No.

Japan International Cooperation Agency

THE DETAILED DESIGN STUDY OF THE RAILWAY ELECTRIFICATION AND DOUBLE-DOUBLE TRACKING OF JAVA MAIN LINE PROJECT IN INDONESIA

FINAL REPORT - TOPOGRAPHIC SURVEY

MARCH 2005

Pacific Consultants International
Japan Railway Technical Service

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Japan International Cooperation Agency (JICA)

Directorate General of Land Communications (DGLC)

Ministry of Communications

Government of the Republic of Indonesia

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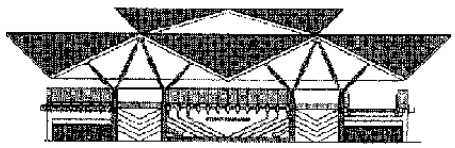


Pacific Consultants International

Japan Railway Technical Service

PREFACE

In response to the request from the Government of the Republic of Indonesia, the Government of Japan decided to conduct the Detailed Design Study of the Railway Electrification and Double-Double Tracking of Java Main Line Project in the Republic of Indonesia and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a team to Indonesia between January 2002 and March 2005, which was headed by Mr. ISHIKAWA Tadashi of Pacific Consultants International. (PCI).

The team conducted the study in collaboration with the Indonesian counterpart team including field surveys on the study area, and planning works, and then held a series of discussions with the officials concerned of the Government of Indonesia. Upon returning to Japan, the team duly finalized the study and delivered this report.

I hope that this report will contribute to the enhancement of friendly relationship between our two countries.

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

March 2005

MATSUOKA Kazuhisa
Vice President
Japan International Cooperation Agency

March 2005

Mr. Matsuoka Kazuhisa
Vice President
Japan International Cooperation Agency

Dear Sir,

Subject: Letter of Transmittal

We are pleased to submit herewith the Final Report of "The Detailed Design Study of the Railway Electrification and Double-Double Tracking of Java Main Line Project in the Republic of Indonesia". The report contains results of the study which was carried out by Pacific Consultants International in association with Japan Railway Technical Service between January 20, 2002 and March 24, 2005.

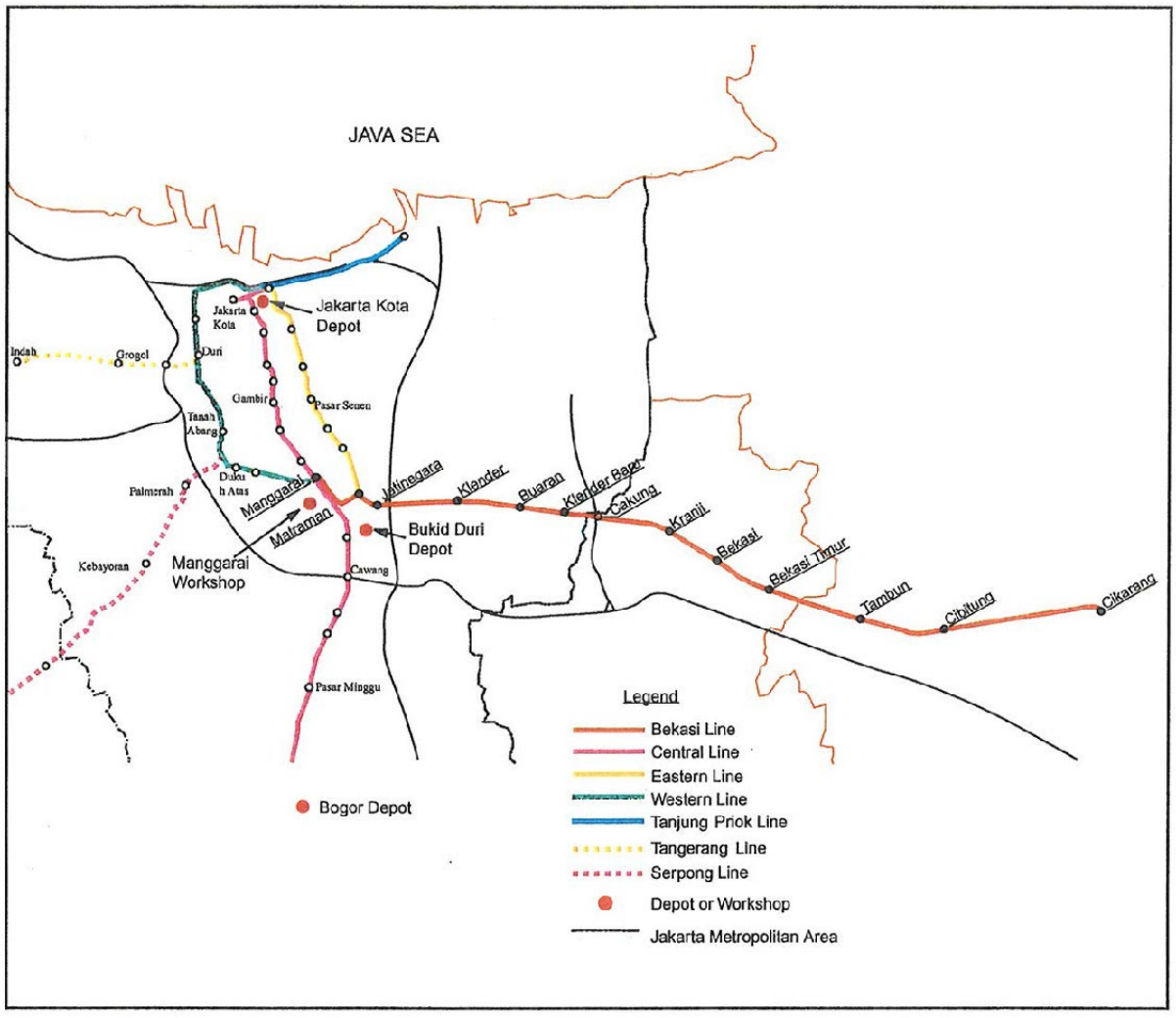
The JICA Study Team has submitted several reports to JICA and DGLC. Following discussions with the JICA Evaluation Team in June 2002 the Study Team submitted to the Government of Indonesia (GOI) the Basic Design Report. The Detailed Design for the section between Bekasi and Cikarang was submitted in March 2003, a report on a Comparison Study between "Manggarai Main Line Elevated" and "at Grade" Station was submitted in December 2003.

In order to expedite implementation of the Project, GOI has decided to reduce the land area to be acquired. Accordingly the track alignment was changed by taking 2 m from the original ROW. In a letter dated June 1, 2004, the GOI requested Government of Japan (GOJ) to review the Basic Design and to proceed with the Detailed Design based on this new land requirement. Between September 5, 2004 and March 11, 2005 JICA Study Team conducted the Basic Design and Detailed Design based on the new land plan and all results were submitted to DGLC in a Draft Final Report on February 11, 2005. Through several discussions with DGLC, the JICA Study Team explained such reports and prepared this Final Report.

We would like to express our appreciation to the personnel of JICA, DGLC and other concerned parties for their support during this long project.

Yours faithfully

Ishikawa Tadashi
Team Leader JICA Study Team



LOCATION MAP

MANGGARAI STATION

BEKASI STATION

SECTION I
INTRODUCTION

I.1. General

During the detailed design study of The Railway Electrification and Double–Double Tracking of Java Main Line Project, Pacific Consultants International hereinafter called PCI acting as Main Consultant has a need to collect Topographic Survey data covering the study area.

To support the above requirement, PT. Tigenco Graha Persada hereinafter called Tigenco, acting as survey company has been assigned by PCI to to perform the Topographic Survey at propose location.

The survey method and result describe in details in the following section of this report.

I.2. Location

The study area or project location covering the area from Manggarai Station to Cikarang Station with a total distance approximately 36.3 km.
During field activity, to simplicity the survey management the survey area divided into three section as follows :

Section I. Manggarai to Cipinang	= 6.3 km
Section II . Cipinang to Bekasi	= 13 km
Section III. Bekasi to Cikarang	= 17 km

I.3. Schedule

Survey schedule are as follows :
- Field survey start from March 1,2002 until April 30,2002.
- Data processing and Drawing finish at May 31,2002.

SECTION II
SCOPE OF WORK

II.1. Map Digitizing

A Total of 23 (twenty three) sheets of available Topographic Maps of Jatinegara – Bekasi has been digitized.
The basic scale of available Topographic maps is 1 : 1000

II.2. Benchmark Establishment

A total of 50 (fifty) pcs of Benchmarks has been installed on the site, it consist of 15 (fifteen) Benchmarks at Jatinegara - Bekasi and 35 (thirty five) benchmark at Bekasi - Cikarang.

II.3. Traverse Measurement

Total of Traverse point is 331 points, and the location are as follows :

- Manggarai – Cipinang = 72 points.
- Cipinang – Cakung = 74 points.
- Cakung – Bekasi = 70 points.
- Bekasi – Cikarang = 105 ponts.
- Cikarang Yard = 10 points.

II.4. Leveling Measurement

Total point and route of Leveling measurement was equal to Traverse ponit i.e 331 points.

II.5. Longitudinal Profile

Total of Longitudinal Profile length is 36.3 km.

II.6. Cross Section Survey

Total of Cross Section survey is 669 cross.

II.7. Track Alignment Survey

Total length of Track alignment survey is 36.3 km.

II.8. Topopgraphic Detail Survey

Total area of Topographic detail survey approximately 207.9 ha.

SECTION III
PERFORMANCE METHOD

III.1 Map Digitizing

To produce digital drawing, the manual Topographic drawing was digitized by Using Digitizer Calcomp A0 size.
The result is a set of digital drawing in Auto Cad format.

III.2. Benchmark Establishment

For recent survey references and future activity references, a total of 50 (fifty) pcs of concrete Benchmark has been installed from Manggarai Station to Cikarang Station.
The Benchmark was made from concrete with the steel structure inside. The size of the Benchmark is 20 cm x 20 cm x 80 cm, buried ± 70 cm on the ground and protruding ±10 cm above the Ground.
The Benchmarks position attached on appendix 1 of this report.

III.3. Reference Point

Acting as existing Horizontal coordinates system, a total of 2 (two) points were adopted as origin.
The Coordinates of the reference points are as follows :

Point	Northing (x)	Easting (y)
DTK 220	- 1573.524	5181.983
DTK 219	- 1516.552	5315.961

Acting as existing Vertical or elevation system, 1(one) point was adopted as origin.
The elevation of the reference point are as follows :

Point	Elevation
DTK220	16.860

III.4. Traverse Measurement

The Traverse measurement were performed by the following method :

- Every Traverse angle measured by using Total Station Sokkia Set 3CII.
- Angle measurement performed by 2(two) double series observation for the direct and reverse position.

- Traverse Distance measured at least 2(two) time i.e forward and backward direction.
- The Traverse route start from reference Benchmark and closed to another Benchmark.
- Traverse route construct a closed Traverse.
- Accuracy :
  - The closing angle of the Traverse is 10"√N, where N is the total number of Traverse points.
  - The linier error of the Traverse is 1 : 10000

The route of the main Traverse measurement are as follows :

1. Loop I : DTK220–DTK219–MB01---MB05–P6---DTK459---DTK222–DTK220 – DTK219

   The result of the traverse measurement is :
   - Total Traverse point : 72
   - Total Distance : 11083.748 m
   - Angle closed error : 00 00' 26"
   - Absis (Y) closed error : 0.054
   - Ordinate (X) closed error : 0.296
   - Liner Closed error : 1:36892

2. Loop II : P6–MB05–MB06---HP29–BLE26---K1---K30–P6–MB05

   The result of the traverse measurement is :
   - Total Traverse point : 74
   - Total Distance : 14069.750 m
   - Angle closed error : 00 01' 20"
   - Absis (Y) closed error : 0.046
   - Ordinate (X) closed error : 0.186
   - Liner Closed error : 1:73251

3. Loop III : HP29–BLE26–MB10---MB14–MB15---KC1---KC11–HP29-BLE26

   The result of the traverse measurement is :
   - Total Traverse point : 70
   - Total Distance : 13542.013 m
   - Angle closed error : -00 00' 43"
   - Absis (Y) closed error : -0.087
   - Ordinate (X) closed error : -0.336
   - Liner Closed error : 1:38970

4. Loop IV : MB15-MB14---BC1–BC2---BC35---MB15–MB14

   The result of the traverse measurement is :
   - Total Traverse point : 105
   - Total Distance : 34284.136 m
   - Angle closed error : -00 01’ 30”
   - Absis (Y) closed error : +0.051
   - Ordinate (X) closed error : -0.071
   - Liner Closed error : 1:394313

5. Loop V : BC34-BC35-CLA1-CLA2---CLA8-BC34-BC35

   The result of the traverse measurement is :
   - Total Traverse point : 10
   - Total Distance : 1518.090 m
   - Angle closed error : 00 00’ 14”
   - Absis (Y) closed error : -0.011
   - Ordinate (X) closed error : -0.029
   - Liner Closed error : 1:48616

The Traverse scheme attached on appendix 2 of this report.

III.5. Leveling Measurement

The Leveling measurement were performed by the following method :
- The Leveling measurement performed by using Automatic Level Wild NAK 2.
- The Leveling measurement will start from reference Benchmark and close to another reference Benchmark.
- Every Leveling section were measured by double run Levelling method with middle hair reading only.
- The Leveling scheme construct a closed circuit Leveling.
- Accuracy :
  - The closing error of the Leveling measurement is 10”√D, where D is total Leveling distance in km.

The route of the Leveling measurement are as follows :

1. Loop I : DTK220-DTK219–MB01---MB05–P6–DTK459---DTK222–DTK220

   The result of the levelling measurement is :
   - Total Distance : 11083.748 m
   - Closing error : -0.027 m

2. Loop II : MB05–MB06---HP29–BLE26---K1---K30–P6

   The result of the levelling measurement is :
   - Total Distance : 14069.750 m
   - Closing error : -0.021 m

3. Loop III : BLE26–MB10---MB14–MB15---KC1---KC11–HP29

   The result of the levelling measurement is :
   - Total Distance : 13542.013 m
   - Closing error : -0.014 m

4. Loop IV : MB14---BC1-BC2---BC35---MB15

   The result of the levelling measurement is :
   - Total Distance : 34284.136 m
   - Closing error : -0.022 m

5. Loop V : BC35-CLA1-CLA2---CLA8-BC34

   The result of the levelling measurement is :
   - Total Distance : 1518.090 m
   - Closing error : 0.001 m

The Levelling scheme attached on appendix 3 of this report.

III.6. Longitudinal Profile

Longitudinal profile measurement were performed by the following method :

- Longitudinal profile performed by using Automatic Level Wild NAK 2.
- Longitudinal measurement performed on the top of the rail and interval 25m.
- Drawing :
  - Horizontal scale 1 : 1000
  - Vertical scale 1: 100

List of Track Elevations attached on appendix 4 of this report.

III.7. Cross Section Survey

Cross section measurement were performed by the following method :

- Cross section performed by using Automatic Level Wild NAK 2.

- The interval of Cross section survey is 25m at Manggarai Station, Jatinegara Station and Cipinang Station, 50m for curve and another station, 100m for straight.
- During Cross section survey the distance of the detail measured by Styllon tape.
- Drawing :
  - Horizontal scale 1 : 100
  - Vertical scale 1: 100

III.8. Track Alignment Survey

Track alignment survey performed from Sta -0+800 (Manggarai Station) to Sta 44K600 (Cikarang Station) with total length 36300 m.
The measurement were performed by using Total Station Sokkia Set 3CII.
During measurement, following details were recorded :
- Position of track
- PT. KAI KM post

List of Track Coordinates attached on appendix 5 of this report.

III.9. Topographic Detail Measurement

Topographic details measurement were performed by using Total Station Sokkia Set 3CII.
The following details were measured during Topographic details measurement i.e :
- Ditch/Trench/Catch basin
- Poles (Telcom, Electric, Signal etc)
- Signaling device (cable, point machine, Trench)
- Level Crossing
- Fly over, High Voltage
- Building, House, Fence, Platform, etc
- Bridge, Culvert, Pipes, River, Drainage etc
-

The Topographic map scheme attached on appendix 6 of this report.

SECTION IV
PERSONNEL AND EQUIPMENT

IV.1. Personnel

A Survey team has been assigned to perform the topographic survey, they consist of the following personnel :

1. Ir. Yusliyanto (Field Coordinator)
2. Sargono (Surveyor)
3. Muchsin (Surveyor)
4. Yayat (Surveyor)
5. Agus J. (Surveyor)
6. Dedi K (Surveyor)
7. Aan (Surveyor)
8. Uu Hudaya (Surveyor)
9. Sopyan (Surveyor)
10. Zarnias (Surveyor)
11. Abdul Malik (Surveyor)
12. Ruli Indra (Surveyor)
13. Syabar Hidayat (Surveyor)
14. Usman (Surveyor)
15. Ruli (Draftman)
16. Tugiyo (Draftman)
17. Yatno (Draftman)
18. Parnin (Draftman)
19. 42 (forty two) Skill Labour

IV.2. Equipment

Following equipment has been utilized to perform the survey activity, it consist of :

- 7(seven) Total Station Sokkia Set 3CII
- 7(seven) Automatic Level Wild NAK 2
- 4(four) Computer
- 1(one) Printer
- 1(one) Plotter
- 14(fourteen) Styllon tape
- 14(fourteen) Handy Talkie

SECTION V
SURVEY RESULT

The survey result that submitted to the client consist of :

- 62 sheet Topographic Map and Profile Manggarai - Cikarang scale 1 : 1000
- 62 sheet Topographic Map and Profile Manggarai - Cikarang scale 1 : 2000
- 13 sheet Topographic Map at Station scale 1:500
- 13 sheet Topographic Map at Station scale 1:1000
- 172 sheet Cross Section Manggarai – Cikarang scale 1 : 100
- 172 sheet Cross Section Manggarai – Cikarang scale 1 : 200
- 1 Original final report.
- 1 CD ROM content the drawing files