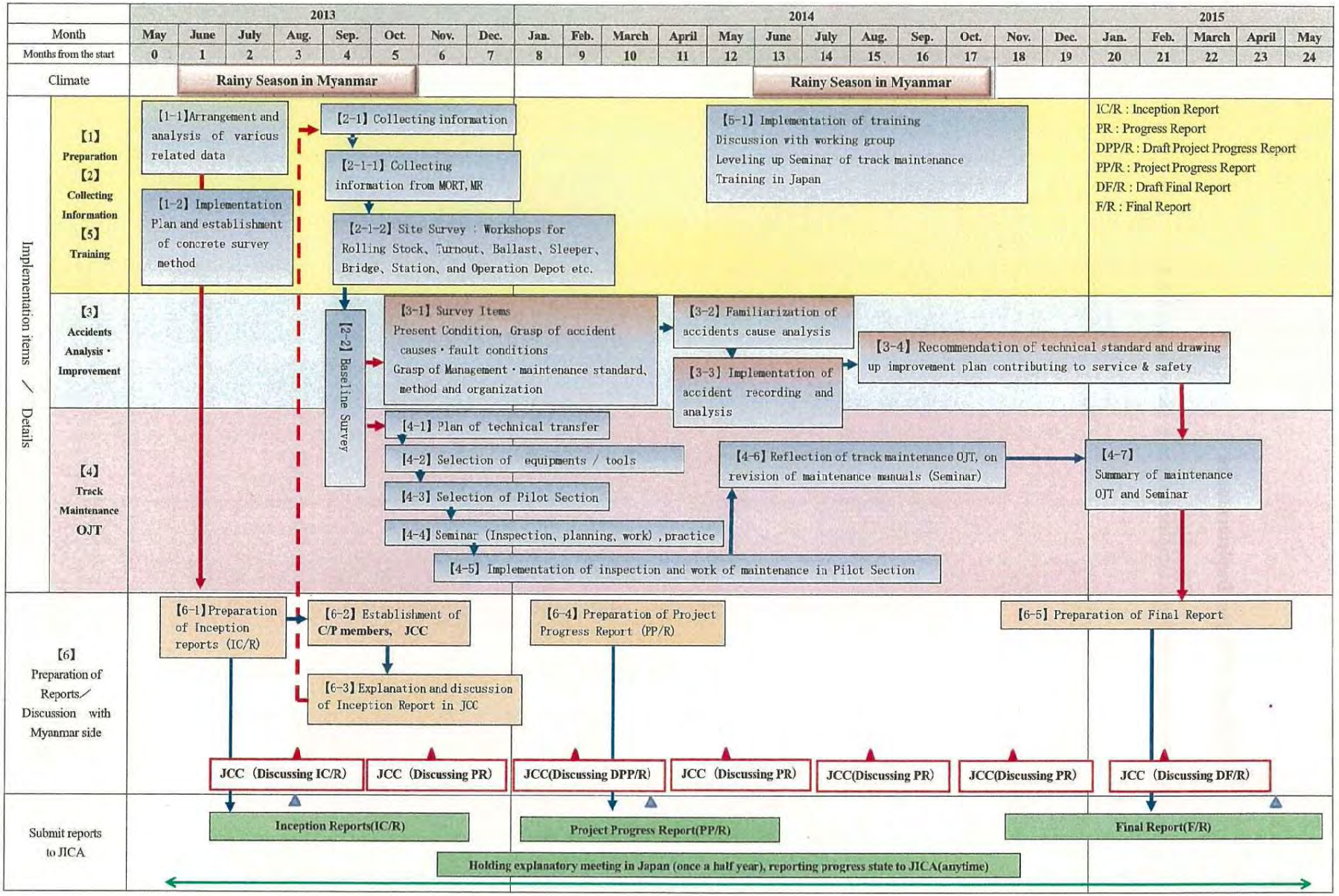


Figure 3-1 Project Implementation

4. Detailed Methods for the Project Implementation

4.1 Recommendation of technical standards relating to administrative and maintenance aspect and drawing up railway facilities improvement plan to improve service and safety level.

Safety can be compared to "air" not only in railways but also in other traffic and transport services, as they cannot exist without safety, though it is not visible or tangible. On the other hand, the improvement of customer services is an indispensable element for existence for traffic and transport services that are being exposed to the waves of modal shift and competition with other transport facilities.

Bearing in mind such a concept, JICA Team surveys in this project the present status of safety and customer services of MR and introduces technical standards related to its maintenance and management. We also extract items for improvement and have discussions with Working Groups (W/G), and based on the results of which we aim at determining the items of improvement for the short-, medium- and long-term phases.

4.1.1 Preparation of a working plan

JICA Team surveys the present status of MR and guides its staff on the technique to analyze causes of accidents and abnormalities. JICA Team requests MR to make its staff participate in the database creating and data analyzing work to understand the meaning of these procedures, thereby expecting that MR staff can continue the sustainable work by themselves after completion of the project.

Japanese experts compile text books to introduce how Japan and other countries tackle with prevention of accidents, and cases and mechanisms of typical accidents.

JICA Team holds a workshop together with MR staff attended to summarize and share the outcome of the above efforts.

See Table 4-1 for the working plan.

4.1.2 Survey of the present status and establishment of organization to collect information

To ensure smooth implementation and high efficiency of project activities from now on, JICA Team grasps the present status and collect relevant information on the basic/general item, methods of accident prevention and action at the occurrence of accidents through the newly appointed counterpart (C/P).

(1) Collection of basic information

We collect (1) the information on the present status of the facilities/equipment in the fields of tracks, rolling stock, signal and telecommunication and train operation, (2) information directly related to the safety and services such as maintenance-related standards, regulations and occurrence of accidents and malfunction and (3) information indirectly related to safety and services, such as revenue/expenditure , organizations, employee structures and other basic factors. We survey, among others, plans and records of investment in respective fields, estimation of maintenance cost, its request, notification status and purposes of expense.

(2) How to tackle with prevention of accidents

We survey methods of prevention of accidents and failures (accident analysis meetings, methods to disseminate the outcome of the meetings over field organizations) and grasp the number of accidents and malfunctions, methods of budget allocation to relevant fields of budget, and notification and purposes of expenditure.

(3) Actions at the occurrence of accidents

We survey the present status of reporting of accidents and relevant actions at the site of accident, the directing and commanding actions at the Head Office, methods of reporting to competent ministries and agencies and the methods of releasing information on accidents to mass media.

4.1.3 Guidance and familiarization of the technique to analysis the present status and causes of accidents and poor services.

Safety of railways assumes learning from the heavy toll of human lives of properties caused by the past accidents and makes it a prerequisite to disseminate among employees an oath never to repeat the same accidents. Regarding passenger services on the other hand, employees shall understand that the closer to customers they are, the heavier responsibilities they are supposed to have.

Aiming at "visualized management," we create a database on accidents and malfunctions in MR from 2010 through 2012 together with the C/P using Excel and other software for calculation. Based on the database, we analyze the trend of the occurrence of accidents/malfunctions and discuss counter measures against. We also guide the C/P on the method to create a simplified database on accidents and introduce cases of compiling monthly and yearly reports.

4.1.3-A Safety

We adopt cases of collision, derailment, train separation and level crossing accidents recently experienced by MR, and compile a text book to introduce methods to verify/analyze causes of selected accidents accident and accident preventing measures.

In selecting cases of accident for the above purpose, we consult with the C/P and consider the important items and those in which MR is interested.

By utilizing the text book, we familiarize the MR staff methods to analyze causes of accidents and to establish measures for accident prevention.

(1) Compilation of the text book

1) Introduction of the efforts of Japan and European countries towards to analysis of accidents and improvement of safety level.

MR currently relies not on national railway technical standards, but on railway technical standards adopted by International Union of Railways (UIC) and the European Railway Industry (UNIFE). Therefore, we introduce the accident preventing measures adopted not only in Japan but also in European countries.

As a successful case in Japan, we cite the measures to prevent level crossing accidents to make MR understand that, in order to decrease the total number of accidents, it is

effective to respond to the most frequently occurring incidents on a preferential basis, and to allocate a budget for hardware measures.

Simultaneously, we introduce the importance of human factors that allows prompt application without requiring particular budgetary arrangements, but requires five- to 10-year for generating successful results.

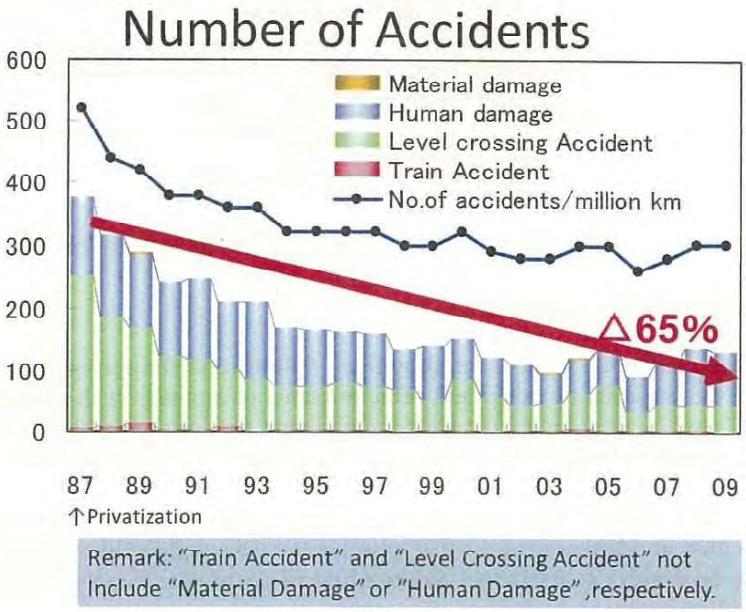


Fig. 4-1: Railway accident after Privatization of Japanese National Railroad

2) Introduction of the causes of and countermeasures against typical accidents in the past in Japan

a) Collision accident

We introduce the accidents caused by hardware failures and human errors, while referring to the (1) Mikawashima accident that accelerated the introduction of Automatic Train Stop device (ATS) and institution of a research institute on labor psychology and physiology, (2) "collision accident on the Shigaraki Railway in which a human error of a person affected the survival of the operator's management, (3) Tsurumi accident and (4) Derailment replication test of train derailment implemented on the Karikachi Test line.

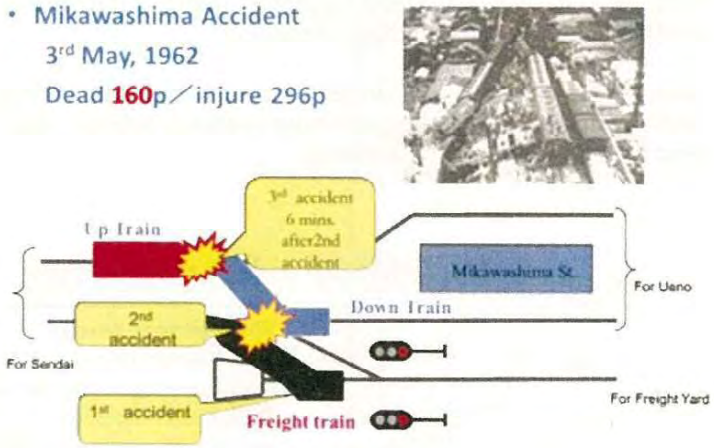


Fig. 4-2: Accident at Mikawashima Station on Joban line, Tokyo

b) Derailment accident

We adopt accidents caused by track failures including irregularities of alignment and those caused by track- and vehicle-related phenomena such as wheel climbing the rail head by introducing the Hibiya derailment accident to make MR understand that even a train running at low speed can claim a heavy toll of human lives.

As a case of train derailment accident on high-speed railways, we introduce (1) the ICE accident at Eschede that unfortunately claimed the lives of 101 passengers and (2) derailment accident on Joetsu Shinkansen at the Niigata Chuetsu earthquake that fortunately victimized no passengers.

ICE Eschede Accident in 1998

Joetsu-Shinkansen Accident in 2004

Fig.4-3: High speed rail derailment accident

c) Accident caused by natural disaster

In consideration of the natural environment surrounding MR, such as cyclones and long rains in the rainy season, we adopt accidents relating to earth-flows and river water increases and introduce cases of accidents in the past such as the loss of Fujigawa river bridge girders on Tokaido line, and train derailment and overturn in a strong wind on Uetsu line.

d) Train fire accident

It is important for MR that relies on diesel engines for powering to implement measures against fire, given the increases in the transport volume and high-speed train operation speed in the future. We introduce the fire accident preventive measures taken for high-speed diesel express trains Hatsukari that were introduced in Japan to cope with the expanded railway networks during the economic growth period in the 1960s.

e) Other accidents

Irrespective of the above cases, we consider adoption of other cases that are thought to be important by Japanese experts in each technical fields and those required for adoption by the MR C/P.

(2) Studying and learning with text books

We use the compiled text books to make the C/P discuss the causes of and preventive measures against accidents by themselves from the standpoint of the railway operator and disseminate the importance of learning from accidents.

(3) Summarization of the results of analysis and countermeasures against accidents.

We hold a workshop to deeper the understanding of MR staff of analysis and establishment of causes measures against accidents, and make MR including the management share the outcome of the workshop.

4.1.3-B Service level

The level of passenger services implies widely-ranged factors, such as train speed, punctuality, fare and charge, comfort (ride comfort, cleanliness and train operation diagrams) and also related with comparison with other transport facilities. The evaluation criterion of each factor depends on the subjectivity and sensitivity of individuals. In this Project, we adopt comparatively clear-cut items, such as low levels of scheduled speed, punctuality (frequency of train delays) and ride comfort (vibration of train).

(1) Compilation of text books

We introduce technical measures in Japan to raise train speed, ensure punctuality and improve ride comfort together with the methods (evaluation items and means) to survey customer satisfaction (CS) with railways.

(2) Results of cause analysis for the low service level and countermeasures

We shall be provided with the data in 2011,2012 on "the sections and factors of speed limit" and "delayed operations" of the trains between Yangon and Mandalay, categorize it with constraining conditions such as geographical conditions, conditions of tracks, track beds and bridges, rolling stock performance and train operation procedures and signal/telecommunication facilities and discuss measures against such problems together C/P.

Regarding ride comfort, we make data visible by using vibration measuring instruments. .

We also implement hearing surveys over customers during the Project period.

(3) Summarization of the results of cause analysis for the low service level and countermeasures

We hold a workshop to deeper understanding of MR staff of causes analysis and establishment of measures to improve the service level and make MR including the top management share the outcome of the workshop.

4.1.4 Recommendation on technical standards relating to administrative and maintenance aspect to improve the service level and safety

(1) Recommendation on technical standards to improve safety

We clarify the items prioritized for the improvement of safety. To ensure safety, nothing is more important than motivation of employees, with observance of standards and efforts for improvement by employees being a key to attain sustainable success. To prepare an environment for this purpose, therefore, it is important to create organizational norms and climates to allow evaluating the efforts by employees in a visible form.

(2) Recommendation on technical standards to improve the service level

We clarify the items prioritized for MR to improve customer service. It is expected that passenger flows will become more active not only in Myanmar but also to/from other countries as a result of economic development from now on. Improvement of service level is of utmost importance for MR in order to win the competition with other transport facilities and make railways survive and develop further in the future.

4.1.5 Drawing up of short- , medium- and long-term railway facilities improvement plan

We organize "Working group to improve the service level and safety (tentative naming)", make it analyze a series of surveys and extract improvement items for each phase based on the outcome of the workshop. After that, we draw an improvement road map for discussion.

(1) Short-term (three-year) improvement items

Items related to the safety of customers are prioritized to anything else, which shall simultaneously be those to promptly yield effect. It is recommended to promote the Project while selecting the Pilot sections and checking the effect through trials to replace components for which the spare part supply period is already overdue.

<Conceivable items>

* Track rehabilitation through ballast refills, renewal of rails, welding rail joints and track irregularities improvement
* Renewal of locomotive and diesel multiple units(DMU) engines and improvement of passenger coach accommodations
* Introduction of electronic interlocking systems into major stations, measures against lightning and improvement of block system between stations
* Renewal of telecommunication systems
* Improvement of staff educating facilities

* Survey of durability of railway civil engineering structure

(2) Medium-term (5- to 10-year) improvement items

We apply the items verified as short-term improvement items to major trunk lines, while targeting modernization of MR to cope with increases in the transport volume and higher speed operation.

<Conceivable items>
* Introduction of the automatic train protection system (ATP)
* Improvement of storage tracks and rolling stock maintenance bases

(3) Long-term (10- to 30-year) improvement items

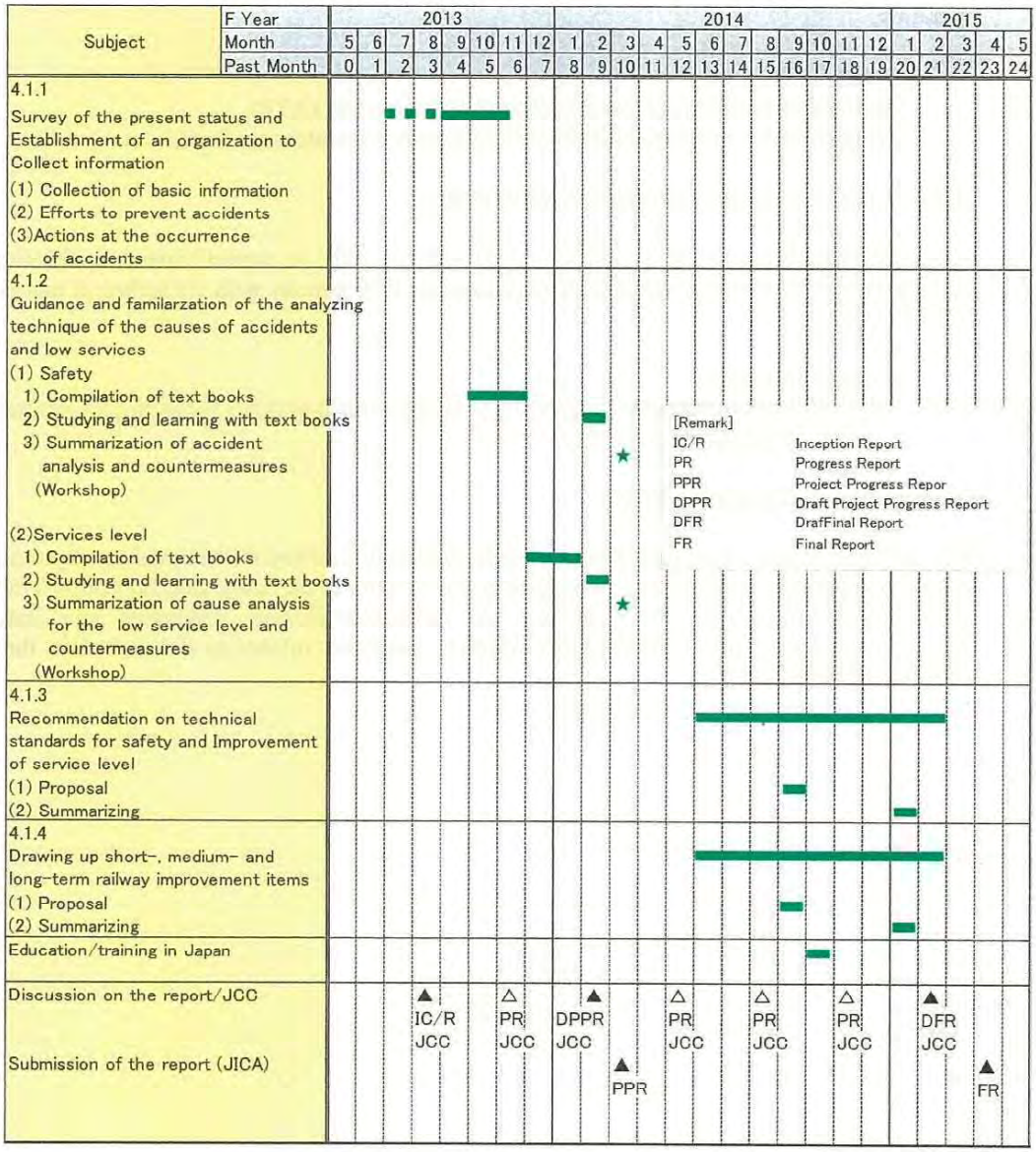
Long-term improvement items shall be selected not only to repeat/expand application of medium-term improvement items but also to consider the harmony with the technical innovation in the future.

<Conceivable items>
* Electrification and introduction of operation control systems including the centralized traffic control system (CTC)

4.1.6 Education/training in Japan

We educate and train approximately 11 trainees relating to railway institutional management for two weeks in Japan, including implementation of site tours to the Integrated Education/Training Center (Shin-Shirakawa), JR East, and the Overseas Human Resources and Industry Development Association (HIDA), with concrete programs subject to determination through consultations with MR.

Table4-1 Table of work planning schedule



4.2 Technology transfer of track maintenance technologies to improve the level of Service and Safety through implementation of the Pilot Project

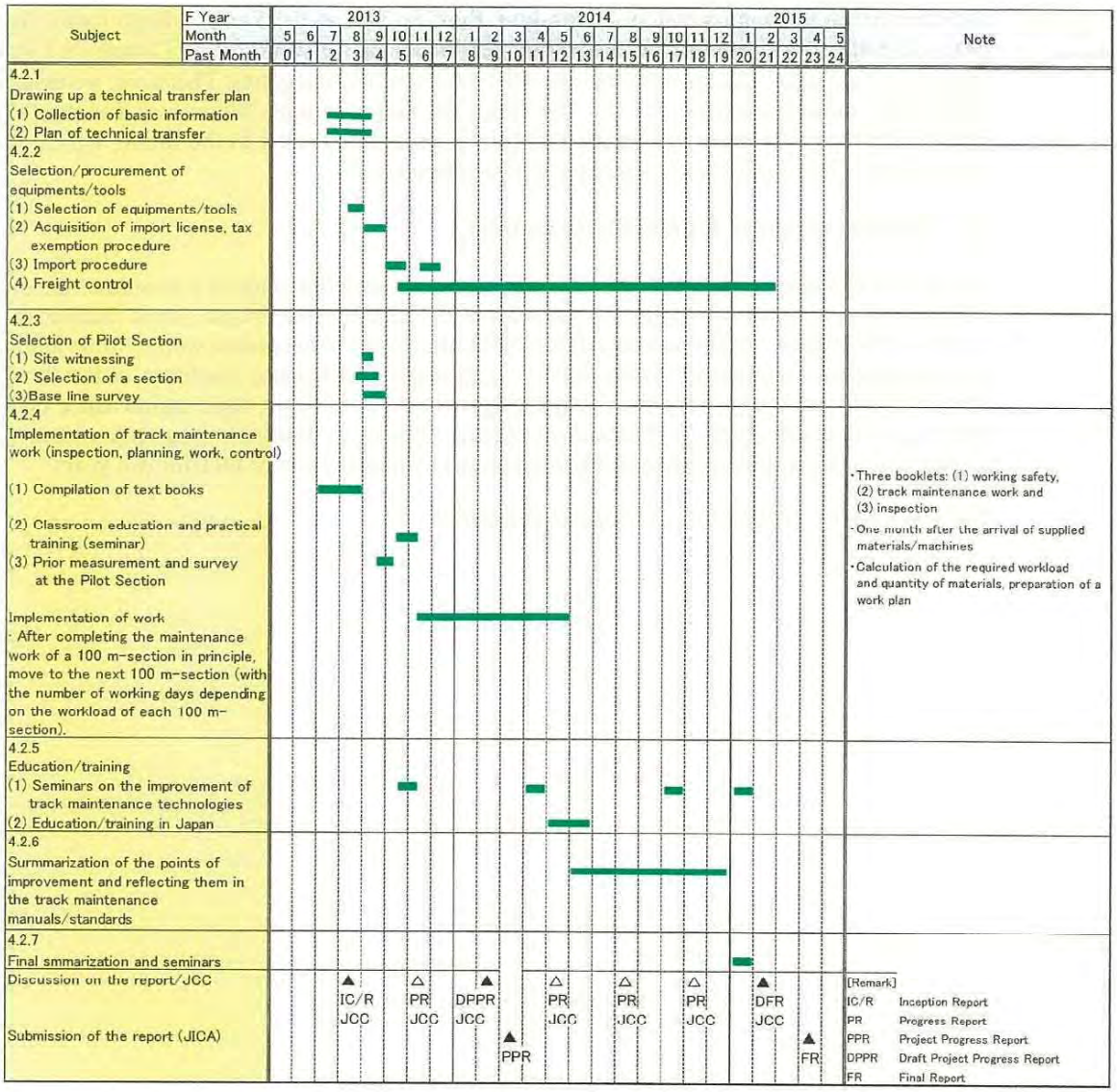
In this Project, the track maintenance OJT is one of the most important subjects, which will be implemented in the approximately 20 km-long Pilot Section in the Yangon–Bago route. As a gang of maintenance workers currently executes maintenance work for a 5.1-mile (8.2 km) segment, it is thought that the Pilot Section can be covered by four gangs. Therefore, we assume performing training and guidance for four gangs for OJT purposes. We expect that the Pilot Section dealt with by these four gangs will become a model section in the future, which will evolve further into a railway network on a nationwide scale.

4.2.1 Drawing up a plan for technology transfer

The system of track maintenance work currently in practice in Myanmar is a version of the old-fashioned system implemented in the past in Japan. Through this Project, track maintenance workers of MR shall receive education/training of basic track maintenance works, while aiming at a mechanized maintenance system to use large-scale maintenance machines in the future. This means a conversion from the current gang system to a larger sized maintenance depot system or a re-construction of maintenance system. Bearing in mind this long-term vision, we prepare a plan for technology transfer focused on the track maintenance OJT for two years.

See Table 4-2 for the schedule of technology transfer.

Table 4-2 Tentative Schedule (Track Maintenance)



4.2.2 Procurement of the required equipments / tools

(1) Table 4-3 summarizes the required equipments / tools, which will be procured by the Japan side.

Table 4-3: List of the required equipments / tools

No.	Item	Unit	Weight (kg)	Size (mm)
1	Digital standard gauge	5	3	1,320×90×108
2	Instrument detection for track	5	1	200×150×150
3	Mesuring instrument for rail wearing depthe	2	0.6	200×135×51
4	Gap gauge	5	0.5	150×20×10
5	Taper gauge	5	1	200×20×20
6	Thermometer for rail	5	0.1	81×35×11
7	Square for rail	5	5	800×1,570×100
8	Trackmaster	1	43	2,100×1,320×225
9	Mesuring instrument for train swing	1	4	184×184×159
10	Tape	13	0.1	200×15×3
11	cloth measuring tape (30 m)	5	0.7	300×300×30
12	steel measuring tape (30 m)	5	0.9	300×300×30
13	Square	5	0.1	161.5×323×2
14	Slate pencil , Chalk	4	0.1	150×100×20
15	Tie tamper	1	29	750×180×880
16	Beater	18	5	910×790×30
17	Shovel	18	2	1,000×300×50
18	Bar	35	10	1,500×30×30
19	Spike hammer	13	5	910×345×30
20	Panpuller	18	3	1,000×200×50
21	Jack for rail	40	16	187×155×300
22	Equipment for ballast tamping	5	62	930×845×360
23	Generator	1	97	540×910×700
24	Generator	5	21	510×290×425
25	Shovel	9	1	1,000×250×300
26	Dump shovel	9	3	1,000×300×50
27	Shovel with blade divided into multiple	9	3	1,000×300×50
28	Hoe with blade like nail of wild goose	9	1.5	760×200×150
29	Hand screen	18	3	400×600×70
30	Hoe with blade of traiangle	9	1.7	950×230×110
31	Wooden maul	9	5	1,000×300×200
32	Basket made by bamboo or plastic	9	1	400×419×120

No.	Item	Unit	Weight (kg)	Size (mm)
33	Jack traverser	10	40	2,350×1,000×861
34	Rail sawing machine	3	50	450×550×950
35	Rail boring machine	3	25	877×294×433
36	rail bending machine	1	90	1,000×500×250
37	rail joint expandor	1	78	1,130×620×350
38	Sleeper replacing machine	1	12	400×150×150
39	Rail carrying machine	9	88	2,850×956×690
40	Rail carrying tongs	9	2	220×150×30
41	Shovel	18	2	1,000×300×50
42	Single open ended spanner	9	5	800×100×20
43	Chisel	5	2.5	200×30×30
44	Rail fork	5	6.5	1,040×100×100
45	Disc grinder	5	1.5	300×150×150
46	Power wrench	5	9	400×400×150
47	Low joint maintenance machine	1	205	1,443×450×995
48	Spanner for joint bolt	9	5	600×60×20
49	Rail grinding machine	1	57	2,061×244×380
50	Swager for back bolt	1	10	300×250×100
51	Hydraulic lining machine	5	25.5	630×150×148
52	Low roller	7	0.5	177×30×22
53	Chisel with handle	3	3	200×490×30
54	Spanner for bed plate / rail brace	7	5	600×60×20
55	Adz	9	2	550×150×50
56	Hand hammmar	9	0.5	350×100×30
57	Spanner for huck bolt	9	5	600×60×20
58	Gimlet for huck bolt	13	0.5	250×200×20
59	Gimlet for cut spike	13	0.5	250×200×20
60	gouge	9	0.2	250×30×30
61	Electric saw	5	2	300×100×200
62	Boring machine	3	2.5	400×100×200
63	Sleeper carrying tongs	9	2.5	500×300×30
64	Pad remover	9	0.1	200×100×20
65	Light track trolley	5	77	1,500×1,232×233
66	Gas cutting machine	2	15	1,000×1,000×1,000
67	Rail lifting machine	3	17	867×260×200
68	Spanner	2	1.5	385×110×25

No.	Item	Unit	Weight (kg)	Size (mm)
69	Track jack	9	20	250×150×550
70	Low elasticity pad	20	0.1	180×110×10
71	Track shim	20	0.5	400×50×5
72	variable pad	40	0.1	200×100×10
73	Gravel stop	20	76	610×500×400
74	Huck bolt	40	1	200～400×30×30
75	Brushcutter	4	4	30×30×1730
76	Design for turnout etc	1		
77	Design for the other materials	1		

(2) Figure 4-4 illustrates the flow of the import procedure for equipments / tools in the procurement process. Below explained are the major points to be observed.

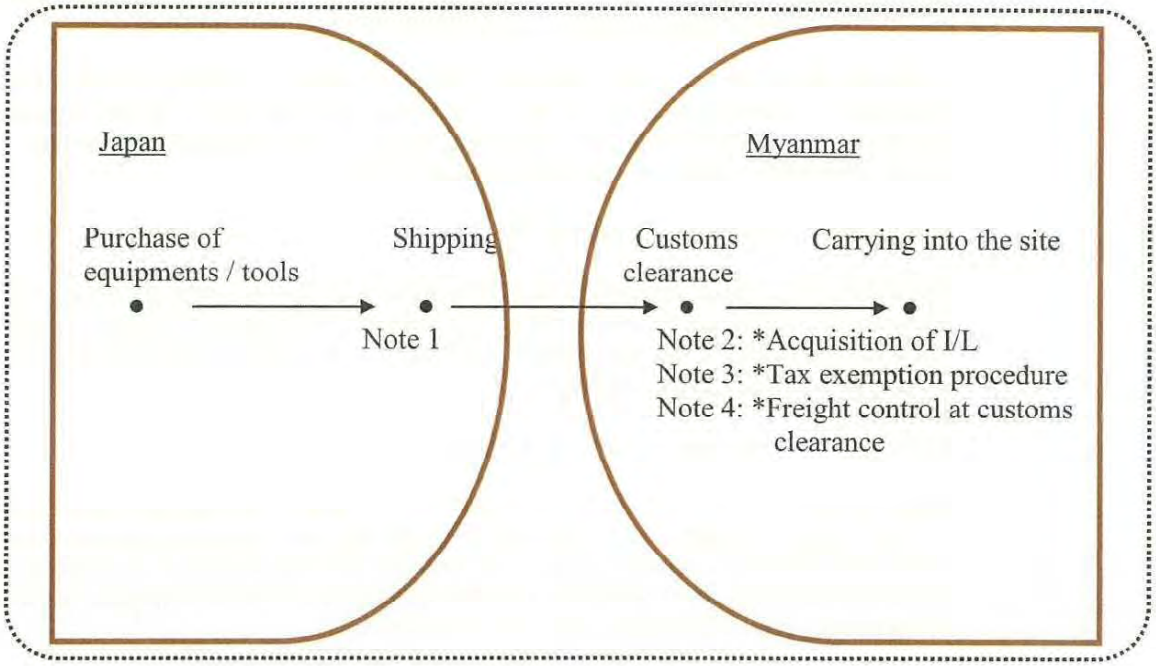


Fig. 4-4: Flow of the equipments / tools import procedure.

1) Acquisition of import license (I/L) (Notes 1 and 2)

Trading in Myanmar requires importers to acquire an import license (I/L) in advance.

Importers shall acquire an import license before shipment (Note 1) as a prior procedure required for import clearance in landing the purchased equipments / tools.

2) Shipping of equipments / tools

If the cargo has been shipped from the export country before the acquisition of an import license, the importer shall be subject to confiscation of cargo or other penalties by Myanmar. Therefore, due attention shall be paid to the dates of I/L acquisition and cargo shipping from the export country. Furthermore, the cargo shall arrive at Myanmar before the last day of import specified in the import license.

3) Import declaration (Note 2)

Although import declaration can be performed by the importer, it is normally entrusted to a professional agent called a customs broker with a fee paid, as the clearance procedure is extremely complicated and requires expertise knowledge of laws.

Checking and signing the documents for clearance can be done only by the registered customs specialists belonging to a customs broker.

4) Import clearance (Note 2)

This is a procedure for importers to obtain permission from the customhouse with the cargo subject to inspection after (1) reporting cargo items, categories, quantities, prices and other particulars and (2) paying custom duties and other relevant taxes.

Until this procedure completes, the cargo retains the status of a foreign article without becoming a domestic one and, therefore, it cannot be handed over to the Myanmar territory from the bond area. As omission/ignorance of this procedure or false file of return constitutes smuggling, due attention shall be paid.

5) Procedure for tax exemption (Note 3)

Importers shall obtain permission of the customhouse for tax exemption before the clearance procedure in importing cargos that fall in the category of tax-free articles. Detailed procedures in this regard shall be subject to prior confirmation with competent offices and customhouses in Myanmar.

6) Freight control at import clearance (Note 4)

After the arrival of the cargo at the landing port of Myanmar, the importer cannot claim it until the import clearance completes. In the meantime, the importer is required to bear warehouse expenses, container yard rental fees and other extra costs. It is required for the importer, therefore, to promptly complete the custom clearance procedure and take other actions to avoid otherwise unnecessary expenses.

4.2.3 Selection of Pilot Section

In the 46.5 mile section (74.8 km long) between Yangon and Bago, we implement track maintenance as a means of technical transfer in the approximately 20 km-long Pilot Section, which is selected through a site survey to allow experiencing maintenance of different track structures, such as defective, sound, straight and curved tracks, turnouts in station yards and bridges, so that the effect of technical transfer is readily obtainable.

4.2.4 Implementation of track maintenance (inspection, planning, work and control)

(1) Compilation of text book

To use for classroom education and practical training, we compile a text book in three parts, each covering the fields of (1) safety of work, (2) track maintenance work and (3) track inspection.

We implement practical training and maintenance work based on this text book and compile, (1) standards and (2) manuals, for track maintenance work, after modifying, adding or deleting contents of the text book based on review of track maintenance training.

(2) Classroom education and practices (seminars)

Before implementing actual track maintenance work on the Pilot Section, we will have seminars on the particulars related to track maintenance such as inspection, planning and work for the workers to be assigned to the Pilot Section. This is the first classroom education and an important step to assess the level of local staff, which will significantly contribute to the work progress control in the future.

Before starting the maintenance work in the Pilot Section, we will also perform practical training on track maintenance (inspection and work) on non-commercial tracks. As safety is one of the most important concerns for track maintenance workers, we also educate them on safety in practicing track maintenance work, with (1) wearing protectors and other protective equipment and (2) deployment of security guards (train watchmen) subject to prior negotiation with MR. However, we propose at least wearing protective shoes, helmets and safety vests.

Regarding classroom education and practical exercises, we select an inspector and three to four works from each gang; implement education in the classroom in the morning and practical exercises using working tools in the afternoon, for about one month in consideration of the combinations of work category and associated job and the number of object trainees. As a part of base line survey, track irregularities (5 items), train vibration accelerations (Vertical and lateral), average speed in the Pilot Section will be measured.

(3) Implementation of prior measurement and surveys of the Pilot Section

Before implementing track maintenance work for tracks used for commercial services in the Pilot Section, we measure track levels (transit measurement at curves) to calculate the amount of rail lift and the volume of ballast for the total length of the Pilot Section. Furthermore, we patrol the total length to (1) visually check the conditions of track structure/materials and (2) survey the workload required and the volume of materials in each 100 m-segment to draw up a working plan.

(4) Implementation of inspection, planning and work in the Pilot Section

Based on the working plan for each 100 m-segment compiled according to the results of prior measurement and surveys, we implement in turn education and training for the inspector and workers of each track maintenance gang. In the course of this education/training for a particular gang until the track maintenance work in the range of track section in its charge completes, inspectors and workers for other gangs are expected to observe, witness and help the work in progress when necessary in order to make these gang-wise separated operations yield an extended effect over the whole Pilot Section.

For this education/training, we will in principle use the intervals between trains during the daytime. Based on the experience in practical training, time-consuming work will be shifted to the time zone when tracks are not used for commercial purposes.

See the paragraphs 1) to 11) below for the scheduled track inspection and maintenance work together with the following descriptions for the purpose, points and summaries of the inspection/maintenance work.

1) Ballast compacting work (use of hand tie-tampers, beaters or shovels)

①Inspection of track irregularities and conditions

Twice-yearly inspection of vertical/lateral displacement and settlement of tracks to extract irregular points before they affect the train running safety and ride comfort for compiling an improvement plan.

② Correction of track irregularities

To guarantee the safety of running trains and improve/maintain ride comfort, the ballast layer, which transmits the train load to the tack bed and absorbs vibration/shock, is normally compacted to correct track unevenness and irregularities. The effect of the ballast layer is ensured when a sufficient volume of ballast is supplied to an appropriate thickness under sleepers.

2) Ballast sieving

① Inspection of ballast

The ballast layer loses its function, with elasticity decreased and draining capacity worsened due to sand/soil flying from the surroundings, mud pumping and grain refining caused by the train load. Therefore, ballast layer should be checked once a year and sand/soil in the ballast layer shall be removed approximately.

② Execution of work

Deteriorated ballast shall be sieved to remove sand/soil, with new ballast refilled to recover the lost volume and function. It is normally the case that ballast is compacted simultaneously.

3) Rail renewal work

① Inspection of rail

Rails shall be inspected once a year on a regular basis for wear, corrosions, cracks and other conditions for renewal in case they have flaws, corrosions or worn parts to threaten the safety of train operation.

To extend their life, however, it is often the case at present that some parts of the rail such as cracks due to fatigue and corrugated wear parts are ground before replacing rails.

②Rail renewal work

Rails are normally replaced by suspending trains rather than utilizing the intervals of train operation. To replace a rail, prepare a new one in advance at the renewal site.

Rails are normally replaced through (1) manual operation in case the length of renewal section is 10 m or less and (2) by using dedicated machines such as an crane type rail traverser (a carrier to hang and move rails) and rail replacer in case the length of renewal section is longer than 10m .

4) Rail joint work (rework on rail clearance (rail joint clearance), correction of rail joint depression)

①Inspection of rail joint

Insufficient rail joint clearances generate an axial force in rails due to the loss of allowance for elongation and cause rail buckling. On the other hand, excessively large rail joint clearances increase the shock at train passage to worsen ride comfort, cause joint depression, damage rails and break fish bolts. To prevent these phenomena, rail clearances sball be inspected twice a year, in spring and autumn, to ensure proper clearances.

Implement a maintenance plan to correct irregular rail joint clearances.

②Clearance correcting work

After the above inspection, defective points where rail joint clearance is excessively small or insufficient in summer shall be corrected to an appropriate clearance value according to atmospheric temperature (that shall be specified in advance in the relevant rule for different rail lengths).

③ Fail joint correcting work

In particular, excessively large joint clearances are disadvantageous from the viewpoint of maintenance work, as they cause track settlement, joint edge battering (deterioration of rail top) and damage on track materials, which shall be corrected, therefore, by rectifying joints, using processed fishplates (new design) and increasing sleepers.

5) Track realignment work

① Inspection of track displacement

Track displacement (lateral displacement: horizontal alignment) shall be inspected regularly or

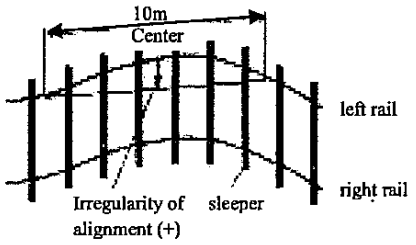


Fig. 4-5: irregular alignment

approximately twice a year.

Large displacement in the lateral direction significantly affects the safety of running trains and ride comfort. This requires preparation of a plan for correction.

② Irregular alignment correcting work

To correct the irregularities of alignment, the horizontal displacement of the rail side in the lateral direction shall be corrected under the direction of a gang leader. Straighten the rails in straight sections and rectify those to a constant curvature in curved sections. Where the section for rectifying work is long, MTTs are frequently used to ensure the efficiency of correcting work.

6) Turnout maintenance work

① Inspection of turnout

When compared with other sections, turnout sections feature a number of rail joints and discontinued rail portions. This causes large degrees of shock, lateral force and vibration at train passage, which tends to lead to track irregularities and wear/damage of component members. Therefore, turnouts shall also be inspected regularly once to twice a year (function inspection twice a year and inspection of materials once). Inspect tracks for alignment/depression and turnouts for the switching function twice a year and track materials for damage, wear, corrosion and breakage once a year.

In any event, systematically rectify abnormalities that would threaten running safety or ride comfort proposed and replace deteriorated materials and parts. New type of turnout will be proposed.

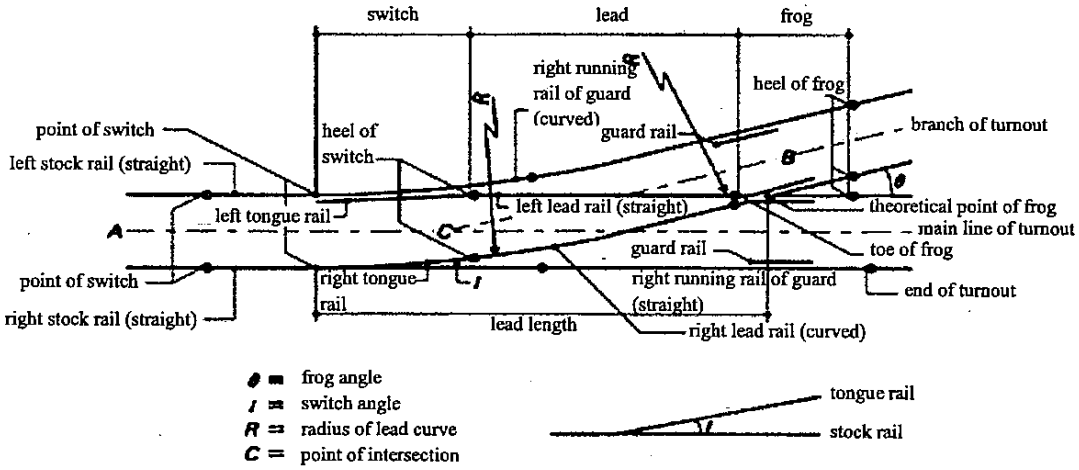


Fig. 4-6: Structure and components of a turnout

② Repair and renewal of turnouts

Minute attention shall be paid in the turnout maintenance work to renew improper materials found in inspection without delay. Joint raising work (compacting) is frequently required in turnout sections, as they are studded with rail joints.

7) Inspection and maintenance of bridge sections

① Inspection

Unlike in ordinary sections, tracks on bridges are composed of wooden sleepers simply placed on bridge girders. Maintenance of the tracks on bridges will be practiced. Inspection centers on the inspection of sleepers, fasteners and guard rails. In the same way as in the maintenance of ordinary tracks, inspect tracks for (1) track irregularities and wear/damage on rails and (2) conditions of aforementioned members and function/conditions of materials approximately once a year. Replace defective parts in the maintenance work.

② Maintenance work

Currently in MR, sleepers are not fixed at girders on bridges, so they tend to creep into the direction of running of trains to make the intervals between sleepers inappropriate. Therefore, fix hook bolts to make sleepers immovable. Replace sleepers or correct their position, and replace hook bolts and install angles for fixing sleepers as necessity arises.

Note) Cautions for bridge work

Safety measures are not taken against falling on bridges at the moment. We discuss with MR safety measures including adoption of safety nets.

8) Correction of track gauge

① Inspection

Irregular track gauge directly governs the safety of running trains. Inspect the gauge together with other track irregularity items (longitudinal/cross level, alignment, distortion) approximately twice a year.

Irregular track gauge is often caused due to rail wear and loosened/lost fasteners. Systematically rectify the points of incorrect track gauge.

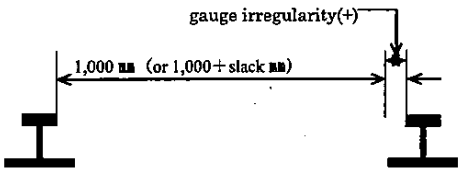


Fig. 4-7: Track gauge

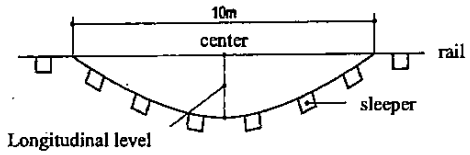


Fig. 4-8: Irregular longitudinal level

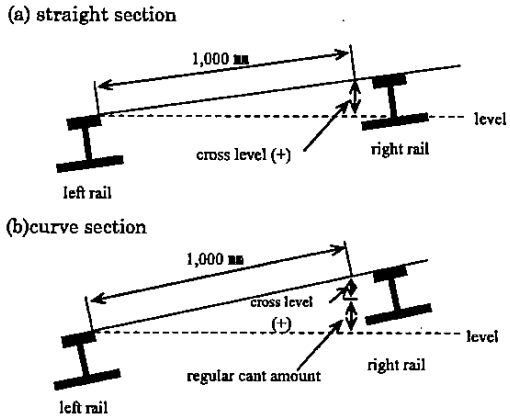


Fig. 4-9: Irregular cross level

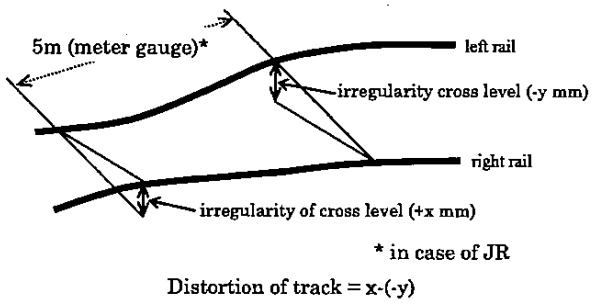


Fig. 4-10: Distortion of track

② Correction work

The track gauge, a distance between left and right of rails, tends to lose precision due to (1) displacement of rails pushed by lateral force or (2) wear of the rail side. To correct the track gauge, remove the rail fasteners in the vicinity of the irregular point and laterally move the rail to the correct position.

9) Welding of rails (preparation of long-rails and a measure to strengthen rail joints)

Welding of rails is an ultimate measure to strengthen rail joints.

Elimination of rail joints by welding rails dramatically strengthens and improves the track structure (introduction of long-rails). It is thought that rails shall be welded through consultations with MR for the scope of work and welding methods. There are several rail-welding methods for MR. However as the welding results are featured by insufficient qualities, finishing precisions and reliability levels, we educate and guide Myanmar workers on welding methods and the control of welding quality.

Note) We introduce other non-welding joint strengthening measures adopted in Japan and support Myanmar on this issue after consulting with MR.

10) Improvement of formation

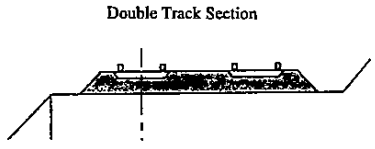


Fig. 4-11: Width of formation (= L)

① Inspection of ballast and roadbed

Inspect ballast and roadbed approximately once a year.

Roadbeds play an important role to maintain the track structure/alignment and make working passes/evacuation routes in emergency. It is required to prepare an improvement plan to expand widths and install gravel retaining walls for the places found defective through inspection.

②Although a standard width of formation is specified in Myanmar, we found through site surveys that sufficient widths are not maintained. To fully exert the effect of aforementioned ballast compacting work, we guide MR to expand the width of formation where it is insufficient.

11) Control and evaluation of track conditions

As the indexes to control and evaluate track conditions, we generally adopt the values of five track irregularities items (track gauge, longitudinal/cross levels alignment and distortion of track), which can be measured by simple means (track gauge, strings and pieces, etc.) or simplified measuring instruments (Track Master).

For the purpose of track control, set threshold values for maintenance for track irregularity items that guarantee the safety of running trains, measure irregularities periodically and provide maintenance services within the pre-set time length in case the value of an item has exceeded the threshold value.

To maintain appropriate track conditions after providing maintenance services and aim at extending the maintenance periodicity, also set the target values of track irregularities for finishing work to judge whether the maintenance services are appropriate.

To evaluate track conditions, measure track irregularities at constant intervals and count the number of the points where the threshold value has been exceeded. Judge whether the track conditions are appropriate thereafter by the changes in the number of points exceeding threshold values. If the track maintenance is improved by such an evaluating system, it is thought that the points where a threshold value is infringed will decrease.

We also discuss a method to assess track conditions by measuring train vibration, acceleration at a constant periodicity, though this measurement includes the influence of rolling stock performance. In this case as well, set the threshold value for (vertical/lateral vibration acceleration or vibration piece,) and correct the points where the threshold values have been violated. If the track maintenance is improved by this evaluating system, it is thought that the overall level of train vibration acceleration (amplitude) will decrease, followed by the decrease of the number of the points where a threshold value is infringed.

After the completion of track maintenance operation described in the above paragraphs 1) to 11), we will discuss improvement measures, renew the essentials of track maintenance manual and make efforts thereafter to disseminate the renewed version of the essentials of maintenance manuals.

4.2.5 Education/training

In Myanmar, a rainy season starts every year at the end of May. As the track maintenance work in a rainy season is apprehended to adversely affect track beds, we will primarily implement education/training from the end of May to October, 2014.

(1) Seminars to improve track maintenance technologies

We assess the level of track maintenance technologies of MR employees and compile appropriate text books. Thereafter, we hold seminars to improve track maintenance technologies for those participated in the maintenance of pilot section (approximately 20 members) three

times: at the start of track maintenance OJT, after completion of track maintenance and at the final summarization of track maintenance OJT.

(2) Education/training in Japan

We implement a two-week education/training program twice in Japan each for approximately 11 trainees including some MTT operators, in which education/training on track technologies (centering on lectures and practical training) will be performed under the cooperation of JR East and Japan Railway Track Consultants, at the Integrated Education/Training Center (Shin-Shirakawa), JR East, and at the Overseas Human Resources and Industry Development Association (HIDA). MTT operators are included in the above program to prepare for introduction of MTTs into track maintenance in the future.

We practice actual work at the side tracks, and observe the nighttime work to use MTTs in the suburbs of Tokyo.

We discuss the detailed contents of curriculum so as to reflect the level of MR engineers, and also discuss with MR about suitable timing of training in Japan.

4.2.6 Summarization of the points of improvement and reflecting them in the track maintenance manuals/standards

We summarize the points of reflection through the whole of maintenance work and compile the maintenance manuals to meet the present status of the track maintenance in Myanmar in consideration of the local organizations, working conditions and climates. The essentials of maintenance manuals will be easy to use, while including the steps of work and handling of machines/materials for track maintenance.

4.2.7 Final summarization and seminars

In closing the above technical transfer course on track maintenance work, we will open seminars for the trainees participated in the program and track maintenance members for other sections selected through consultation with MR. As this is the final step for MR employees to receive technology transfer, which is expected to evolve as a model shop to every section of the country in the future, we will avail ourselves of this opportunity to totally wipe unknowns out of MR members regarding the whole of track maintenance work.

5. Project implementation Organization

5.1 Structure of project implementation Organization

Based on R/D, we will organize a project implementation Organization shall be organized as shown in Fig. 5-1.

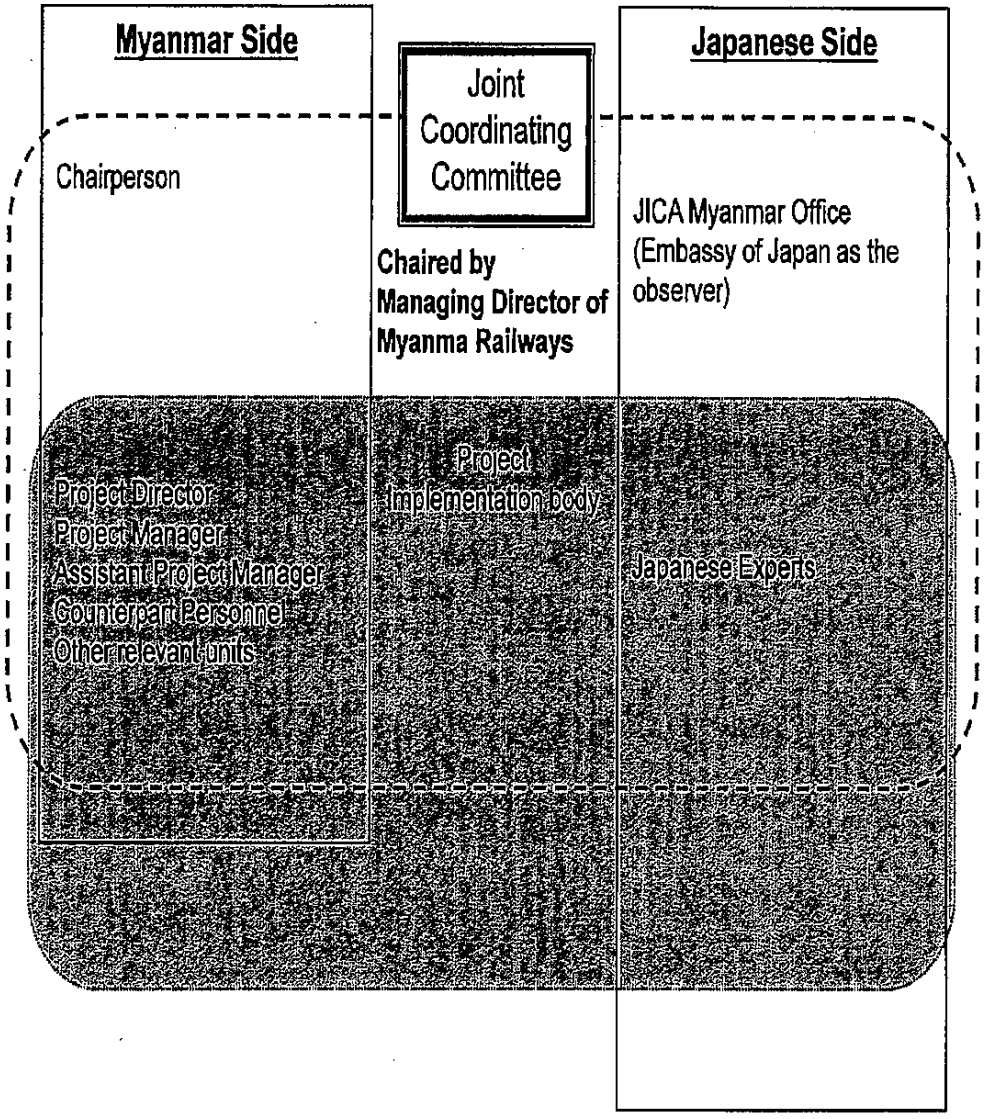


Fig. 5-1: Structure of project implementation Organization

This project will be promoted as a scheme of "technical cooperation" that shall be addressed (1) by Myanma Railways (MR) supported by the Ministry of Rail Transportation on the Myanmar side and (2) by JICA and a tripartite consortium (JV) composed of Japan International Consultants for Transportation Co., Ltd. , Oriental Consultants Co., Ltd. , and Sumitomo

Corporation, who are entrusted with this Project by JICA, with hand tie-tampers offered by the Institute for Transport Policy Studies on the Japan side. To ensure smooth implementation of the whole project, the Joint Coordinating Committee (JCC) will be instituted as referred to later in 5.4.

5.2 Implementation body on the Myanmar side

MR will play a central role on the Myanmar side. To correspond to Japanese experts, a Counterpart Team is organized for this project. See Table 5-1. Project Director commands the general affairs and implementation of the project, while Project Manager manages the projects and directs technical affairs.

In the OJT project for the pilot section between Yangon and Bago, track maintenance is the mainstream of the field work, which will be led by (1) the leaders for civil engineering departments of Division 7 (Yangon) and Division 6 (Insein) in charge of the Yangon–Bago section and (2) those supporting the area of Lower Myanmar Administration and (3) the civil engineering staff at the Head Office. Regarding the safety and service improvement project based on the analysis of accidents, the MR Head Office located at Naypyitaw has the initiative to the implementation of the Project.

5.3 Implementation body on the Japan side

The JICA experts selected from the above tripartite consortium will guide/advise the personnel on the Myanmar side and offer recommendations where necessary for the project. See Table 5-1 for the list of the expert members.

Japan International Consultants for Transportation Co., Ltd. , a leader of the consortium, which was instituted in November 2011 by JR Companies, private railways and other enterprises as a comprehensive consultant for overseas railways, is privileged to enjoy whole hearted cooperation for this project from JR Companies and also from Japan Railway Track Consultants, an expert consultant on track technologies established by JR Companies..

5.4 Establishment of Joint Coordinating Committee (JCC) and Its Functions

JCC is the committee to confirm the progress of the Project, discuss important matters and make decisions for the better implementation of the Project.

It fulfills the following functions;

(1) To discuss and approve the annual work plan of the Project to be formulated under the framework of the R/D,

(2) To evaluate the achievement of the annual work plan and overall progress of the Project;

(3) To facilitate the necessary authorization of the Project outputs,

(4) To review and exchange opinions on major issues that arise during implementation of the Project.

Managing Director of MR will be the chairperson of the JCC. The members are listed in Table 5-2.

Originally it was planned to be held at least twice a year and when necessary arises.

However on the request of Myanmar side, it is planned to be held around once every 3 months.

6. P.D.M.

6.1 Modification of P.D.M.

With respect to P.D.M. attached to R/D as annex I, mainly the description of 「Objectively Verifiable Indicators」 and 「Means of Verification」 corresponding to 「Overall Goal 」 and 「Project Purpose」 are modified. The modified descriptions are shown in Table 6-1. The reasons for modification are given as follows.

(1) Overall Goal : Objectively Verifiable Indicators

① Number of annual accidents

Because (a) the Pilot Section is rather short, only 20km, accordingly rehabilitation of track is limited in length, (b) the rehabilitation/modernization of various railway facilities on the Yangon-Mandalay line is not made clear, accordingly it may be difficult to show how much the accidents caused by the deteriorated railway facilities can be reduced, and (c) number of accidents fluctuates considerably year to year mainly due to weather conditions, quantitative expression for reduction of accidents is avoided.

② 「Reduction of Number of Limited Speed Locations」, 「Improvement of Journey Speed」, 「Improvement of Punctuality of Train Operation」

Without the modernization of signaling systems, it may be difficult to raise the train speed, while ensuring the train operation safety. Accordingly 「Reduction of Number of Limited Speed Locations」, 「Improvement of Journey Speed 」, and 「Improvement of Punctuality of Train Operation」 are adopted as evaluation items, and also quantitative expressions are avoided.

(2) 「Overall Goal : Means of Verification」,

「Project purpose : Objectively Verifiable Indicators」, 「Project Purpose : Means of Verification」

The meanings are not changed, but the description is modified as given in Table 6-1.

(3) Others : Counterpart Training in Japan

Number of trainees is increased.

- Railway Institutional Management Improvement : 11persons×2weeks
- Track Maintenance : 11persons ×2×2weeks

6.2 Establishment of Base Line

6.2.1 Based on accident analysis, recommendation on technical standards relating to administrative and maintenance aspect and drawing up railway facilities improvements plan to improve service and safety level.

The following are established as the Base Line for Yangon-Mandalay Line, in 2012/2/2013,

① Number of train accidents classified by kinds

(per one million train km)

② Delay time of express passenger train (average value and maximum value)

③ Limited speed and Journey speed.
④ Satisfaction level of the clients. (Interview)
⑤ Number of passengers per year

6.2.2 Technology Transfer of Track Maintenance Technology to improve the level of Service and Safety through Implementation of The Pilot Project

① Track irregularities (gauge, cross level, longitudinal level, longitudinal alignment, twist).Their means, maximum values, standard deviation
② Vertical and lateral vibration accelerations. Their means, maximum values, standard deviation
③ Average train speed.

Table 6-1 Modification of PDM

Annex 1
PDM

Project Design Matrix
The Project on Improvement of Service and Safety of Railway — Project Implementation Period : 2013 to 2015
Excuting Agency:Myanma Railway(MR) ,Ministry of Rail Transportation — Project Site: Yangon — (24months)

Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption
Overall Goal Service and safety level of Myanma Railways is improved.	①Number of annual accidents on Yangon-Mandalay line decreases compared with the pesent and past records. ②Number of speed ristricted locations on Yangon-Mandalay line decreases compared with their present number. ③Journey speed on Yangon-Mandalay line increases compared with the present journey speed. ④Punctuality of express passenger trains on Yangon-Mandalay line is improved compared with the present situation. ⑤Satisfaction level of clients is enhanced. ⑥Number of passenger	-Statistics on safety -Reporting of accidents cause analysis and discussion of countermeasures are executed. -Satistics on operation -Interview/questionnaires to clients -Satistics on operation	
Project Purpose Administration and maintenance ability is improved for the enhancement of sevice and safety of Myanma Railways.	①Accident cause analysis and countermeasures to prevent the similar accidents, and means to improve service levels are established and executed ,and inherited by MR ②Administrative and managerial capacity of track maintenance is improved and improved level is kept by MR	-Reflection on organization,management/ operation rules,facilities renewal plans -Utilization,modification of administration management manuals -Actual results of maintenance execution, such as the record of maintenance	-Administration staff members are not relocated drastically -Technical staff members are not relocated drastically
Output			
1. Issues are clarified for the enhancement of service and safety in the administration and maintenance process, and the improvement plan is drawn.	1-1 System for collecting information of track, rolling stock, signal and communication, and operation is established. 1-2 Safety issues are listed based on the investigation and analysis of cause of accident. 1-3 Service issues are listed. 1-4 Service and safety improvement plan is drawn so as to tackle the issues.	1-1 Related management document(s) of System for collecting information 1-2 Listed issues 1-3 Listed issues 1-4 Service and safety improvement plan	-The Government support to the Myanma Railways, especially financial support is secured.
2. Technical capability is improved through emergency track maintenance to improve the level of sevice and safety.	2-1 Technical transfers are made effectively at each measure (targeted numbers of technical staff 30 persons). 2-2 Working manual of emergency track maintenance is prepared. 2-3 Proper equipment and materials are procured both qualitatively and quantitatively. 2-4 Counterpart personnel acuired necessary proficiency through seminars(3 times), trainings(3 times) for technical improvement on the rail maintenance and others.	2-1 Record of technical transfers 2-2 Set of Working manual 2-3 Inventory list of equipment and materials 2-4 Record of seminar and training	

Table 6-1 (continued)

Annex 1

Activities	Input (Japanese side)	Input (Myanmar side)	Preconditions
1. Preparation of Railway Service and Safety Improvement Plan 1-1 To conduct current situation survey regarding track, rolling stock, signal and communication, and operation, and establish system for collecting information. 1-2 To promote familiarization on the investigation and analysis method of accident cause based on the comprehensive factors of track, rolling stock, signal and communication, and operation. 1-3 To coinduct the investigation and analysis mentioned above. 1-4 To provide recommendation based on above analysis on necessary technical standards to improve service and safety level. 1-5 To draw the improvement plan of railway facilities through discussion with the "Working Group for service and safety imprivement(tentative name) " **2. Enhancement of Technical Capabilities of Track Maintenance** 2-1 To draw the technology transfer plan. 2-2 To procure the necessary equipment and materials. 2-3 To conduct emergency track maintenance. 2-4 To summarize betterment point(s) obtained during emergency track maintenance operation, and to feedback to the successive measures. 2-5 To draw the working manual of emergency track maintenance. 2-6 To conduct seminars, trainings for technical improvement on the rail maintenance and others.	**1. Dispatch of Japanese Experts** Fields of Experts(several person) -Railway OM improvement -Technical Standards -Track Maintenance -Procurement of Equipment and Materials/Project Coordination **2.Counterpart training in Japan** -Railway Institutional Management Improvement: 11person ×2weeks -Track Maintenance: 22person (11p×2×2weeks) **3.Equipment** Necessary handy equipment of emergency track maintenance, such as Tie Tamper. **4.Expense** -For research, travelling, training, the other activities for Japanese experts	**1. Assignment of Counterpart** -Project Drector: 1person -Project Manager: 1person -Railway Polocy/OM Improvement: 1person -Rail Maintenance: 1person -Procurement of Equipment and Materials: 1person -Others: As approproate **2.Provision of facilities for the Project implementation:** -Project office (in the Myanmar Railways, Lower Myanma Regional Office) -Working tools and furniture for Project Office -Internet connection in the Project office **3.Joint Coordination Committee(JCC)** -Establishment of JCC **4.Expense** -Local cost for personnel -Cost for office rent and quipment. -Expense for the pilot project,such as gravels,sleepers,rail materials and others. -Other expenses: For research,travelling,training,the other activities for counterpart personnel **5.Others** -Status guarantees of Japanese experts, ID card for access into the Myanma Railways properties. -Access to the necessary statistical data and related information -Other necessary local cost	Natural Disaster does not hit the railway facilities fatally.

7. Dispatching Schedule of JICA Expert.

Table 7-1 Personnel Planning

Assignment	Name	Belongs	2013								2014												2015				
			5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
Leader/ Track maintenance	Sadaaki KURODA	JIC		6/25	7/10	8/25	9/8	(10/15) (11/15)	(10/31) (11/30)			(2/16)	(3/4)		(5/14)	(5/30)		(8/18)	(9/3)	(10/15)	(10/31) (11/15)	(11/30)		(2/16)	(3/4)		
Deputu leader/ Maintenance planning	Nobuyuki MATSUO	JIC		6/25	7/10 7/23	8/25 7/28		10/28 (11/15)		(12/12)	(1/6)		(3/11)		(5/15)		(7/13)		(9/1)	(10/30)			(1/15)	(2/28)			
Operation Maintenance	Hiroshi KOMATSU	JIC		6/25	7/13	8/21	9/20	(10/20)	(12/28)		(1/19)		(3/25)	(4/10)		(6/8)	(7/1)		(8/29) (9/15)		(11/1) (10/20)	(12/30)		(2/10)	(3/29)		
Procurement of equipment and material	Yuuichi TANIGUCHI	Sumitomo				8/25	(9/23) (10/15)		(11/13)											(10/1)	(10/30)						
Signalling and Telecommunications	Kiichi TAKEMURA	JIC					9/16	9/27			(1/6)	(1/23)				(6/1)	(6/15)							(2/1)	(2/15)		
Rolling Stock	Makoto ISHIKAWA	OC				8/25	(9/8)				(1/6)	(1/23)				(6/1)	(6/15)							(2/1)	(2/15)		
Track Maintenance	Kazuhiko MURAO	JIC					(9/20)		(11/18)		(1/6)		(3/5)	(4/10)	(5/31)								(1/5)	(2/18)			
Track Maintenance(2)	Kiyoshi MIYAMOTO	OC							(11/15)	(12/14)											(11/15)	(12/14)					
Coordination	Mitsuru TAKAMI	JIC		6/25 (0.63)	7/13	8/19	9/27						(3/22)	(4/10)										(3/1)	(4/10)		
Train Operation	Hideharu IGARASHI	JIC				8/25	(9/8)				(1/6)	(1/23)				(6/1)	(6/15)							(2/1)	(2/15)		
Track working	* * * *	JIC					9/9	9/13																			
Railway Advisor	Mitsuo HIGASHI	JR East/JIC																									

8. Undertakings of Myanma Railways and the government of Myanmar

According to R/D signed between Managing Director of MR and Chief Representative, Myanmar Office of JICA, on March 28, 2013. Government of Myanmar and Myanma Railways provide JICA Expert Team with the following.

8.1 UNDERTAKINGS OF Myanma Railways AND the government of Myanmar

8.1.1 Myanma Railways ("and the government of Myanmar") will take necessary measures to:

(1) ensure that the technologies and knowledge acquired by the Republic of the Union of Myanmar nationals as a result of Japanese technical cooperation contributes to the economic and social development of the Republic of the Union of Myanmar, and that the knowledge and experience acquired by the personnel of the Republic of the Union 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 and their families, which are no less favorable than those granted to experts of third countries performing similar missions in the Republic of the Union of Myanmar under the Colombo Plan Technical Cooperation Scheme.

8.1.2 Myanma Railways (and the government of Myanmar) will take necessary measures to:

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

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

(3) exempt the JICA experts from taxes and any other charges on the equipment, machinery and other material necessary for the implementation of the Project;

(4) exempt the JICA experts from income tax and charges of any kind imposed on or in connection with any emoluments or allowances paid to them and/or remitted to them from abroad for their services in connection with the implementation of the Project; and

(5) meet taxes and any other charges on the equipment, machinery and other material, necessary for the implementation of the Project.

8.1.3 Myanma Railways / the government of Myanmar will bear claims, if any arises, against the JICA experts resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the project, except when such claims arise from gross negligence or willful misconduct on the part of the JICA experts.

8.2 Input by Myanma Railways

Myanma Railways will take necessary measures to provide at its own expense:

(a) Services of Myanma Railways' counterpart personnel and administrative personnel;
(b) Suitable office space with necessary equipment;
(c) Supply or replacement of machinery, equipment, instruments, vehicles, tools, spare parts and any other materials necessary for the implementation of the Project other than the equipment provided by JICA;
(d) Means of rail transport for the JICA experts for official travel within the Republic of the Union of Myanmar;
(e) Information as well as support in obtaining medical service;
(f) Credentials or identification cards;
(g) Available data (including maps and photographs) and information related to the Project;
(h) Running expenses such as fuels for generator, related materials necessary for the implementation of the Project;
(i) Expenses of necessary for transportation within the Republic of the Union of Myanmar of the equipment as well as for the installation, operation and maintenance thereof; and
(j) Necessary facilities to the JICA experts for the remittance as well as utilization of the funds introduced into the Republic of the Union of Myanmar from Japan in connection with the implementation of the Project
(k) Various local cost

- Local cost for personnel
- Cost for office rent and equipment.
- Expenses for the pilot project, such as gravels, sleepers, rail materials and others.
- Other expenses:

  For research, travelling, the other activities for counterpart personnel, and other necessary local cost

9. Cooperation and assistance by Japan and other countries (governments and private enterprises) in the field of railways

9.1 Cooperation and assistance by the governments and private enterprises of Japan and other countries in the field of railways

9.1.1 Assistance by the governments

We will survey the contents of assistance, amounts of funds and conditions of loans and other matters regarding the assistance (ODA) extended by the governments of Japan and other countries in the filed of railways.

9.1.2 Cooperation by private enterprises

We will survey the contents of cooperation, scales/conditions of financial cooperation/investment and other conditions extended by the private enterprises of Japan and other countries in the field of railways.

9.2 Technical training center (Myanma Railways Technical Training Center (RTTC)) established with the assistance by Germany

We will survey the circumstances surrounding the establishment of the above RTTC, contents and methods of assistance therefor and the status of its operation by MR after completion of German assistance and reflect the resultant findings in the better implementation of this Project.

The Project on Improvement of Service and Safety of Railway in Myanmar

Inception Report
August 28th, 2013 at Nay Pyi Taw

JICA EXPERT TEAM

Japan International Cooperation Agency

Table of Content

Japan International Cooperation Agency

1. Project Summary

(1)Project Background

Train operation safety and service levels are major issues for MR.

(2)These circumstances led to this Project, stated in the Record of Discussion, signed in last March between Managing Director, Myanma Railways, and Chief Representative, Myanmar Office, JICA.

2. Basic Plan of Project Implementation

Program Target

- Enforcement of management and O&M ability of MR, contributing to upgrading service and safety level.

Output 1

- Based on accident analysis, issues are clarified for the enhancement of service and safety in the administration and maintenance process, and the improvement plan is drawn up.

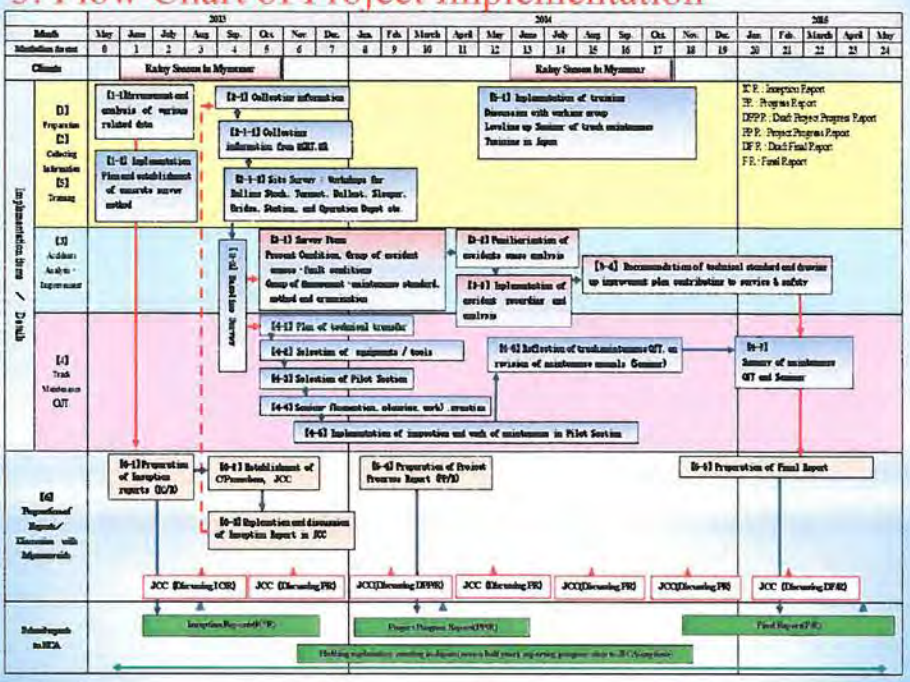
Output 2

- Technology transfer of track maintenance technology through implementation of the Pilot Project

Project Site

Yangon – Bago Section. Pilot section about 20km

3. Flow Chart of Project Implementation



4 Detailed Methods for the Project Implementation

4.1 Implementation Plan for Output 1

Based on accident analysis, recommendation on technical standards and drawing up railway facilities improvement plan to improve service and safety level

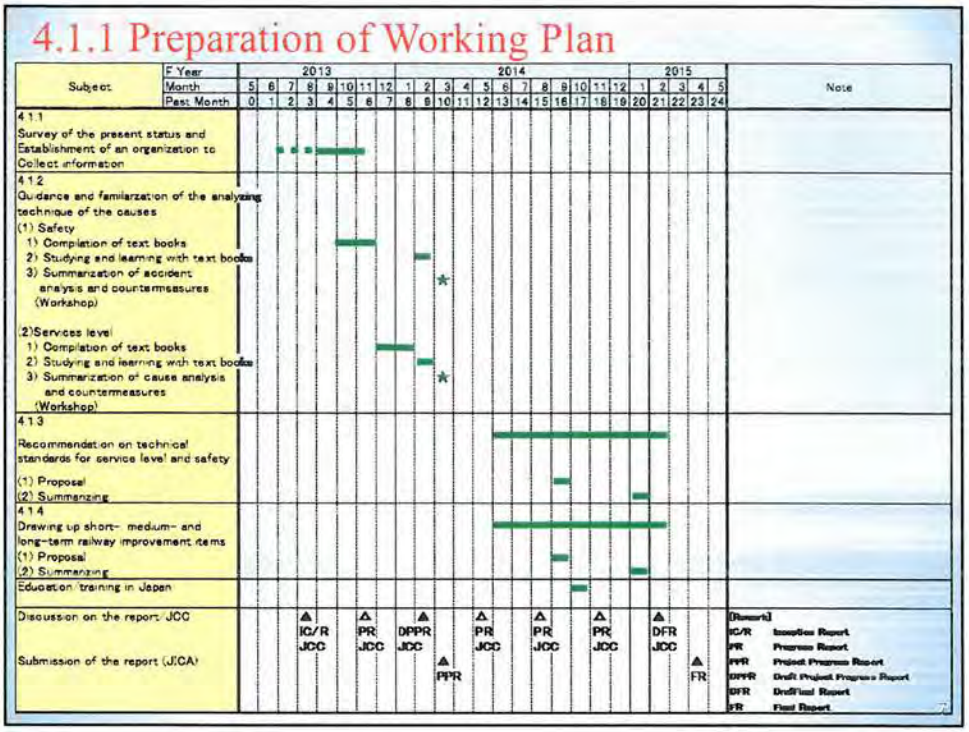
Train collision due to shunting signal violation

(JR Chuo Line in 1997)

Breakage of Pier due to scouring

(JR Hanawa Line in 1997)

4.1.1 Preparation of Working Plan



4.1.2 Survey of the present status and establishment of organization to collect information

（1） Collection of basic information

（2） Effort to prevent accidents

（3） Actions at the occurrence of accidents

Japan International Cooperation Agency

4.1.3 Guidance and familiarization of the analyzing technique for the causes of accidents and low service level based on the comprehensive factors of railway

- Compilation of the text book
- Familiarization of cause analysis and to conduct cause analysis and establish countermeasures together with MR staff.
- Summarization

Concept Sentence

(Safety)	(Service)
・Lesson and learning from past accidents.	***・To win the competition with other traffic modes.***
・Never again same ones.	

4.1.4 Recommendation on technical standards to improve the service level and safety

4.1.5 Drawing up of short(3years)- , medium(5-10years)- and long-term(10-30years) railway facilities improvement plan through discussion with the “Working Group for service and safety improvement”

4.1.6 Education/training in Japan

11 trainees relating to railway institutional management for two weeks

4.2 Implementation Plan for Output 2

Technology transfer of track maintenance technology through implementation of the Pilot Project

Track Master

Inspection of turnout

Japan International Cooperation Agency

4.2.1 Drawing up a plan for technology transfer

Subject	F.Year	2013												2014												2015					Note
	Month	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5					
	Past Month	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24					
4.2.1 Drawing up a technical transfer plan																															
4.2.2 Selection/procurement of equipments/tools (1) Selection of equipments/tools (2) Acquisition of import license, tax exemption procedure (3) Import procedure (4) Freight control																															
4.2.3 Selection of Pilot Section (1) Site witnessing (2) Selection of a section (3)Base line survey																															
4.2.4 Implementation of track maintenance work (inspection, planning, work, control) (1) Compilation of text books (2) Classroom education and practical training (seminar) (3) Prior measurement and survey at the Pilot Section Implementation of work																															-Three booklets: (1) working safety, (2) track maintenance work and (3) inspection -One month after the arrival of supplied materials/machines -Calculation of the required workload and quantity of materials, preparation of a work plan
4.2.5 Education/training (1) Seminars (2) Education/training in Japan																															
4.2.6 Summarization of the points of improvement and reflecting them in the track maintenance manuals/standards																															
4.2.7 Final summarization and seminars																															
Discussion on the report/JCC				▲ IC/R JCC			△ PR JCC			▲ DPPR JCC				△ PR JCC			△ PR JCC			△ PR JCC			▲ DFR JCC						[Remark] IC/R Inception Report PR Progress Report PPR Project Progress Report DPPR Draft Project Progress Report FR Final Report
Submission of the report (JICA)												▲ PPR													▲ FR					

4.2.2 Procurement of the required equipments/tools

- 75 kinds of equipments/tools are being prepared by Japan side
- Track materials such as rails, sleepers, ballasts and manpower are necessary for implementation of the Pilot Project and should be provided by MR.
- MR and JICA experts must cooperate closely for early arrival of equipments and tools necessary for the Pilot Project

4.2.3 Selection of the Pilot Section

（1）20km between Yangon and Bago

（2）It will be selected through a site survey to allow experiencing maintenance of different track structures such as defective, sound, straight and curved tracks, turnout, bridges.

4.2.4 Implementation of track maintenance (Inspection, Planning, Work and Control)

（１）Compilation of text book
（２）Classroom education and practices (seminars)
（３）Implementation of prior measurement and surveys in the Pilot Section
（４）Implementation of inspection, planning and work in the Pilot Section

Select 11 kinds of track maintenance works including maintenance works of rail, ballast, turnout, bridge, welding, alignment, gauge, roadbed etc.

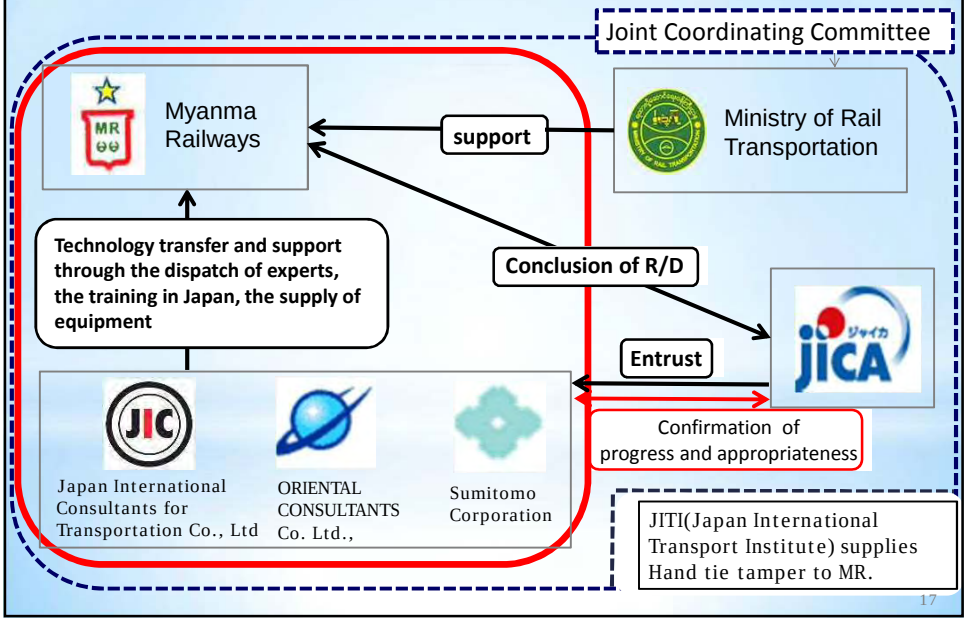
4.2.5 Education/training

（１）Seminars to improve track maintenance technologies
（２）Education/training in Japan

4.2.6 Summarization of the points of improvement and reflecting them in the track maintenance manuals/standards

4.2.7 Final summarization and seminars

5. Project Implementation Organization



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Administrative and Counterpart Personnel for the project

Fields	Myanma Railways	Japanese Side（JICA Expert Team）
Project Director	U Saw Valentine, General Manager (Technical & Admin. support)	Sadaaki KURODA (Leader)
Project Manager	U Tin Soe, General Manager(Civil)	Nobuyuki MATSUO (Duputy Leader)
Railway Policy / OM Improvement	U Kyaw Kyaw Myo, Assistant General Manager(Operating)	Hiroshi KOMATSU
Track Maintenance	U Maung Maung Than, Assistant, General Manager(Civil)	Kazuhiko MURAO Kiyoshi MIYAMOTO
Procurement of Equipment and Materials	U Win Htein, Deputy General Manager (Supply)	Yuichi TANIGUCHI
Signalling and Telecommunications	U Myint Lwin, Assistant Engineer (Signalling & Telecommunications)	Kiichi TAKEMURA
Rolling Stock	U San Myint (Train Operation)	Makoto ISHIKAWA
Train Operation	U Zaw Pe Sein (Divisional Traffic Manager)	(Hideharu IGAGASHI)
		Mitsuru TAKAMI (Coordination)

18

Joint Coordinating Committee

Chairman U Thurein Win Managing Director of Myanma Railways			
Myanmer Side		Japanese Side	
Name	Position (Major)	Name	Position (Major)
U Saw Valentine	General Manager (Technical & Admin Support)	Sadaaki KURODA	Leader of Japanese Expert Team (Track maintenance)
U Myint Wai	General Manager (Operating) for analyzing accidents	Nobuyuki MATSUO	Duputy Leader (Maintenance planning)
U Aung Win	General Manager (Mechanical & Electrical) for rolling stocks	Hiroshi KOMATSU	Railway Administration and Management Expert
U Tin Soe	Project Manager, General Manager (Civil)	Yuichi TANIGUCHI	Procurement of Equipment and Materials Expert
U Than Htay	Assistant Project Manager, Deputy General Manager (Civil)	Kiichi TAKEMURA	Signalling and Telecommunications Expert
U Khin Maung Thein	Assistant Project Manager, Deputy General Manager (Signalling & Telecommunications)	Makoto ISHIKAWA	Rolling Stock Expert
U Min Aung	Counterpart Personnel, Assistant Engineer (Civil)	Kazuhiko MURAO	Track Maintenance Expert
U Myint Lwin	Counterpart Personnel, Assistant Engineer (Signalling &Telecommunications)	Kiyoshi MIYAMOTO	Earth Roadbed Expert
Daw Thi Thi Nwe	Assistant General Manager (Finanace)	Mitsuru TAKAMI	Coordinating Expert
U Aung Thu Latt	Assistant General Manager (Admin)	(Hideharu IGAGASHI)	Operation Expert
		Mituso HIGASHI	Railway Management Adviser
			Representative of JICA
			Representative of JICA
			Representative of Embassy of Japan : Observer

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6. PDM Modification

6.1 Modification of PDM

The major modifications are given in the following Table.

	Original	Modification	Reasons of modification
Overall Goal Objectively Verifiable Indicators	①Decrease of number of accidents by 20% ②Increase of average sanction speed by 10% ③Enhancement of satisfaction level of clients	①Decrease of number of accidents compared with past/present number ②Decrease of number of speed restricted location ③Increase of journey speed ④Improvement of punctuality of express passenger train ⑤Enhancement of satisfaction level of clients ⑥Increase of passenger numbers	①Increase of indicators:Efforts to identify "service level" from the wider viewpoint ② Avoidance of % expression (a)short length of Pilot Section (b)unsettled improvement plan of various railway facilities including signalling system (c)yearly fluctutation of number of accidents due to weather
Counterpart Training in Japan			
Railway instistutional management program	4 persons × 2weeks	11 persons × 2weeks	
Track maintenance	4 persons × 2 × 2 weeks	11 persons × 2 × 2 weeks	

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6.2 Establishment of base lines

6.2.1 Based on accident analysis, recommendation on Technical Standards and drawing up railway facilities improvement plan to improve service and safety level.

The Base Line for Yangon-Mandalay Line, in 2012/2013.

①Number of train accidents classified by kinds (per one million train km)
②Delay time of express passenger train (average value and maximum value)
③Limited speed and journey speed.
④Satisfaction level of the clients.
⑤Number of passengers

6.2.2 Technology transfer of track maintenance technology through Pilot Project

The Base Line in the Pilot Section

①Track irregularities (gauge, cross level, longitudinal level, longitudinal alignment, twist).Their means, maximum values, standard deviation
②Vertical and lateral vibration accelerations. Their means, maximum values, standard deviation
③Average train speed.

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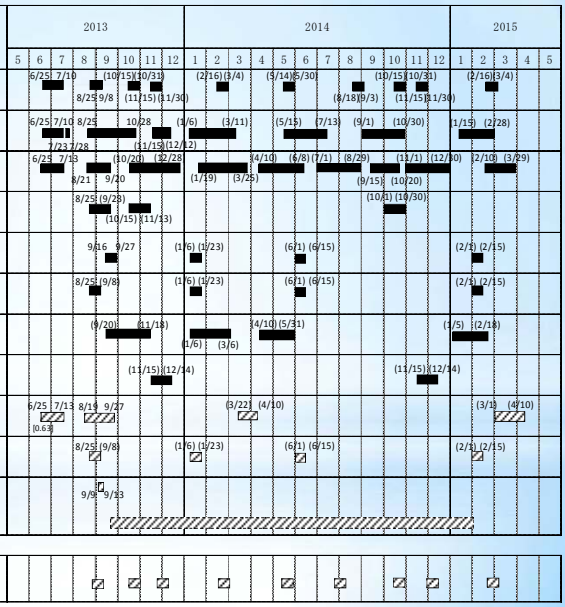
7.Dispatching schedule of JICA Expert

Assignment	Name	Belongs
Leader/ Track maintenance	Sadaaki KURODA	JIC
Deputu leader/ Maintenance planning	Nobuyuki MATSUO	JIC
Operation Maintenance	Hiroshi KOMATSU	JIC
Procurement of equipment and material	Yuuichi TANIGUCHI	Sumitomo
Signalling and Telecommunications	Kiichi TAKEMURA	JIC
Rolling Stock	Makoto ISHIKAWA	OC
Track Maintenance	Kazuhiko MURAO	JIC
Track Maintenance(2)	Kiyoshi MIYAMOTO	OC
Coordination	Mitsuru TAKAMI	JIC
Train Operation	Hideharu IGARASHI	JIC
Track working	* * * *	JIC
Railway Advisor	Mitsuo HIGASHI	JR East/JIC



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8. Support by Myanma Railway and the Government of Myanmar

According to R/D signed between Managing Director of MR and Chief Representative, Myanmar Office of JICA, on March 28, 2013, Government of Myanmar and Myanma Railways will support the JICA Expert Team in the implementation of the Project.

Thank you for your attention.

Implementation Plan for Output 1

1. To survey current situations of various areas of MR, and to establish system for collecting information.
2. To promote familiarization of the analysis method of causes of accident and low service level based on the comprehensive factors of railway.
3. To conduct the cause analysis mentioned above together with MR staff.
4. To provide recommendation on necessary technical standards to improve service and safety level
5. To draw up the improvement plan of railway facilities through discussion with the “Working Group of service and safety improvement”

Implementation Plan for Output 2

1. To draw up technology transfer plan of track maintenance through OJT in the Pilot Section.
2. To procure the necessary equipments and tools.
3. To conduct track maintenance (inspection, planning, work) jointly with MR staff.
4. To summarize points to be improved obtained during track maintenance operation.
5. To revise the track maintenance manual.
6. To conduct seminars, training for technical improvement of the track maintenance