CHAPTER 11 ECONOMIC ANALYSIS

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11.1 Project Background

This project, "The new railway line for the Cengkareng Airport", is a plan to construct a new railway line between the new Cengkareng Airport and the centre of Jakarta City.

The new Cengkareng Airport is nearly 30% completed at the stage of our investigation.

On the other hand, the Cengkareng access Road, which is planned to connect the new airport with the road system in Jakarta, will be completed in time for the completion of the new Cengkareng Airport.

The new railway line for the Cengkareng Airport (hereinafter called "the new line"), has airport users, airport employees, for its major targeted passengers.

When the new line is constructed, it is expected that some road traffic will be converted to the railway (please refer to Table 11.1.1). The new line passengers will be able to enjoy the time saving benefit of using the railway instead of the road.

Also, due to the traffic converted from the road to the new line, it is expected that road congestion in the project area will be eased, thus creating a time saving benefit for road users as well.

From the viewpoint of the Indonesian economy as a whole, various cost savings, including fuel savings, will be realized by the implementation of this railway project.

Besides the direct benefits such as time saving and cost savings, additional benefits such as creation of job opportunities will be realized.

We try to quantify those additional benefits as much as possible, but we are not including these additional benefits for the calculation of E.I.R.R. for the sake of providing a conservative analysis.

Table 11.1.1 Passenger Hour of Traffic Related to JIAC for Buses and Sedans (Equivalent Passenger Hour for Rail)

('000 person hour)

	Passenger Hour/New Rail		Passenger Hour/Buses/Sedan			
Route / Year	A	C	A		C	
			Bus	Sedan	Bus	Sedan
1990	10,017	10,074	4,896	9,133	4,563	8,778
2000	24,300	23,363	11,382	18,028	10,028	16,856
2010	47,883	41,672	26,967	37,240	21,160	32,682

11.2 Methods of Analysis

11.2.1 "WITH/WITHOUT" Analysis

This analysis method is a comparative analysis of cases when the project is implemented (WITH THE PROJECT), and is not implemented (WITHOUT THE PROJECT).

This concept is explained below.

* WITH THE PROJECT

New line is constructed, the future traffic between Cengkareng and Jakarta is borne by the new line and road traffic modes.

Cengkareng New Railway

Cengkareng Access Road/Connected Existing Roads

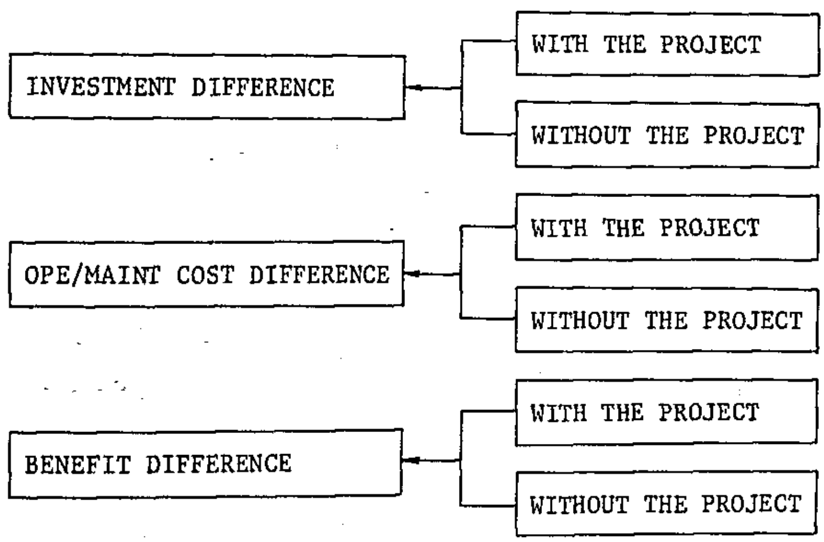
* WITHOUT THE PROJECT

If the new line is not constructed, all the traffic between Cengkareng and Jakarta will be borne by the Cengkareng access Road/Connected Existing Roads.

Regarding the capital cost of the project, only the new line's construction cost is summed up. In other words, only the capital expenditure for the new line is seen as the capital cost of the project.

The following is the reason for the above concept. In both cases of WITH and WITHOUT, existing railways, the Cengkareng access road, and the existing road system are considered as sunk costs, therefore the sunk costs are not included for the calculation of Economic Internal Rate of Return.

Table 11.2.1 Economic Analysis Flow Chart



11.2.2 Alternatives of 'WITH THE PROJECT'

1) ROUTE A

Route A will connect the new line with the central line. If this alternative is implemented, the length of new rail is 19.8km, and the length of existing rail is 11.2km.

2) ROUTE C

Route C will connect the new line from the Cengkareng Airport with Rawabuaya station at Tangerang Lines, and then connect with the West Line near Duri station.

For the case of 'WITHOUT THE PROJECT', a new investment in buses will be necessary in order to respond to the increasing passenger traffic demand between Cengkareng and Jakarta.

For the sake of providing conservative calculation of E.I.R.R., investment cost of passenger cars are not included.

In other words, some amount of bus investment will be avoided if the new line is constructed. Therefore, due to the difference in volume of converted traffic, bus investment cost as a difference of 'WITH' and 'WITHOUT' is different according to alternative A and C.

11.2.3 Evaluation

For the two alternatives of A and C, the difference of WITH and WITHOUT in investment cost, maintenance and operating costs, and benefit are calculated, and is seen as NET FLOW.
(* Remark)
We calculate the E.I.R.R. on this net-flow and use it as an index for evaluation.

This index is an overall parameter which uses economic price for evaluating the following items.

1. Investment cost, Operating cost, Maintenance cost
2. Land acquisition cost of each alternative

3. New line passengers benefit (time saving benefit)
4. Road user's benefit, in the project area due to the new line construction. (time saving benefit for road traffic passengers, due to the reduction of road traffic)

In this analysis, an inflation factor is not included for the calculation of E.I.R.R.

* Remark

$$0 = \sum_{i=1}^{30} \text{NET FLOW } i/(1+\text{E.I.R.R.})^{i-1}$$

Besides E.I.R.R., the following indices are obtained.

1) Road accident avoidance

Due to the new line construction, road traffic in the project area is expected to be less than before. Therefore, a reduction in the number of traffic accident is expected.

We estimate the reduction in the number of traffic accidents due to the new line construction.

2) Job creation

Since one of the important policies of the Indonesian Government is to promote more job opportunities, we estimate the job creation benefit due to the construction of the new line.

3) Fuel saving

Since another important policy of the Indonesian Government is to promote the saving of fuel, we list the following index.

° Fuel saving

Due to the construction of the new line, there will be traffic converted from road traffic to rail traffic, thus realizing a fuel saving.

11.2.4 Proposition

1) Foreign exchange rate

¥270 = US$1 = RP670 (As of September, 1982)

2) Durable years and Re-investment

We could calculate the durable years from PJKA'S depreciation rate, but since PJKA'S classification does not match our categories, we use the durable years shown in Table 11.3.5.

3) Inflation

Inflation is excluded for the following reasons.

a. An inflation forecast of 30 years must incorporate various factors, therefore estimation using a simple estimated inflational rate could result in a significant error, and could have a serious impact on the economic evaluation.

b. Inflation will have the same effect on investment cost, maintenance/operating cost, and benefits.

4) Traffic volume borne by the new line

Converted Traffic

In this economic analysis, we consider that all the conversion of traffic will occur by a shifting of passengers from bus and passenger car traffic to the new line.

11.3 Economic Cost Estimation

11.3.1 Capital Cost

The following adjustments should be made to determine the economic cost estimation. (Refer to Table 11.3.2)

1) Tax, subsidy adjustment

a. Foreign currency portion

Import duties and Import Sales tax are already excluded from the calculation of financial cost, so it is not necessary to make any adjustment.

b. Local portion (Material and Equipment)

According to what we hear from the tax authorities, we judge that we can use the data on the central line track elevation. Therefore, we deduct the producer side tax (Average 20%, including corporate tax), MPO & PPN (4.5%) from the financial cost.

c. Local portion (Labour)

Based on information from the tax authorities, we estimate that the average construction worker (one spouse and three dependents) is not liable for income taxation because of the basic deduction for family dependents.

The basic deductions for personal income tax at the time of our study are the following.

Table 11.3.1 Basic Deductions for Personal Income

Item	Deduction Amount
Earner	300,000 R.P/Year
Spouse	300,000 R.P/Year
Children	150,000 R.P/Year
(up to 5 Children)	(Average 3 Children)

2) Re-investment

In order to have a common basis for investment in WITH/WITHOUT cases it is assumed that re-investment is made after the durable years of assets. (Table 11.3.5)

3) Residual value (Salvage value)

The project life of 30 years is only used for the analysis, and the facilities of the new line will continue to be used.

Therefore, residual values of assets are treated as a minus cost.

Table 11.3.2 Each Alternative's Investment Cost (Economic Price)

(MIL RP)

		1984 - 1988	1989 - 2000	2001 - 2013	Total
Route A	Electrification	6,295		5,695	11,990
	Telcom & Signals	4,690	734	3,107	8,531
	Civil Engineering	27,495		16,367	43,862
	Land	9,684		646	10,330
	Rolling Stock	7,760	7,407	22,926	38,093
	Airport	4,801		2,121	6,922
Route C	Electrification	4,277		2,951	7,228
	Telcom & Signals	3,629	637	2,201	6,467
	Civil Engineering	24,801		6,755	31,556
	Land	6,596		872	7,468
	Rolling Stock	7,760	7,407	17,283	32,450
	Airport	4,801		2,121	6,922

Include reinvestment, exclude residual value
Please refer to the financial evaluation regarding foreign/local portion of investment cost (Financial price)

WITHOUT THE PROJECT, INVESTMENT (Economic Price)

This analysis illustrates the difference of investment costs, maintenance/ operating costs, and benefits of WITH and WITHOUT cases.

For the case of 'WITHOUT THE PROJECT', the number of buses required is of course the same, but the number of buses required in each alternative of 'WITH THE PROJECT' is different.

Therefore, the number of buses, as a difference between 'WITH' and 'WITHOUT' will be different according to each alternative.

The following table shows the number of buses and investment cost of buses reduced if each alternative is implemented.

Table 11.3.3 Reduction in Number of Buses and Cost

	Route A/WITHOUT	Route C/WITHOUT
	BUSES	BUSES
NUMBER	2,247	1,793
AMOUNT	67,367 mil Rp	53,732 mil Rp

Those numbers represent the reduction of bus investment when each alternative is implemented (from 1988 up to 2013).

11.3.2 Maintenance/Operating Costs

WITH THE PROJECT New Line Maintenance, Operating Costs

Necessary annual maintenance and operating costs are calculated for the maintenance and operation of the new line.

For the calculation of maintenance cost, since the maintenance ratio is not available we applied the maintenance ratio used for the central line track elevation.

WITHOUT THE PROJECT Maintenance, Operating Costs for road vehicles

We calculate how much additional expenditure in the form of maintenance and operating costs is necessary if the new line is not constructed.

These road vehicle maintenance/operating costs include the maintenance, operating costs of buses, in the project area. For the sake of conservative analysis, maintenance, operating costs of passenger cars are not included.

A. Maintenance cost of the new line

Calculation

a. Maintenance cost of depreciated assets
= Maintenance ratio × Total Depreciated assets

b. Maintenance cost of replaced assets
= 0.95/durable years × maintenance ratio × Total replaced assets

c. Replacement cost of replaced assets
= 0.95/durable years × Total replaced assets

* Remark 2. Please refer to Table 11.3.5 of the maintenance ratio.

Since trains of the new line will run on a part of the existing railway system, a portion of the existing railway maintenance cost should be borne by the new line.

Calculation of that portion of the existing lines' maintenance cost which should be borne by the new line is calculated by the following method.

Since the present value of the existing railway system is not available, we estimate how much investment is required if the existing railway were to be newly constructed.

We apply the maintenance ratio to these estimated costs, and then apply the share ratio, which defines the portion that the new line has to bear.

Table 11.3.4 New Line Share Ratio

Route		Share Ratio
A	1988 - 1999	0.157
	2000 - 2009	0.184
	2010 -	0.291
C	1990 - 1999	0.322
	2000 - 2009	0.282
	2010 -	0.415

$$\frac{\text{New Line Train Extension on Connected Existing Lines (per day} \ \ \text{(Car-kilometre)})}{\text{Connected Existing Lines (per day} \ \ \text{(Car-kilometre)})}$$

= New Line Share Ratio

Table 11.3.5 Maintenance Ratios and Life Expectancies of Assets

		Maintenance Ratio	Life Expectancy	(Note 5) Type of Assets
Civil work	Foundations	0.0004	57	Depreciated assets
	Elevated track structure	0.0027	50	"
	Platforms	0.0041	32	"
	Overbridges	0.0051	32	"
	Station buildings (RC)	0.0067	45	"
	Buildings (RC)	0.0057	45	"
	Tracks	0.15	25	Replacement assets
Signals and tele-communication	Safety measures at the railway crossings	0.0292	12	Depreciated assets
	Signals	0.0210	20	"
	Telecommunication equipment	0.0312	9	"
	Signal lines	0.035	35	Replacement assets
	Communication lines	0.12	35	"
	Track circuits	0.035	19	"
Electrical works	Transformer equipment	0.0008	20	Depreciated assets
	Building for transformer stations	0.0057	45	"
	Overhead contact wires	0.03	45	Replacement assets
	Electrical distribution wires	0.15	30	"
Rolling stock	Machinery at workshop	0.05	20	Depreciated assets
	Electric car	0.035	20	"
	Machinery at depot	0.05	20	"

(NOTES)
- Depreciated assets are to be replaced after their durable years.
- Replacement assets are to be replaced by replacing a certain ratio of assets every year.

B. Operating Cost: New Line Portion

Operating cost required for the new line's operation is calculated for the following items.

a. Personnel Cost

Station staff, Drivers and Conductors, Maintenance staff, Increased head office staff

b. Electricity Cost

Calculate the electricity cost necessary for new trains' operation.

Electricity consumption per one car-kilometre is 1.151KWH, and the cost is 53.03 RP/km.

Electricity contract charge and electricity bond money are both included in the Electricity cost.

C. Maintenance Cost: Road Traffic

When the new line is constructed, due to the traffic converted from buses, passenger cars to rails, the number of buses and passenger cars in operation will be reduced compared with the case of 'WITHOUT THE PROJECT'. Also due to the road traffic converted to railway, there will be significant saving of the maintenance cost for buses.

Maintenance cost difference due to the converted traffic is calculated as the difference in car-kilometres of 'WITH' and 'WITHOUT' the project.

In line with our policy of providing a conservative analysis, we exclude the maintenance cost for passenger cars, and only include the maintenance cost for buses.

D. Operating Cost: Road Traffic

For the same reason at that mentioned in C, the operating cost difference due to the converted traffic is calculated. Maintenance and operating costs of vehicles are calculated by the method used for the JABOTABEK master plan.

With the same reason mentioned in C, we only calculate the operating cost for buses for the sake of providing a conservative analysis.

11.4 Benefit

11.4.1 Maintenance / Operating Cost Saving Benefit

The difference between 'WITH THE PROJECT' and 'WITHOUT THE PROJECT' in maintenance and operating costs is seen as a cost saving benefit.

(1) WITH THE PROJECT

Maintenance cost & operating cost of the new line and connected existing railway line.

1) Ground facilities

Newly-constructed facilities

Maintenance cost is calculated by applying the maintenance and replacing ratios to each investment item.

Connected existing lines

It is calculated by applying the maintenance ratio & replacing ratios, and adjusted by the New Line Share Ratio.

2) Rolling stock

- Maintenance cost is calculated by applying the maintenance ratio to the investment cost.
- Electricity cost is calculated by applying the electricity consumption/km to car-kilometre.

3) Personnel cost

Personnel cost consists of those for train drivers, conductors, station staff, maintenance staff, and an increase of head office staff.

(2) WITHOUT THE PROJECT

All amounts of maintenance cost and operating cost for buses, which exceed 'WITH' are treated as costs of 'WITHOUT THE PROJECT'. We estimate the maintenance and operating cost very conservatively as mentioned before.

11.4.2 Time Saving Benefit

o Railway passengers' time saving benefit due to the converted traffic. Passengers who use the new line instead of buses and passenger cars can enjoy a reduced travel time between Cengkareng and Jakarta.

o Road traffic passengers time saving benefit due to the easing of traffic congestion.

Due to the construction of the new line, road traffic volume 'WITH THE PROJECT' will be smaller than that of 'WITHOUT THE PROJECT'. Due to the reduced traffic in the case of 'WITH THE PROJECT', bus passengers and sedan/taxi passengers can enjoy a time saving due to the decrease in road traffic congestion.

Table 11.4.1 Passenger Time Value

(RP)

Mode	Time value (1 hour) Central Line Track elevation	Time value used for this study
Sedan (Including Jeep)	800	945
Taxi	800	945
Bus	134	174.5
Rail	134	174.5

Assumption: Since central line track elevation data is new as of 1981, these data are used as basis. Also adjustment was made for foreign passengers for deribing time value for this study.

11.5 Evaluation

11.5.1 Characteristics of This Project

This project is one of the 26 projects in the JABOTABEK RAILWAY NETWORK, and is for construction of a new railway line between Cengkareng Airport and Jakarta.

If this project is implemented, airport users, airport employees will be able to gain significant benefits, such as time saving, compared with using the road traffic mode.

From the viewpoint of the Indonesian economy as a whole, various cost savings include fuel saving will be realized by the implementation of this railway project.

This economic analysis is implemented on a quite conservative basis; for example, there will be no investment in road facilities for the case of 'WITHOUT THE PROJECT'.

11.5.2 Evaluating Indices

As mentioned previously, this analysis is designed to evaluate the feasibility of the project with E.I.R.R. as an overall parameters, which uses economic price for evaluating the following items.

a. Investment cost, operating cost, maintenance cost
b. Land acquisition cost
c. New line passengers benefit (time saving benefit)
d. Road users benefit

E.I.R.R. for both alternatives A and C are determined as 14.3% as shown in Table 11.5.1.

The following 4 indices are used as additional indices.

Additional indices

a. Road accident avoidance benefit

b. Fuel saving benefit

This benefit forms a part of maintenance/operating cost saving benefit. Since conservation of oil resources is one of the important policy of Indonesia, this benefit is estimated.

c. Job creating effect

Number of workers required for the construction.

Table 11.5.1 Remarks & Additional/Supporting Indices

		A	C
E.I.R.R. (Economic Internal Rate of Return)		14.3%	14.3%
Remarks	Single track line-completed	1987	1987
	Construction period	4 years include land acquisition	4 years include acquisition
	Double track construction completed	2006	2008
	Double track operation commences	2007	2009
Additional Indices	Fuel saving benefit (Only bus fuel saving of bus included for calculation of E.I.R.R.		
	Fuel saving (kl, over 26 years)	1.57 MIL	1.39 MIL
	Road traffic accident avoidance (over 26 years)	5,400 persons (540 death)	4,800 persons (480 death)
	Job creating effect not included for E.I.R.R.	For construction 4,000,000 man-day	3,000,000 man-day
	Operational persons (person) (directly involved employees only)	Year 1990 232 Year 2000 236 Year 2010 347	214 219 275

Table 11.5.2 Economic Price of Major Items

Unit: RP

Item	Market price	Economic price	Note
Sedan 2000 cc	13,263,493	6,643,882	Economic price is calculated by deducting registration and taxes.
Taxi 1200 cc	12,147,000	5,912,158	
Bus (45 passengers)	34,239,000	29,968,000	
Gasoline	300/1	300/1	Market price is closer to the international price, therefore is used as an economic price.
Diesel	85/1	113.3/1	
Engine oil (car)	1,240/1	992/1	
Engine oil (bus)	1,164/1	931/1	

* Source: Harbour Road F/S, Java Electrification, Information from JABOTABEK counterpart, as of September, 1982

Table 11.5.3 Estimated Wage for PJKA Workers in JABOTABEK (Present)

Job	Level	Average wage
Driver	Level 1	Rp. 83,561
Conductor	Level 1	Rp. 83,561
Mechanic	Level 1	Rp. 83,561
Section Staff	Level 1 Level 2 Level 3	Rp. 87,885
Inspection Staff	Level 1 Level 2 Level 3	Rp. 87,885
Head Office Staff	Level 1 Level 2 Level 3	Rp.103,894

Information from PJKA Inspection 1
as of September, 1982

Table 11.5.4 Sensitivity Analysis

Cost Overrun (10%, 20%)

Alternative			
Alternative	A	Base case	E.I.R.R. 14.3%
		Cost overrun (10%)	E.I.R.R. 13.6%
		Cost overrun (20%)	E.I.R.R. 12.9%
	C	Base case	E.I.R.R. 14.3%
		Cost overrun (10%)	E.I.R.R. 13.5%
		Cost overrun (20%)	E.I.R.R. 12.9%

Traffic Demand

Alternative			
Alternative	A	When JIAC related person trip does not increase after year 2000	E.I.R.R. 13.9%
	C	"	E.I.R.R. 13.9%

Reference Materials

- Report on Urban/Suburban Railway Transportation in "JABOTABEK" area (Master Plan), March 1981, JICA
- Feasibility Study on Track Elevation of Central Line, March 1982, JICA
- Economic Appraisal of Transport Projects, HANS ADLEr 1971, Indiana University
- JABOTABEK Metropolitan Development Plan, Dec. 1980
- Technical Report No. 7/30, JMDP Team, Dec. 1980
- Harbour Road Feasibility Study, June 1981, JICA
- Survey Bis Kota DKI Jakarta, 1979/80, DINAS LALU LINTAS DAN ANGKUTAN JALAN RAYA
- Indonesian State Railways, Facts & Figures 1980
- Statistik Indonesia year Book 1980/81
- Statistik Ekonomi, April 1982, Bank
- Transport Strategy for JABOTABEK Technical Report No. 7/22, Dec. 1980

11.5.3 Evaluation of Alternatives

Alternatives both A and C become feasible from the viewpoint of E.I.R.R.

But as shown in Table 10, when we compare the benefits which are additional indices besides E.I.R.R., alternative A becomes more attractive.

For example if alternative A is chosen, it is estimated that fuel saving per annum will be 61,000 kl (total 1.57 mil kl), which represents nearly 0.3% of total fuel oil consumed in Indonesia of 1981, while alternative C is saving represents only 0.2%.

Besides the fuel saving benefit, alternative A brings more benefit to the socio-economy of Indonesia such as traffic accident avoidance, job creation. Those benefits should be fully evaluated for this project besides E.I.R.R.

11.5.4 Sensitivity Analysis

1) Cost Overrun Analysis

In order to confirm the project viability of each alternatives, we carry out and the sensitivity analysis of cost increase for 10% and 20%.

Results are shown in the next table. Results show that Route A and C are both feasible even in the most pessimistic cost overrun case of 20%, in relation to the socio-economy of Indonesia.

2) Sensitivity Analysis on Traffic Demand

We implemented sensitivity analysis under the assumption that JIAC related person trip stays at the same level after year 2000. (In other words, JIAC related person trip for year 2010 is equal with year 2000.)

The sensitivity analysis also shows that both alternatives are viable in terms E.I.R.R.

CHAPTER 12 FINANCIAL EVALUATION

CHAPTER 12 FINANCIAL EVALUATION

12.1 Purpose and Proposition

12.1.1 Purpose of Financial Evaluation

As it is mentioned in the financial evaluation of the Report on Urban/ Suburban Railway Transportation in "JABOTABEK" area, March 1981, in Indonesia at present, all the railway facilities and rolling stock investment is carried out by the Indonesian Government, and PJKA is the operating body of the railway system.

In principle, PJKA has to manage its operating expenses within the operating revenue.

But the fact is that PJKA's operating expenses surpass its operating revenue, thus creating operating losses. PJKA is subsidized by the Indonesian government to cover these losses.

Present railway fares in Indonesia are not set out to cover operating expenses, and PJKA's interest payments to the government.

Especially, railway fares for urban/suburban areas are set at very low levels by government policy, since the urban/suburban railway system has a great significance as a basic infrastructure.

It is also considered that, in line with the government policy, it may be necessary to apply existing railway fares to the new railway line for Cengkareng Airport (hereinafter referred to as "the new line").

Regarding this project, PJKA does not have to operate on a commercial basis, but it is desirable for PJKA to balance operating expenses and operating revenue as closely as possible.

From the viewpoint mentioned above, the first objective of this financial evaluation is not the calculation of the Financial Internal Rate of Return, but to study the following items.

(i) From the profit & loss projection of this project, to determine the necessity of government subsidies.

(ii) To study the financing of debt for the project, and debt repayment ability from the cash flow projection.

(iii) To study the adequate fare level for the new line.

It is originally designed to do financial evaluation for two alternatives, namely A and C.

But according to the technical studies and economic analysis, route A becomes most feasible, therefore the financial evaluation is only carried out on route A.

12.1.2 Proposition for Cash Flow Projection

Based on the volume of new line passengers projected by the traffic demand forecast, we evaluate profits and expenses, and debt burden of the new line.

Project life, exchange rate of RP/US$/Yen, and concept of inflation are exactly the same as for the economic analysis.

As far as the economic analysis is concerned, for investment, operating & maintenance cost calculations, economic price (excluding taxes) is used. But for the financial analysis, all tax portions are added back to those costs.

(1) Foreign currency portion

Since PJKA is a governmental institution, we have supposed that there will be no import duty imposed.

(2) Local currency portion (Material & equipment)

In line with the data from the feasibility study on the central line track elevation, producer side tax (include corporate tax) 20%, and MPO, PPN of 4.5% are added back to the economic price.

(3) Local currency portion (Labour)

Based on information from the Indonesian tax authorities, we assumed that no tax adjustment is necessary, therefore we used exactly the same data as for the economic analysis.

We studied three cases of cash flow, namely Base Case, Case 1, Case 2 according to three cases of funding the investment cost.

12.2 Items Composing Cash Flow Statement

12.2.1 PJKA's Items on Revenue / Expenses

(1) Operating revenue

Based on the traffic demand forecast of chapter 3, annual operating revenue is calculated by applying present fares to the passenger volume (passenger kilometre).

Fare is determined by using Table 1 below.

It is assumed that there will be no increase in present fares.

Table 12.2.1 Present Railway Fare in Jabotabek

Distance (km)	Passenger fares
1 - 10	50
11 - 20	100
21 - 30	100
31 - 40	150

. REPUBAHAN DAN TAMBAHAN NO. 2, PADA BUKU STP NO. 03350/ SK/82, 1, REBURA RI 1982, PJKA

Since the new line extension, including existing line will be nearly 31 km, we picked up the zone of 31 - 40 km for the fare calculation. As a result, the fare for 1 passenger kilometre becomes 4.3 RP.

(2) Operating expenses

Operating expenses are seen as the sum of operating and maintenance costs, depreciation for rolling stock, facilities, and also include personnel cost and electricity cost.

For the connected existing line's maintenance cost, the new line's share ratio used for the economic analysis is applied here.

For calculation of depreciation, the number of durable years used for the economic analysis is applied here.

(3) Operating profit and net profit

Operating profit is calculated by deducting operating expenses from operating revenues.

According to Article 13 of the joint decree of the Minister of Finance and the Minister of Communications issued an 30th March, 1970; as a principle, PJKA has to pay 3% of interest on total assets to the Indonesian government.

Therefore, net profit is calculated after deducting that 3% of interest on total assets from the operating profit.

12.3 Schedule for Investment and Debt Financing

(1) Investment

We followed the same rule of investment used for the economic analysis.

In case A, total investment, including the re-investment up to year 2013 is 129.527 billion RP, with an annual average of 4.318 billion RP.

Investment amount from 1984 to 1988 (single track construction and rolling stock) is 67.91 billion RP, and the investment required between 1989-2013 is 61.62 billion RP. (Please refer to the investment cost of route A shown below.)

Table 12.3.1 Financial Cost of Investment

(MIL RP)

			1984-1988	1989-2000	2001-2013	Total
Route A	Electrification	FC	4,748		4,423	9,171
		LC	1,935		1,592	3,527
	Telecom. & signal	FC	3,383	610	2,263	6,256
		LC	1,611	147	1,031	2,789
	Civil engineering	FC	14,359		8,522	22,881
		LC	15,845		9,422	25,267
	Land	FC				
		LC	12,827		856	13,683
	Rolling stock	FC	7,469	7,129	22,067	36,665
		LC	302	288	892	1,482
	Airport	FC	2,208		1,010	3,218
		LC	3,218		1,370	4,588

* FC stands for foreign currency portion, LC stands for local currency portion. Cost includes reinvestment.

(2) Debt financing

- It is assumed that all the investment and debt financing is implemented by the Indonesian government.

It si also assumed that the foreign currency portion of investment is serviced by overseas borrowing, and the local currency portion is financed by RP-denominated borrowing.

In this financial evaluation, we have made the following assumptions.

(i) Overseas borrowing

(a) Most standard terms and conditions are set for official overseas borrowing (include IBRD, ADB).

Interest : 6% p.a.
Term : 27 years (including 7 years grace period)
Repayment: Twenty years, equal installments

(b) Most standard terms and conditions are set for government-to-government base borrowing (exclude IBRD, ADB).

Interest : 3% p.a.
Term : 30 years (including 10 years grace period)
Repayment: Twenty years, equal installments

(ii) Local finance

(a) Most standard terms and conditions are set for borrowing from the Indonesian State Bank.

Interest : 13.5% p.a.
Term : 10 years (including 4 years grace period)
Repayment: 6 years, equal installments

(b) Government budget

In this case, interest repayment and capital repayment are not necessary.

We have set out three cases for financing this project, in combinations of foreign and local portions.

The following table shows the three cases of likely financings.

Table 12.3.2 Finance Programme

	Foreign currency	Local currency	Reference
Base Case	6% 27 years incl. 7 years grace period	Government budget	Appendix 10
Case I	3.0% 30 years incl. 10 years grace period	Government budget	Appendix 11
Case II	6% 27 years incl. 7 years grace period	13.5% 10 years incl. 4 years grace period	Appendix 12

12.4 Profitability of the New Railway Line

When the present rail fare in JABOTABEK is applied in order to make the operating revenue and expenses balanced, it is necessary to have the government subsidies as follows annually from 1988 to 2013.

Table 12.4.1 Government Subsidy Necessary for Operation

(MIL RP)

Year	1988	1989	1990	1991	1992	1993	1994	1995	1966
Subsidy	1,642	1,460	1,331	1,209	1,076	931	773	602	1,045
Year	1977	1998	1999	2000	2001	2002	2003	2004	2005
Subsidy	1,122	900	659	384	163	NIL	NIL	NIL	NIL
Year	2006	2007	2008	2009	2010	2011	2012	2013	
Subsidy	94	1,425	977	599	213	NIL	NIL	NIL	

Under the assumption that traffic demand does not change in future, if the present railway fare is increased by 14%, on a cumulative basis, there will be no government subsidy necessary as far as operation is concerned. But this increase is not good enough to cover debt service, but just enough to cover the operating expenses through the project life.

12.5 Cash Flow Analysis

Details of the Base Case is shown in Appendix 10.

These details are summarized as follows Table Cash Flow of Base Case.

Table 12.5.1 Major Items of Cash Flow

(MIL RP)

	1984-1988	1989-1993	1994-2000	2001-2013	Total
Revenue	1,157 (1,157)	7,525 (1,505)	17,693 (2,528)	68,745 (5,288)	95,120
Operating profit	-1,710 (-570)	-6,007 (-1,201)	-5,485 (-784)	487 (35)	-12,715
Net profit	-3,157	-12,739	-14,513	-22,756	-53,165
Investment	67,906	0	8,175	53,446	129,527
Debt service	5,245	10,590	24,399	31,547	71,781
Net cash flow	-2,713 (-904)	-11,022 (-2,204)	-28,402 (-4,057)	-56,746 (-4,365)	-98,883

( ) is annual average.

A. Base Case (Foreign Currency Loan of 6% interest p.a, Government Budget for local currency)

Net cash flow of the base case continues to be in red ink through out the project life.

The ratio (net cash flow/revenue) shows that if the financing for the base case is chosen, it will be necessary to increase the present fare by nearly 104%.

Table 12.5.2 Cash Flow for Base Case

(MIL RP)

	1984-1988	1989-1993	1994-2000	2001-2013	Total
Revenue	1,157	7,525	17,693	68,745	95,120
Net cash flow	-2,713	-11,022	-28,402	-56,746	-98,883
Ratio	234%	146%	160%	82%	104%

If, traffic demand remains unchanged, in order to achieve positive net cash flow, it is necessary to implement above mentioned fare increase to service the debt (repayment of capital cost and interest).

B. Case I (Low interest 3% p.a. for foreign currency, Government Budget for local currency)

This financing plan incorporates the concessional loan from overseas, therefore the negative net cash flow becomes the smallest among all cases.

The ratio (net cash flow/revenue) is summarized as follows.

Table 12.5.3 Cash Flow for Case I

(MIL RP)

	1984-1988	1989-1993	1994-2000	2001-2013	Total
Revenue	1,157	7,525	17,693	68,745	95,120
Net cash flow	-1,607	-5,491	-17,368	-53,184	-77,650
Ratio	138%	73%	98%	77%	82%

For the case I, in order to make net cash flow positive and service the debt, roughly it is necessary to increase present fare by nearly 80%.

C. Case II (Foreign Currency Loan of 6% interest p.a;
Local Currency Loan of 13.5% interest p.a)

Negative net cash flow of the case II is the largest among all three cases, because of the debt burden is the largest.

Table 12.5.4 Cash Flow for Case II

(MIL RP)

	1984-1988	1989-1993	1994-2000	2001-2013	Total
Revenue	1,157	7,525	17,693	68,745	95,120
Net cash flow	-9,490	-64,076	-57,738	-56,746	-188,050
Ratio	820%	851%	326%	83%	197%

According the above table, for the case II it may be necessary to increase fare by 200% in order to service the debt burden.

12.6 Conclusion

If the present fare is increased by nearly 14%, roughly speaking there will be no subsidies necessary at operating profit and loss level after the year 2000. 14% increase of fares will make cumulative operating revenue and operating loss equal by year 2013.

Our study shows that the financing plan of Case I (concessional loan from overseas and government budget) is the most preferable financing if the project is to service the debt.

The evaluation shows that this project becomes viable if the following necessary measures are taken.

(1) Local portion should be financed by government budget.

(2) Low and long term concessional loan should be sought for the foreign currency portion.

(3) At least, 14% increase of the existing fares will be necessary in order to produce operating profit on a cumulative basis.

(4) If the project has to produce the funds for debt service, under the assumption that most preferable funding is applied, it may be necessary to increase the present fares by 80%.

CHAPTER 13 OPTIMUM ALTERNATIVE ROUTE

CHAPTER 13 OPTIMUM ALTERNATIVE ROUTE

After comparative study, the two (2) alternatives of Route A and Route C are chosen out of the total ten (10) alternatives, it is recommended that Route A will be the optimum alternative of a preferable choice for the following reasons, although both of the two alternatives have achieved an equal rate of 14.3 percent in terms of E.I.R.R.

(1) Route A has greater advantage for passengers' convenience since it would run through both administrative and commercial centers of Jakarta and would be linked directly into junction with the stations of urban center such as Gambir, Sawa Besar and New Cikini.

(2) Whilst Route A will cross the existing railway line by grade separation at only one point near Kota, Route C will cross by grade separation at three points near Rawa Buaya, Grogor and Duri. This means that the work for Route C would become more complicated than that for Route A.

(3) Alternative Route C is based on assumption that double tracking and the electrification work for the Tangerang Line should have been completed before scheduled completion of the New Airport Access Railway System. Therefore, the scheduled opening date of the New Airport Railway may be affected largely depending upon the work progress for improvement of the Tangerang Line.

(4) Because of high probability toward realization of the track elevation of the Central Line, Route A provides high potentiality for train operation in strict accordance with the operation diagram. As a contrast to that, the future train operation on Route C would be affected by any disturbance in train operation on the existing railway lines, since Route C would jointly use the existing line for a long section, and also the West Line would be congested in the future.

(5) The time schedule for completion of Route C would be affected seriously by required removal of houses over a distance of 4.8 km along the Tangeran Line. Since the time for completion of the New Airport Access Railway System is tightly limited, the construction work for Route C would be delayed largely behind the scheduled date of completion if there is any delay in removal of obstructive houses.

(6) Suppose if Route C requires crossing in grade separation with the West Line and Jl. Hasyim, it would take a form of crossing in three storied grade separation, which would result in a vast sum of construction costs.

CHAPTER 14 DETAIL PLANNING OF AIRPORT STATION

CHAPTER 14 DETAIL PLANNING OF AIRPORT STATION

14.1 General

Discussed below is the preliminary design of railway facilities in the airport is excuted for Layout Alternative 1 recommended in Chapter 6.

As Alternative 1 requires the transport of passengers by bus between the railway station and the airport terminal buildings, due consideration must be given in the design to provide the maximum convenience for passengers changing from trains to buses and vice versa. The design of building should also be a suitable "gateway" to Indonesia. In addition, a large-scale green zone is prepaired for the rest place of passengers.

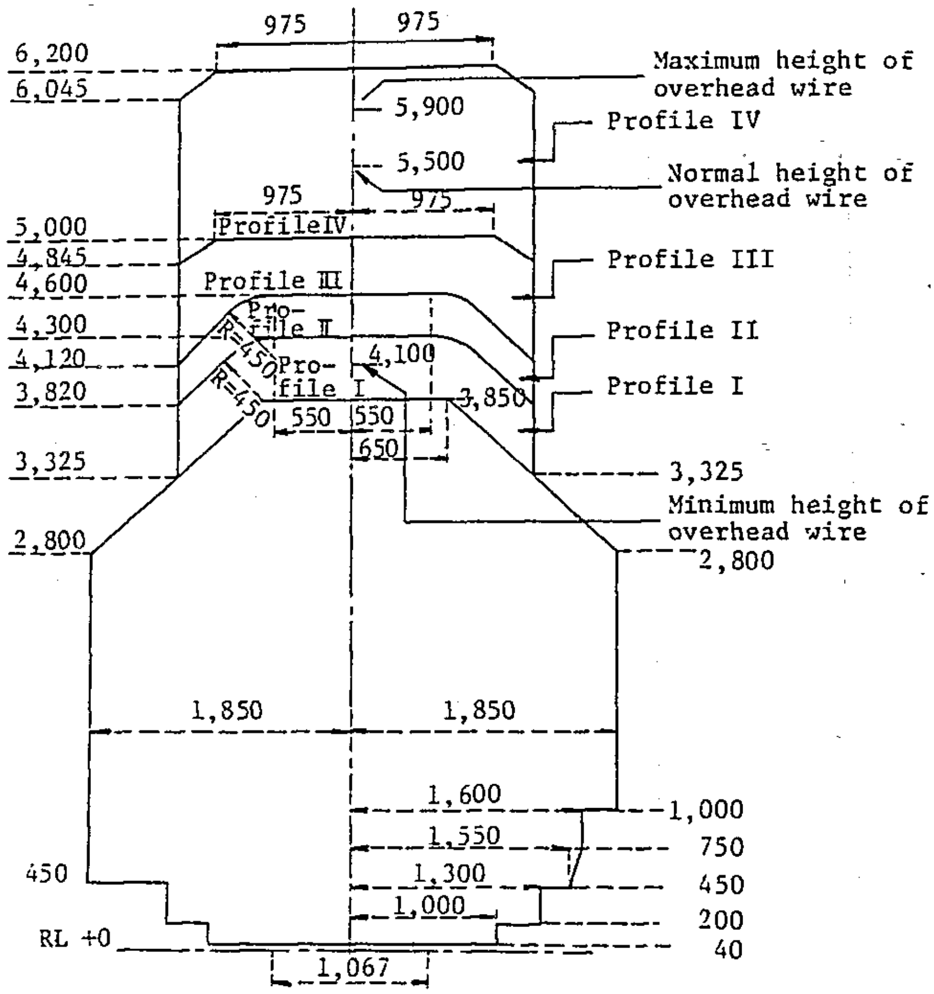
14.2 Design Conditions

Matters which are related to preliminary design conditions are as follows:

Construction gauge	:	As shown in Fig. 14.2.1		
Track structure*	:	Rail 50N	height	153 mm
		Track pad	height	6 mm
		PC sleeper 39 pcs/25 m	height	155 mm
		Crushed stone	depth	250 mm
			Height total	564 mm
Roadbed	:	As shown in Fig. 14.2.2		
Distance between track centers	:	Inside of station	4.0 m	
		Outside of station	4.0 m	
Formation width	:	2.7 m (from the centre of track)		
Design load	:	Value equivalent to train load, KS-18		

* As this Report is in the stage of the feasibility study of the whole project, and it was seemed that the type of rails and number of sleepers did not exert great effects upon the results as far as the specifications were to allow the modern railway transportation. Therefore, in this Report the type of rails and number of sleepers were tentatively agreed upon as indicated above between the Study Team and the Indonesian side.

However, the final decision should be made through careful comparisons and calculations and according to the Indonesian standard in the study of the Detailed Design. With regard to ballast thickness the following study has been carried out, and the final decision should be also made after further review in the Detailed Design.



Profile I	:	Minimum profile for Bridge with speed restriction 60 km/hour
Profile II	:	Minimum profile for Tunnel and Viaduct with speed restriction 60 km/hour and for Bridge, no restriction
Profile III	:	Minimum profile for New Viaducts and new constructions, except Tunnels and Bridges
Profile IV	:	Normal profile for Electric Car

Fig. 14.2.1 Construction Gauge

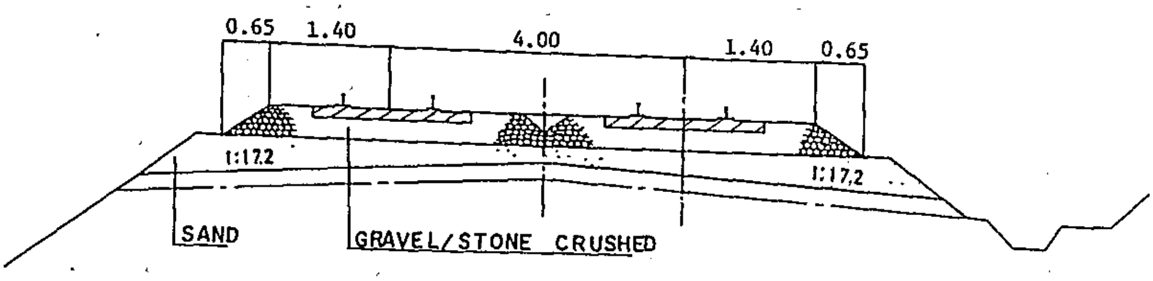
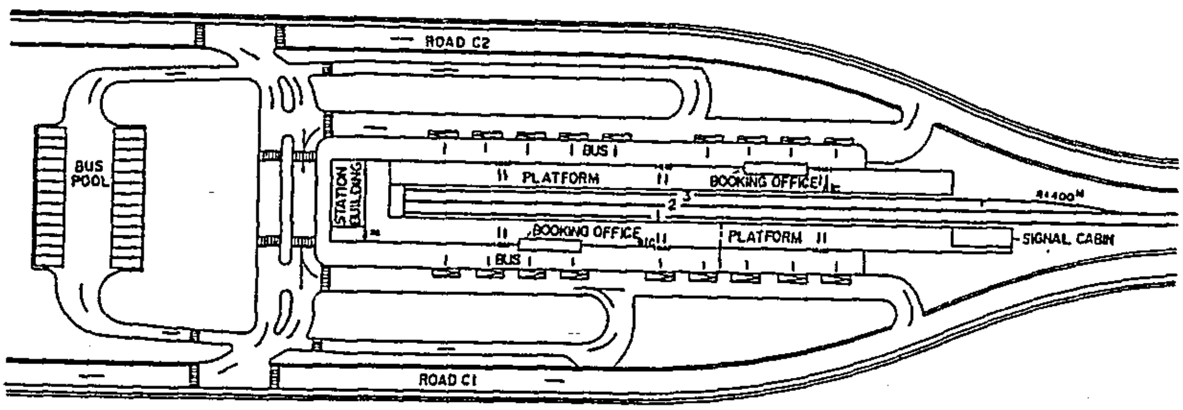


Fig. 14.2.2 Roadbed Standard Drawing

14.3 Facilities of Airport Station and Handling of Passengers

The airport station is a dead-end station. The main line from the airport to Jakarta is of single track in the early stage and expansion to double tracks will be implemented according to future demand increases.

PLAN



ROUGH CROSS SECTION

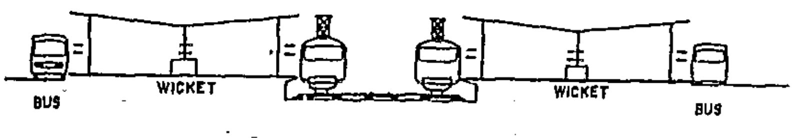


Fig. 14.3.1 Rough Drawings of Airport Station

Three tracks are constructed at the airport station from the beginning. Of these three tracks, one (No. 1) will be used only during single-track operation, and two (Nos. 1 and 3) tracks will be in service during double-track operation. Track No. 2 is used as the storage line and daily inspection line. All three tracks are used for storage of trains at night.

During single-track operation, the railcar platform is provided for Track No. 1 only, and it is used for the boarding and alighting of passengers. For double-track operation, another platform will be constructed for Track No. 3.

Bus departure/arrival platforms are provided outside of the two railcar pltforms. Passengers who arrive at the airport station by railcars walk through the wicket located on the opposite side of the platform, go out to the bus platform, board waiting buses and proceed to the airport terminal buildings. Passengers who arrive at the airport station by bus from airport terminal buildings disembark at the bus platform, purchase railway tickets at the booking office, walk through the wicket, and board the train at the railcar platform.

14.4 Preliminary Design

14.4.1 Alignment Design

(1) Plan alignment design

The entire section from the airport entrance to the airport station is without curves.

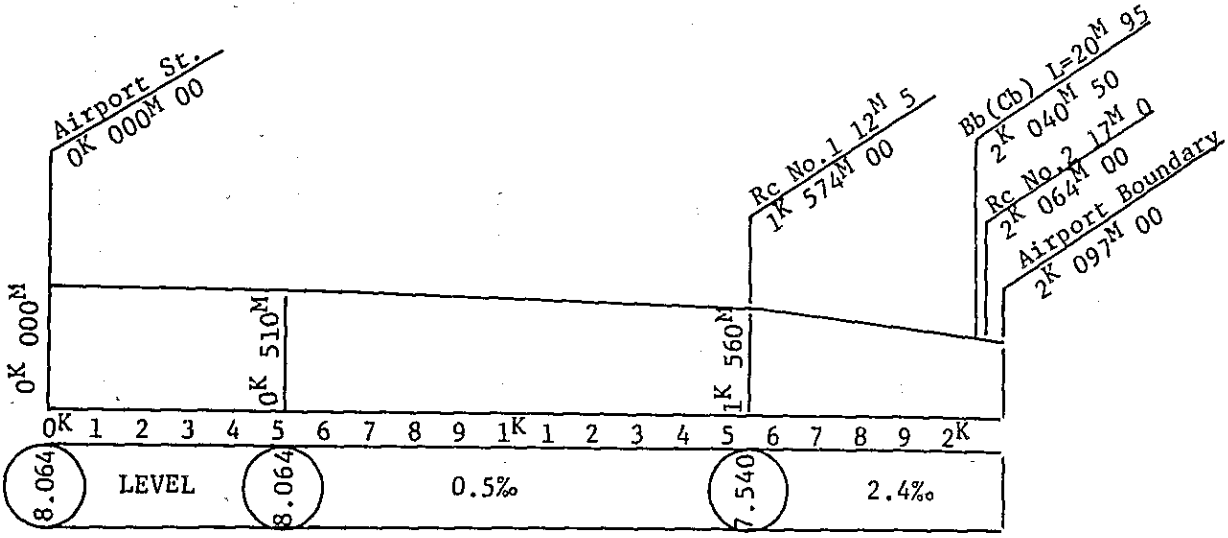
The only curve is of R = 400 m provided at a turnout curve for the track branched to Track No. 3 from the main track in the yard of the airport station.

When double track operation begins, No. 12 scissors crossing (speed limit 45 km/h) is used at the point where main tracks enter the station, and No. 10 turnout (speed limit 35 km/h) is used at the branching point from Track No. 2 to Track No. 3. During single-track operation, No. 12 turnout (speed limit 45 km/h) is used instead of the scissors crossing.

(2) Profile design

A road is located at the airport entrance and another road is located at a point about 500 m to the west of said road. As these two roads intersect the railway, there are two crossings. The height of the railway tracks is determined by the heights of these roads. The profile gradient between these two crossings is 2.4 $^{0}/oo$, which is almost equal to that of the profile gradient of roads running parallel to the railway tracks.

The formation level height of the portion of the airport station is determined as 7.50 m, which is equal to the road level height. Accordingly, the section between Crossing No. 1 and the airport station is of the gradient that connects them, and is 0.5 $^{o}/oo$.



Note: The profile plan line indicates the rail top

Fig. 14.4.1 Rough Drawing of Planned Profile

One new taxiway is planned to connect the two runways at east ends. Access roads (P1 and P2) interesect the railway at a right angle, with the intersection located at around 1 km 350 m.

The runway is planned to be slightly elevated above the access road in the terminal area. Consequently, the new taxiway will cross both the access way and the railway. The longitudinal slope of the taxiway is 1 percent at a bridge and more than 1 percent at an approach before and after this section. Both slopes are less than the maximum slope of 1.5 percent specified in the ICAO (International Civil Aviation Organization) Standard. Taxiway width is 23 m.

14.4.2 Structure Design

(1) Geology

The ground in the vicinity of the airport station is mainly composed of silty clay, clay, and clayey silt. A layer of silty sand 1 m - 3 m thick is distributed 2 m - 3 m under the top surface. Silty sand and sand form a layer of about 10 m beginning at a depth of about 10 m in the vicinity of the airport entrance.

The N-value is 2 - 19 in the clayey layer and is 9 - 60 in the sand layer. It is largely deviated. The depth of the bearing layer of N-value = 50 or higher is 20 m under the top surface.

(2) Terminal facilities

(a) Platforms

Railcar platforms are of embankment system and retaining walls made of reinforced concrete are provided at the sides. The width is 8 m. The height from rail level to platform level is 0.95 m. The separation from the center of the track to the platform edge is 1.6 m. The platform length is 195 m including the length of the buffer stop and the length required for a railcar train of eight-car make-up.

The roof is installed along the entire length of the platform.

Bus platforms are of embankment system and retaining walls of concrete are provided at edges. The width is 8 m with congestion of passengers taken into account, and the height is equal to that of the bus step. The platform length is sufficient to accommodate the number of bus berths, considered as five departure berths, and four arrival berths. The roof covers the entire length of the bus platform.

(b) Station building

Because the design keynote of the airport terminal building is a roof of traditional Indonesian style, the design of the airport station should match it. The roof form with gradient and the skyline is the theme for both the main station building and the roofs of platforms. The fences between railcar platforms and bus platforms are of masonry work, and an international airport station is produced by light sheds and partition walls, lighting fixtures mounted to columns of sheds, guiding display boards, flowers, and so forth.

Main station building

A two-storied building made of steel-framed concrete. Equipped with concourse, waiting room, station master's room, office, rest room, office for maintenance, etc.

Ticket office

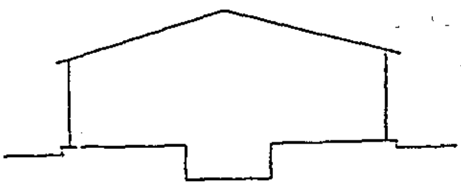
A ticket office, train-control office and passengers' lavatory are provided in a single-storied building made of steel-framed concrete between the railcar platform and the bus platform. These facilities will be required at two locations when double-track operation commences.

Signal cabin

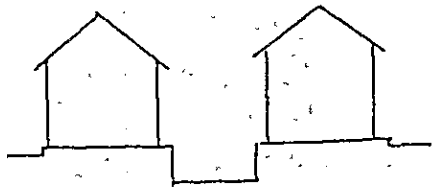
A two-storied building made of steel-framed concrete. Located at the east end of the platform for track No. 1, and containing signal control, signal device room, inspectors' room, and so forth.

Passenger sheds

Two types, i.e., whole covering and partial covering, can be considered for passenger sheds. Although dynamic internal space of whole covering can be obtained when double-track operation begins, the shed is not yet completed during single-track operation, and "under construction" image is produced during single-track operation. Therefore, partial covering with which completed image can be obtained during both single-track operation and double-track operation is recommended.



Whole covering



Partial covering

Fig. 14.4.2 Passenger Sheds

(c) Station plaza

The surroundings of the main station building and passenger platforms are consolidated as the station plaza. A space for departure and arrival of taxis and private cars is provided in front of the station main building, and roadways for buses are provided along bus platforms. A parking space for buses is provided at the west end of the plaza. Traveling of motor vehicles is of one-way traffic from road C2 to road C1, with consideration given to reducing intersection of car lanes. The remaining land is consolidated as green zones. The total area of the station plaza is about 23,400 m^2.

(3) Railway facilities in airport connected to airport station

(a) Bridge

A bridge has been constructed at a point 2 km 040 m from the airport entrance. Road bridges (two-span reinforced concrete boxes) have been completed on both sides of the roadway, and U-type retaining walls made of reinforced concrete have also been completed for the roadway.

For construction of the railway bridge, these U-type retaining walls will be partially destroyed and a two-span reinforced concrete box having spans the same as those of the road bridges will be constructed.

(b) Crossings

The railway makes level crossings with roads at two places, i.e., at points 1 km 574 m and 2 km 064 m. The raod widths are 12.5 m and 17.0 m respectively.

Both crossings are equipped with automatic gates, alarm devices, and so forth in addition to pavement of road crossings.

Detail planning drawings of Airport Station are shown in Annex.

CHAPTER 15 CONCLUSION

CHAPTER 15 CONCLUSION

After detailed study on this project, it can be concluded that the New Railway Line for Cengkareng Airport is fully feasible from the technical aspect and that the project has the great contribution to the future development of the international city of Jakarta from the viewpoint of the nation's economy.

Since the New Airport is to be open to traffic in a few years, it is highly recommended that the project should be implemented at the earliest opportunity, all the necessary measures being taken toward the execution of its construction.

It is sincerely hoped that the implementation of this New Railway Line construction project will serve as an impetus to the other improvement works of the JABOTABEK Railway Lines, which will in turn open the way toward modernization of the whole railway system in Indonesia.