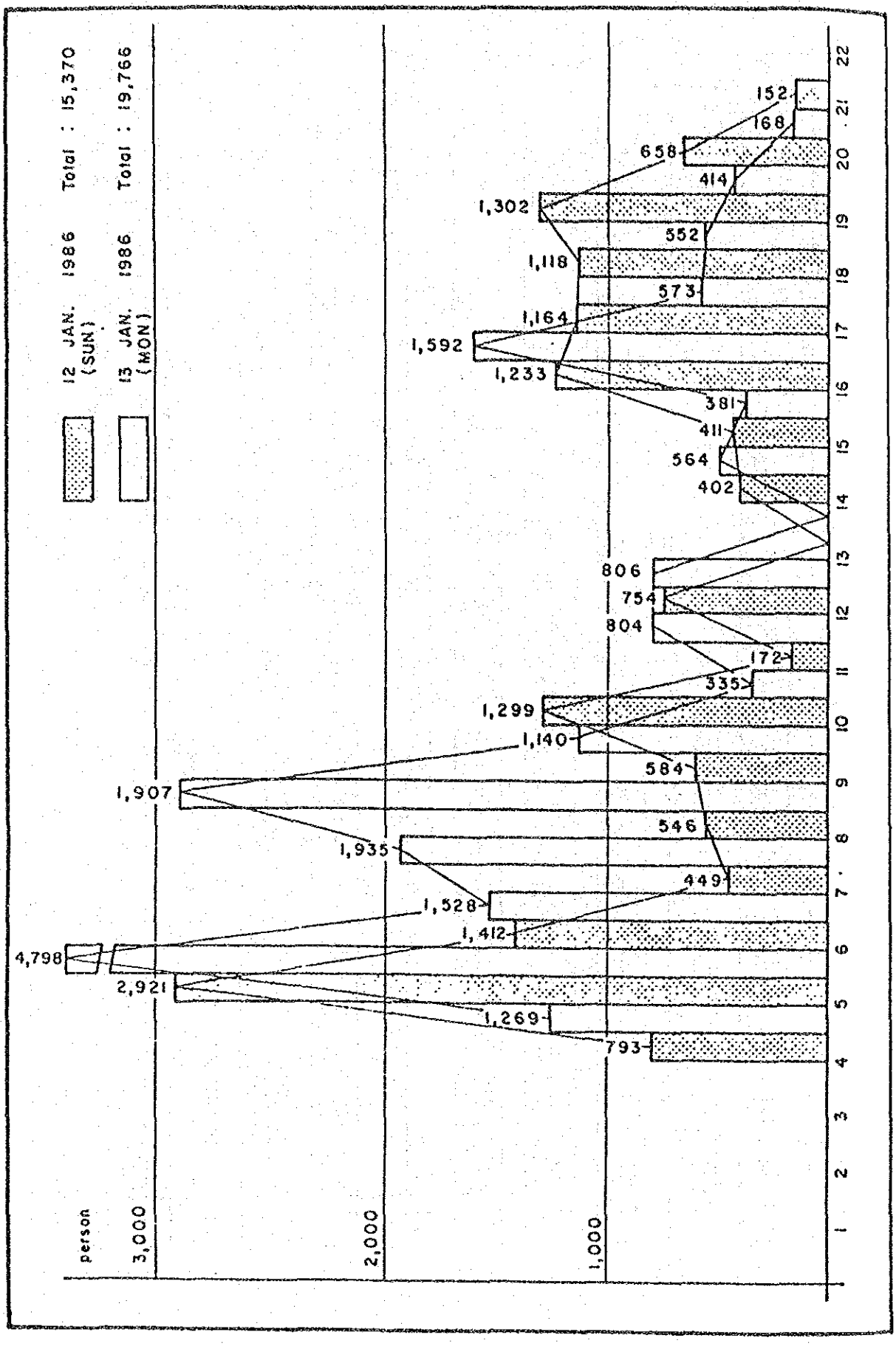
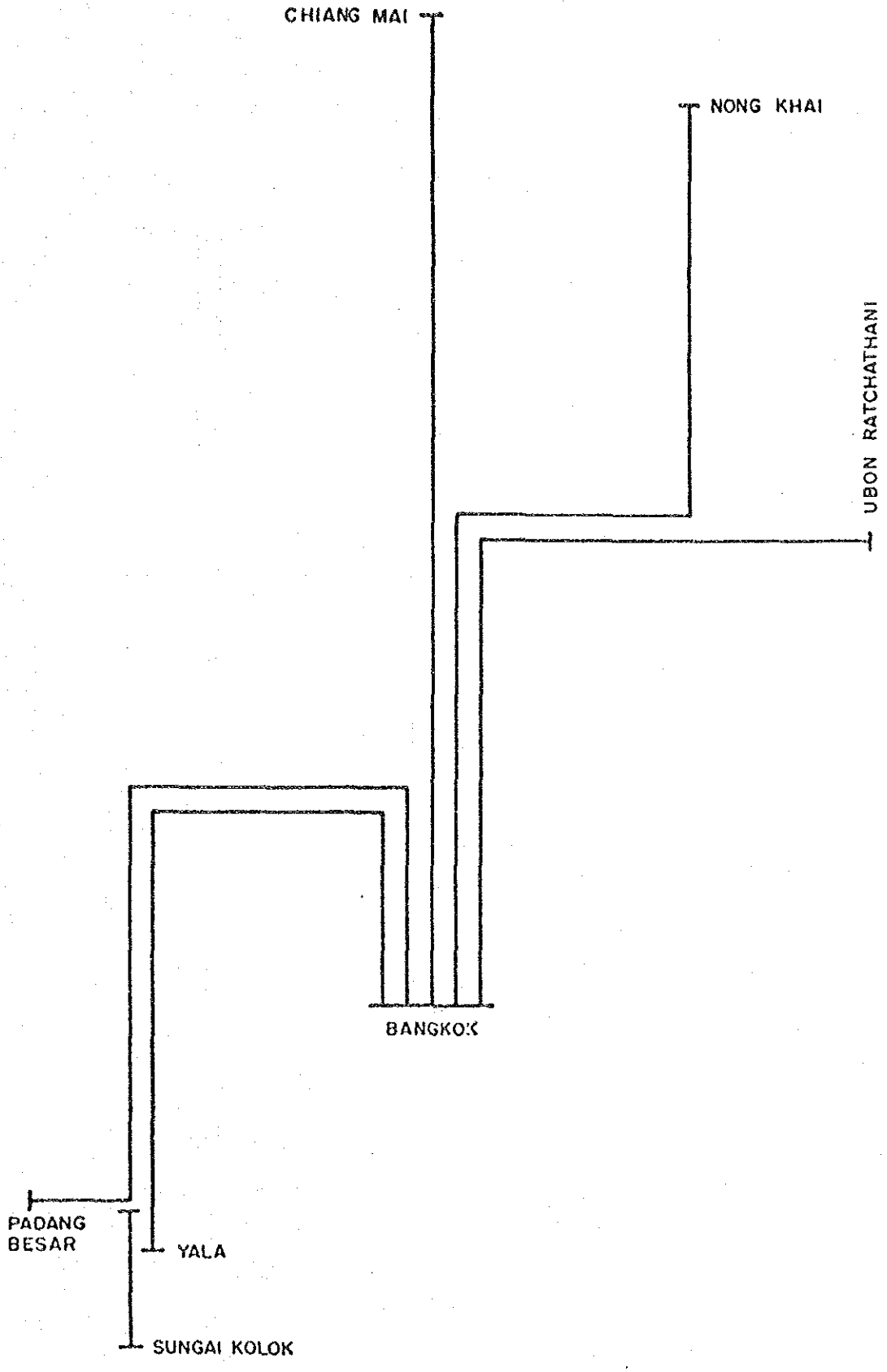
Appendix 4.1.2 Fluctuation by Hour

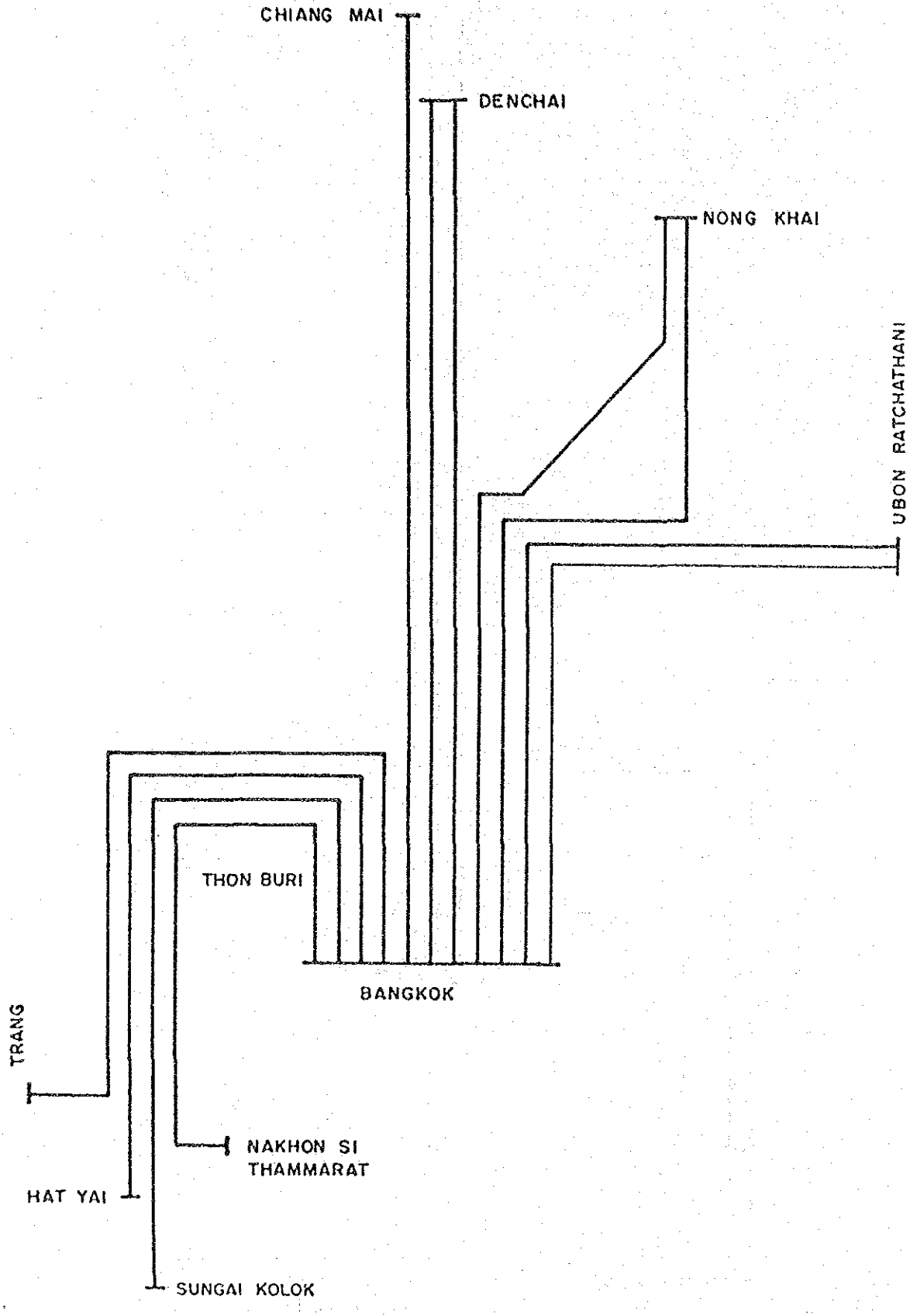


Appendix 4.1.3 Operating Section of Passenger Train

(1) Express



(2) Rapid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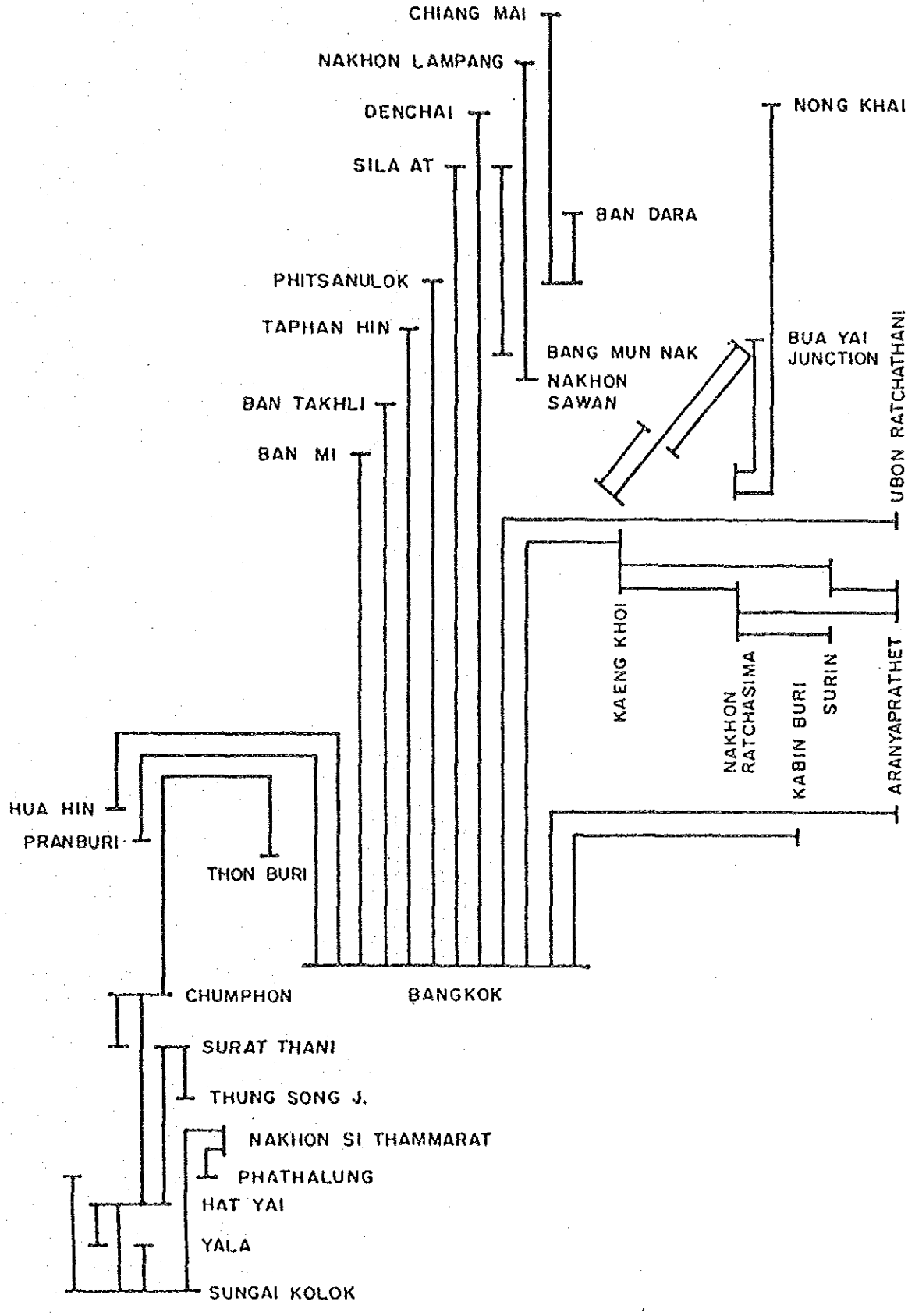
DENCHAI
NONG KHAI
UBON RATCHATHANI
THON BURI
BANGKOK
TRANG
NAKHON SI
THAMMARAT
HAT YAI
SUNGAI KOLOK

(3) Ordinay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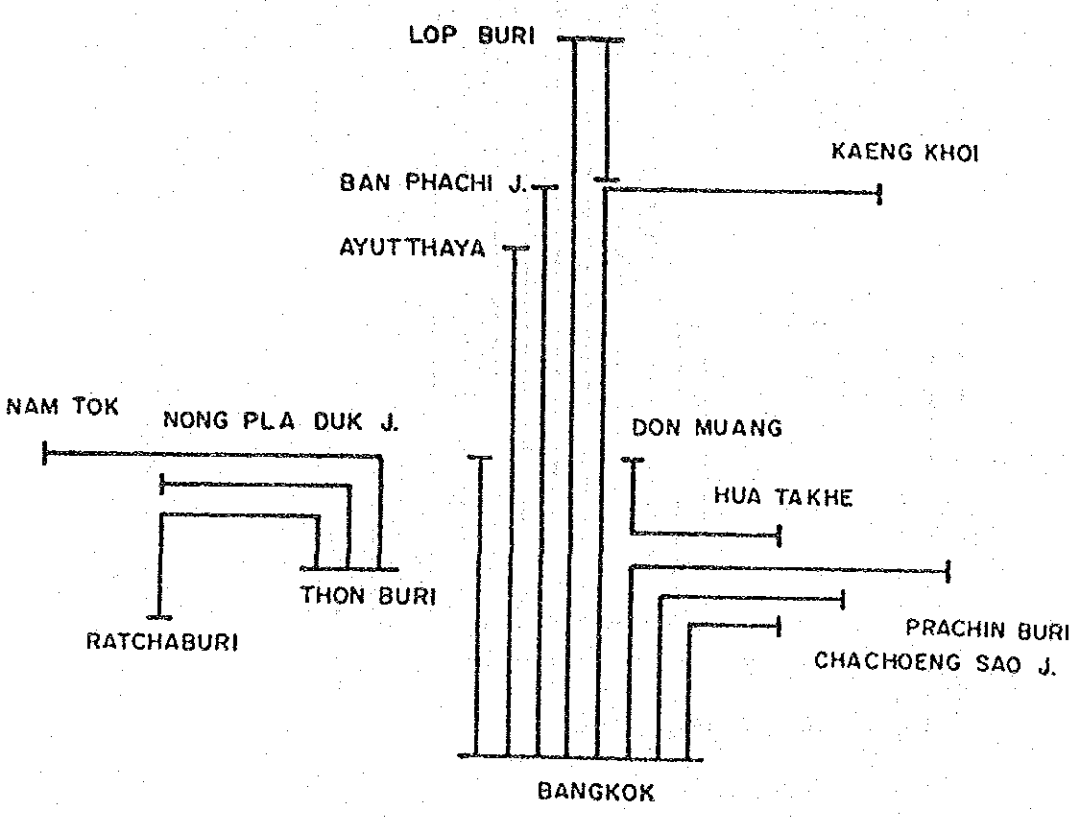
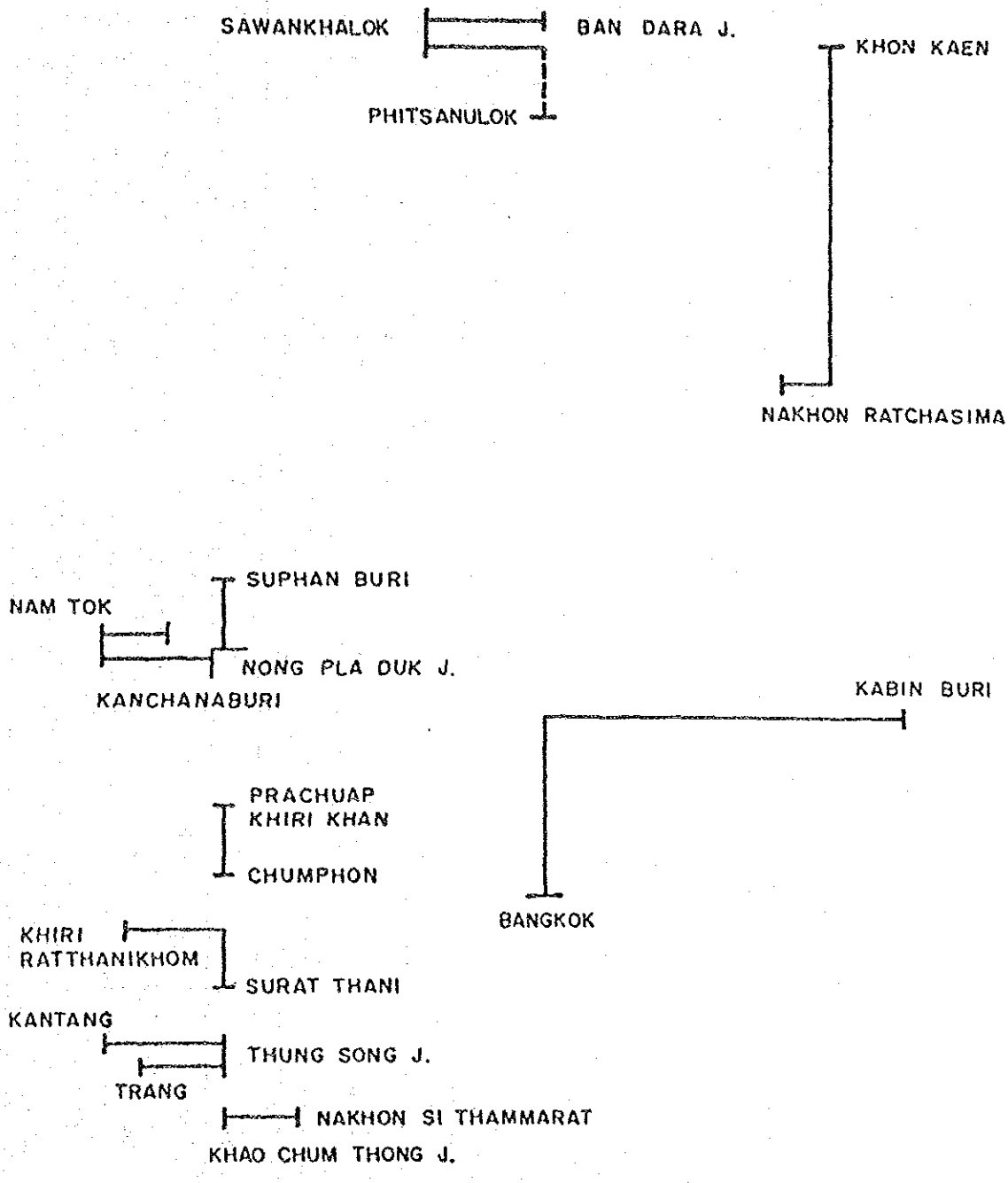
NAKHON LAMPANG
DENCHAI
SILA AT
BAN DARA
NONG KHAI
PHITSANULOK
TAPHAN HIN
BANG MUN NAK
NAKHON SAWAN
BUA YAI JUNCTION
BAN TAKHLI
BAN MI
UBON RATCHATHANI
KAENG KHOI
NAKHON RATCHASIMA
KABIN BURI
SURIN
ARANYAPRATHET
HUA HIN
PRANBURI
THON BURI
CHUMPHON
BANGKOK
SURAT THANI
THUNG SONG J.
NAKHON SI THAMMARAT
PHATHALUNG
HAT YAI
YALA
SUNGAI KOLOK

(4) Commuter


LOP BURI
KAENG KHOI
BAN PHACHI J.
AYUTTHAYA
NAM TOK
NONG PLA DUK J.
DON MUANG
HUA TAKHE
THON BURI
RATCHABURI
PRACHIN BURI
CHACHOENG SAO J.
BANGKOK

(5) Mixed

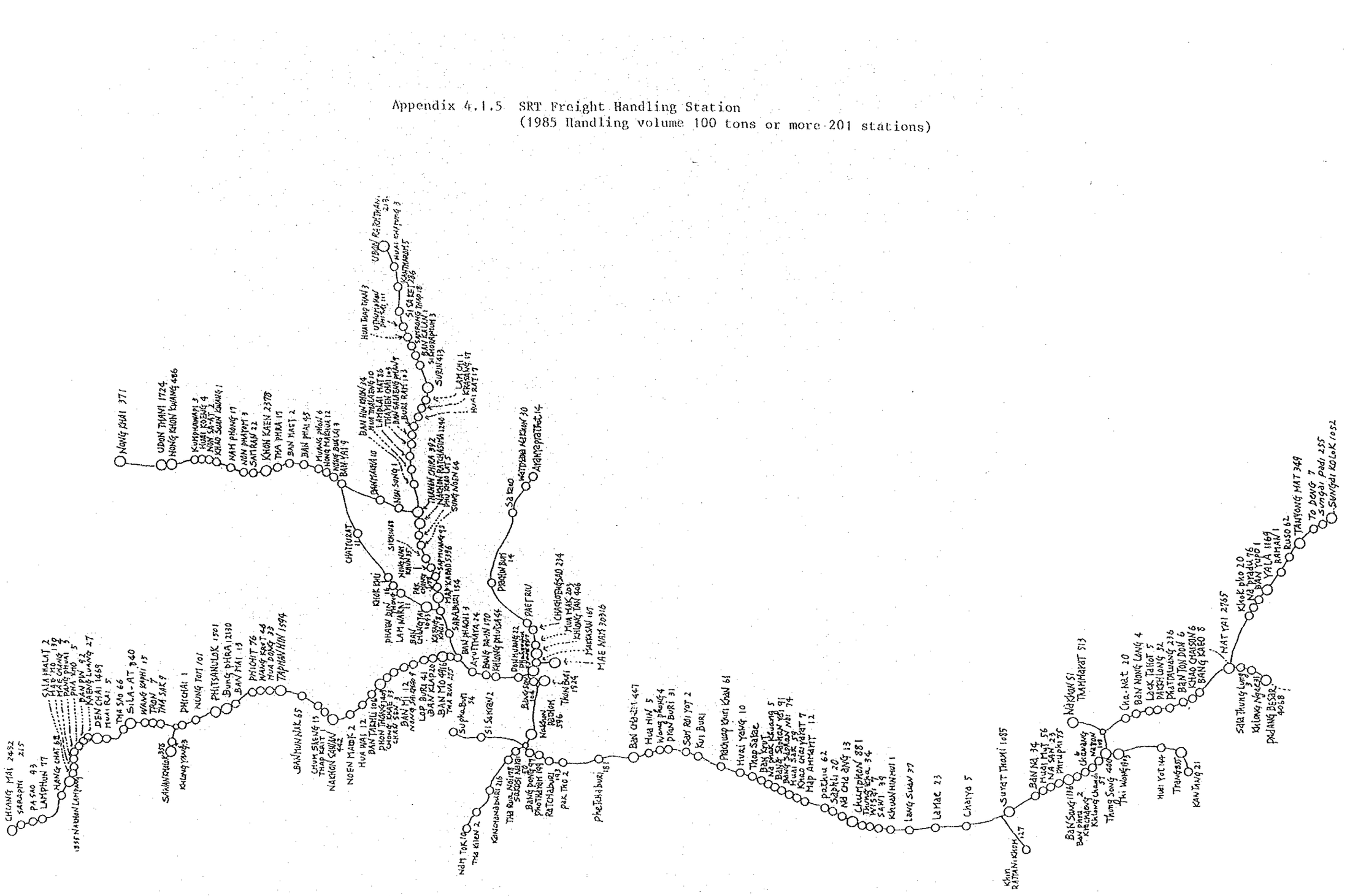

SAWANKHALOK
BAN DARA J.
PHITSANULOK
KHON KAEN
NAKHON RATCHASIMA
SUPHAN BURI
NAM TOK
NONG PLA DUK J.
KANCHANABURI
KABIN BURI
BANGKOK
PRACHUAP
KHIRI KHAN
CHUMPHON
KHIRI
RATTHANIKHOM
SURAT THANI
KANTANG
THUNG SONG J.
TRANG
NAKHON SI THAMMARAT
KHAO CHUM THONG J.

Appendix 4.1.4 Comparison of the Passenger's fare and Arrival time between Bangkok and Major Cities by Trains, Bus and Airline

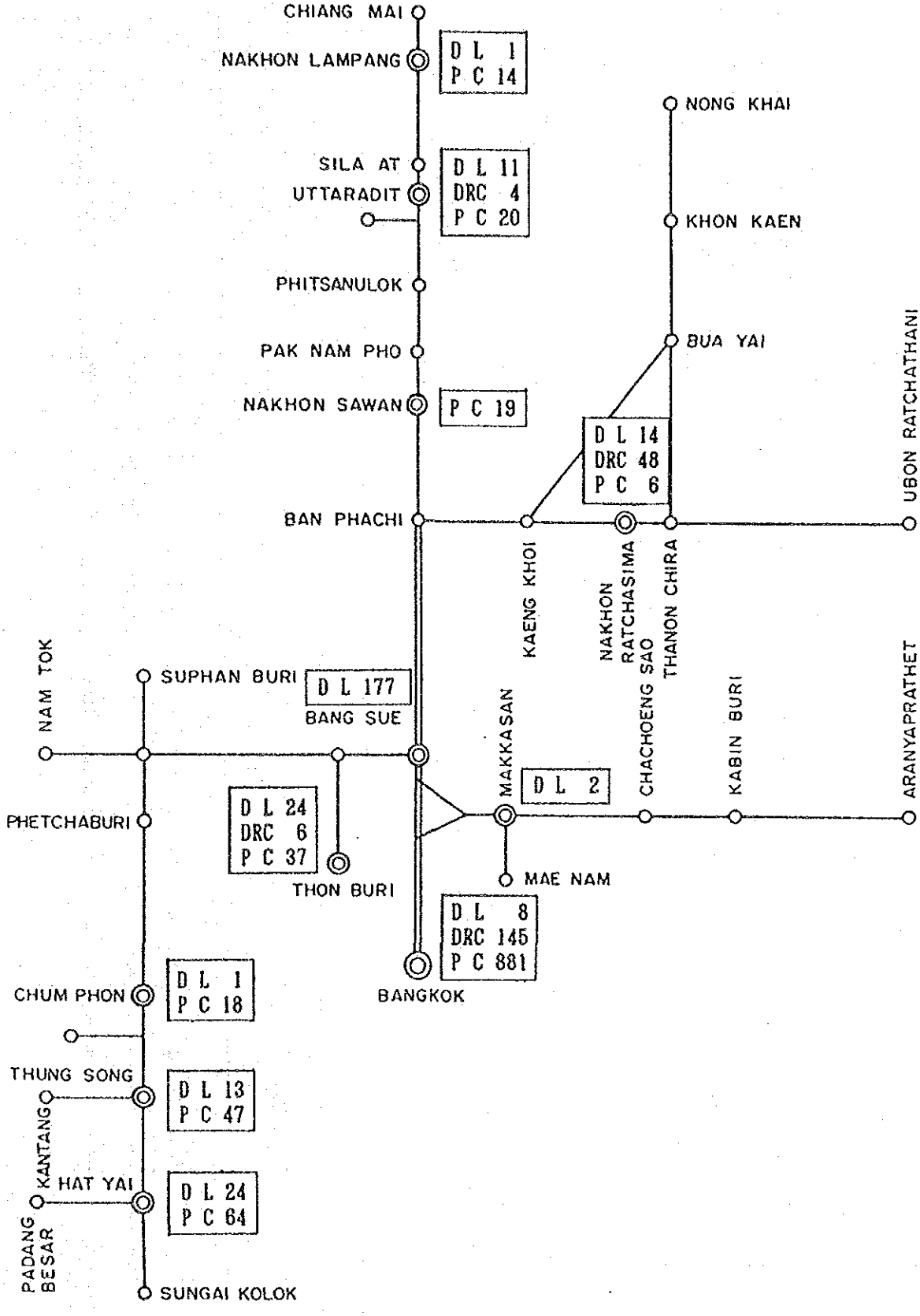
Transportation / Name of City	Railway							Bus				Airline		
	Distance	Fare			Time			Distance	Fare		Time	Distance	Fare	Time
	(Km)	1 st	2 nd	3 rd	Express	Rapid	Ordinary	(Km)	Air-Conditioned	Non Air-Conditioned		(Km)		
Chiang Mai	751	537	255	121	13.40	14.50	19.10	713	242	133	9.00	585	1,100	1.00
Nakhon Lampang	642	463	221	106	11.21	12.29	16.33	610	207	115	8.00	—	—	—
Utteradit	485	356	172	82	7.44	8.41	9.58	541	186	102	7.30	—	—	—
Nakhon Sawan	246	197	99	48	4.05	4.18	4.45	238	87	47	3.30	—	—	—
Lop Buri	133	111	57	28	2.25	2.15	2.39	153	60	32	2.15	—	—	—
Ubon Ratchathani	575	416	200	95	9.30	9.55	13.10	679	229	127	9.40	—	—	—
Nong Khai	624	450	215	103	10.05	10.45	—	614	209	115	8.40	—	—	—
Surin	420	312	153	73	7.06	7.21	9.27	451	155	88	6.25	—	—	—
Khon Kaen	450	333	162	77	7.32	8.04	10.15	444	153	85	6.30	361	710	40
Nakhon Ratchasima	264	207	104	50	4.46	4.51	6.21	256	92	51	3.40	—	—	—
Hat Yai	945	664	313	149	16.30	18.40	—	1,013	339	187	13.00	782	1,530	1.15
Surat Thani	651	470	224	107	12.13	12.26	—	668	225	125	8.20	612	1,190	1.00
Chumphon	485	356	172	82	9.05	9.06	11.25	499	160	95	6.10	—	—	—
Kanchanaburi	133	111	57	28	—	—	3.14	129	53	23	1.35	—	—	—
Nakhon Pathom	64	54	28	14	1.22	1.22	1.32	56	24	13	45	—	—	—

Note: Cost for railway which shown in this table only for the fare, all supplementary tariffs are excluded.

Appendix 4.1.5 SRT Freight Handling Station
(1985 Handling volume 100 tons or more 201 stations)



Appendix 4.1.6 Allocation of Rolling Stocks



Appendix 4.1.7 Statistics of Rolling Stock Repair
of Mechanical Division

	Motive Power Division						Makkasan				
D L	1 month period	3 months period	6 months period	1 year period	2 years period	Total	Heavey repair			Accident	Total
							All	Part	Accident		
	759	259	110	32	26	1,186	27	214	1	9	251
D R C	1 month period	3 months period	6 months period	12 months period	18 months period	Total	Heavey		Accident	Part	Total
Power car	587	183	100	36	4	910	3		1	-	4
Trailer car	-	15	-	-	3	18	1		3	-	4
	Heavey	Medium	Period	Out of Period	Other	Total	Heavey repair		Part	Accident	Total
							All	Part			
P C	19	228	2,173	4,338	115,871	122,629	235	1	57	7	300
F C	1,098	3,183	10,643	2,160	112,285	129,369,	866	-	181	57	1,104

(1) Northern Line

Distance From Bangkok		7.5km	90km	133km	181km	246km	319km	389km	488km	534km	642km	751 km
Section		Bangkok - Bang Sue	Bang Sue - Ban Phachi	Ban Phachi - Lop Buri	Lop Buri - Ban Mi	Ban Mi - Nakhon-Sawan	Nakhon Sawan - Thaphan Hin	Taphan Hin - Phitsanulok	Phitsanulok - Sila At	Sila At - Den Chai	Den Chai - Nakhon Lampang	Nakhon Lampang - Chiang Mai
Maximum Gradient (‰)		10	10	10	10	10	10	10	10	20	20	26
Minimum Curvature Radius (m)		400	800	800	1200	1000	400	500	300	180	180	180
Effective Length of Track in the Station		500	500	500	500	500	500	500	500	450	450	400
Line Capacity		217	137	73	57	57	48	60	59	32	26	28
Number of Trains	Passenger Train	46 (53)	46 (34)	36	30	28	30	28	22	14	8	6
	Freight Train	36	34 (28)	28	28	28	22	20	10	10	10	10
	Total	82 (53)	80 (62)	64	58	56	52	48	32	24	18	16

Note (1) Figures in parenthesis mean the number of trains coming from other lines
(2) Passenger Trains include mixed trains
(3) Freight Trains include temporary trains

(2) Northeastern Line

Distance From Bangkok		90km	125km	134km	180km	264km	376km	420km	515km	575km	348km	450km	569km	824 km
Section		Ban Phachi – Kaeng Khoi	Koeng-Khoi – Map Kabao	Map Kabao – Pak Chong	Pak Chong – Nakhon Ratchasima	Nakhon Ratchasima – Buri Ram	Buri Ram – Surin	Surin – Si Sa Ket	Si Sa Ket – Ubon Ratchathani	Nokhon Ratchasima – Bua Yai	Bua Yai – Khon Kaen	Khon Kaen – Udon Thani	Udon Thani – Nong Khai	
Maximum Gradient (‰)		10	10	24	14	10	8	Less Than 10	10	Less Than 10	8	Less Than 10	10	
Minimum Curvature Radius (m)		800	800	180	400	400	1000	1000	1000	1000	200	500	300	
Effective Length of Track in the Station		500	500	500	500	500	500	500	500	500	500	500	500	
Line Capacity		84	52	52	72	44	44	44	44	36	36	36	28	
Number of Trains	Passenger Train	34	30	30	30	26	26	16	16	18	18	12	12	
	Freight Train	30	20	18	12	8	8	8	6	6	10	10	2	
	Total	64	50	48	42	34	34	24	22	24	28	22	14	

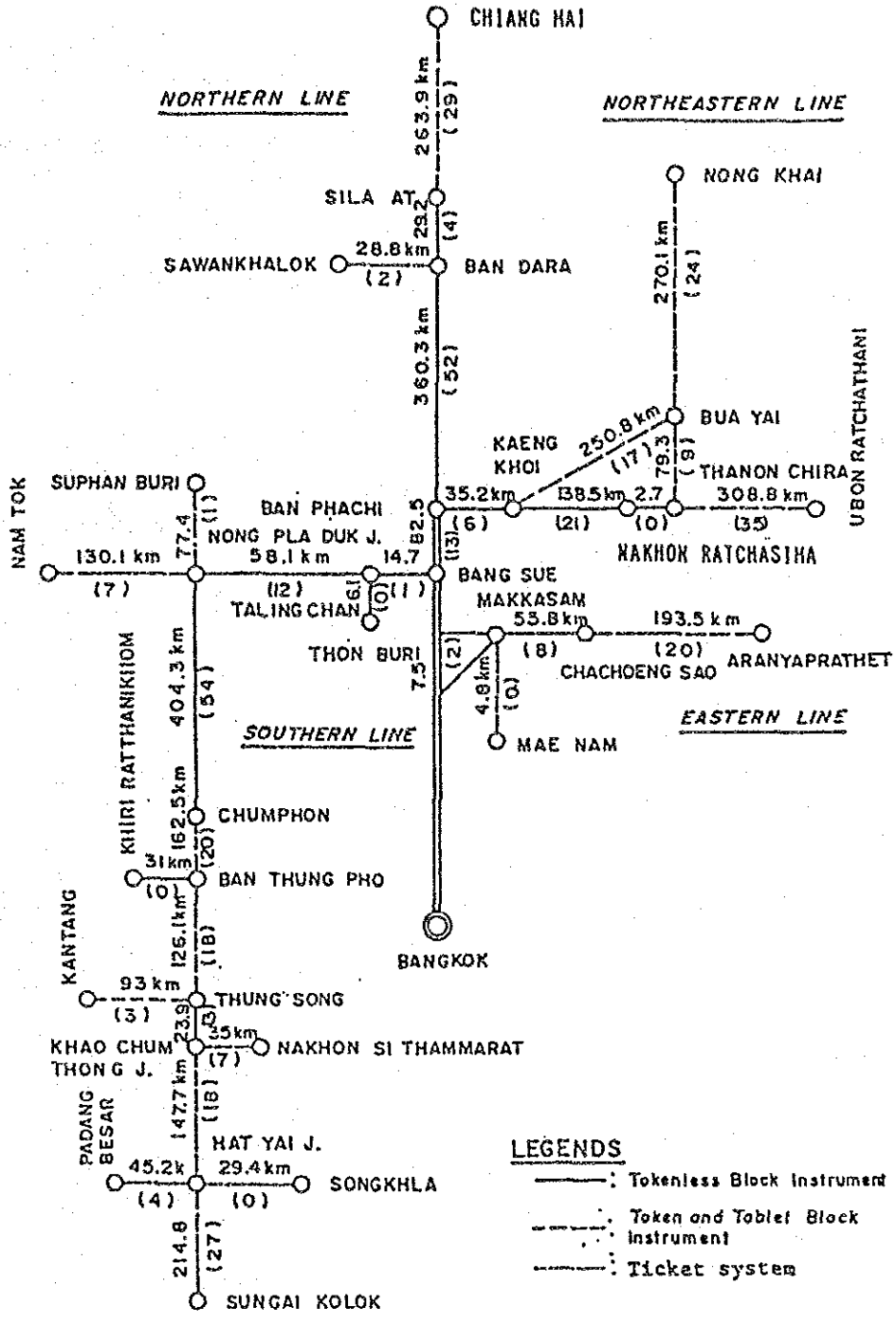
(3) Eastern Line

Distance From Bangkok		15km	31km	61km	121km	161km	255 km
Section		Bangkok I Hua Mak	Hua Mak I Hua Takhe	Hua Takhe I Chachoeng Sao	Chachoeng Sao I Prachin Buri	Prachin Buri I Kabin Buri	Kabin Buri I Aranyaprathet
Maximum Gradient (‰)		10	10	10	10	10	10
Minimum Curvature Radius (m)		400	2000	2000	1000	1000	600
Effective Length of Track in the Station		500	500	500	430	300	430
Line Capacity		64	64	64	28	28	28
Number of Train	Passenger Train	24	24	20	14	10	4
	Freight Train	36	2	0	0	0	0
	Total	60	26	22	14	10	4

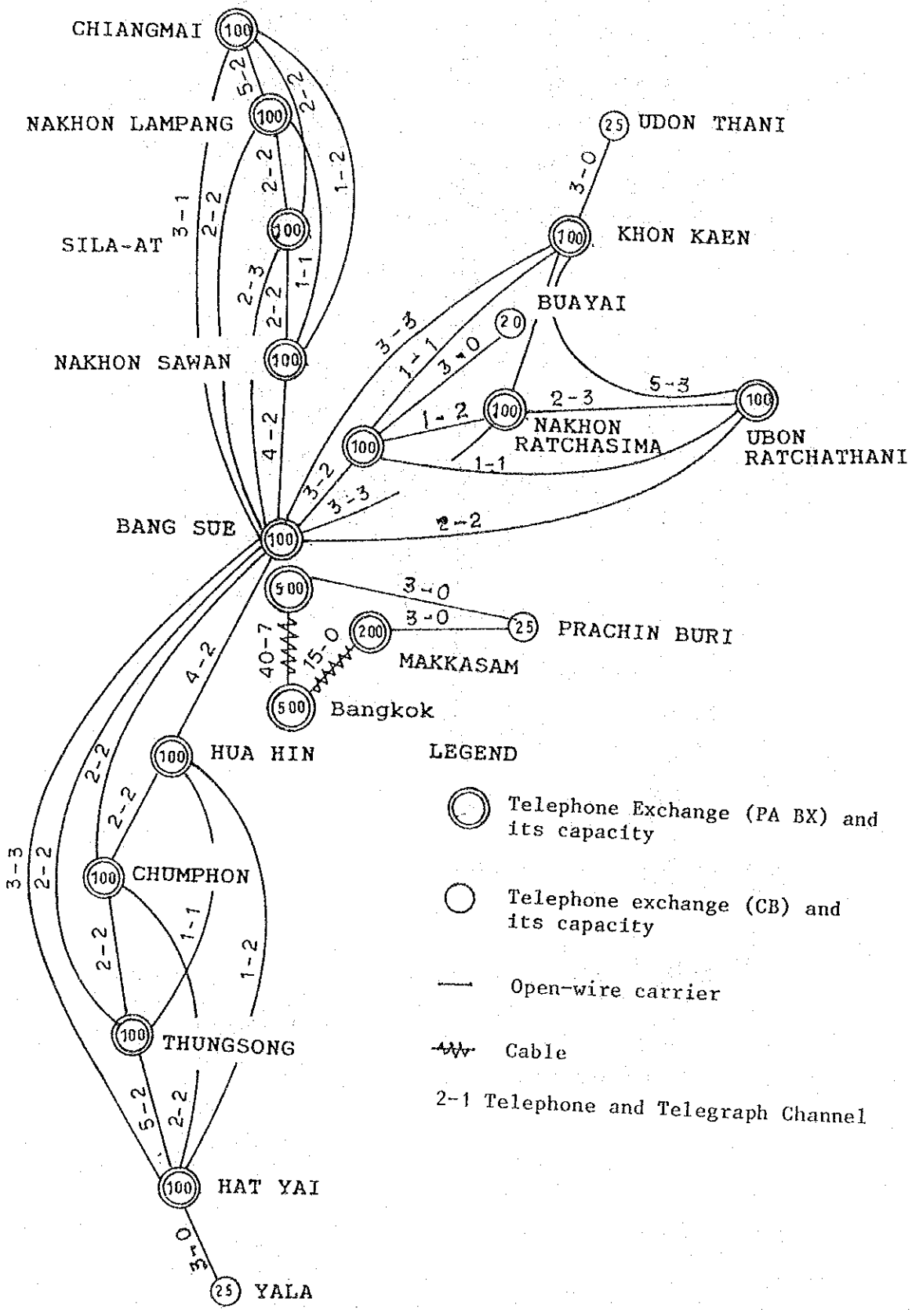
(4) Southern Line

Distance From Bangkok		22km	64km	80km	203km	229km	234km	485km	651km	773km	862km	945km	1055km	1159 km
Section		Bangkok ~ Taling Chan	Taling chan ~ Nakhon Pathom	Nakhon Phathom ~ Nong Pla Duk	Nong Pla Duk ~ Bancha-Am	Bancha-Am ~ Hua Hin	Hua Hin ~ Pran Buri	Pran Buri ~ Chumphon	Chumphon ~ Surat Thani	Surat Thani ~ Thung Song	Thung Song ~ Phatta Lung	Phatta-Lung ~ Hat Yai	Hat Yai ~ Yala	Yala ~ Sungai Kolok
Maximum Gradient (‰)		Less Than 10	Less Than 10	Less Than 10	Less Than 10	Less Than 10	Less Than 10	10	Less Than 10	Less Than 10	18	10	10	10
Minumum Curvature Radius (m)			600	1000	400	1000	1000	400	350	300	250	800	300	400
Effective Length of Track in the Station		500	500	500	500	500	500	500	500	500	500	500	400	250
Line Capacity		43	75	75	57	57	50	40	41	48	41	41	42	42
Number of Trains	Passenger Train	19	29	29	22	20	16	16	16	18	18	16	16	14
	Freight Train	24	20	20	16	14	14	14	14	14	13	12	8	4
	Total	43	49	49	38	34	30	30	30	32	31	28	24	18

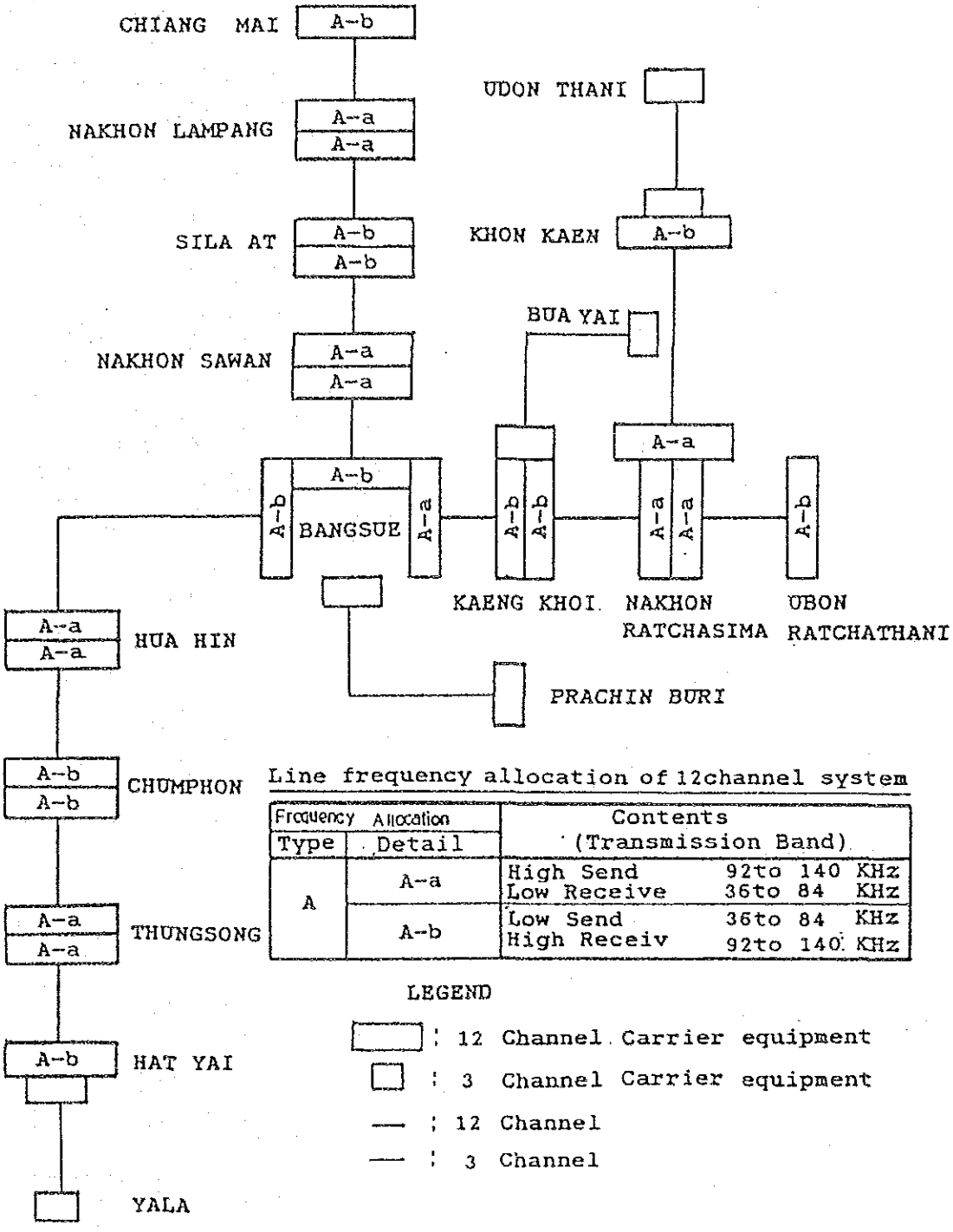
Appendix 4.1.9 Map of Existing Block System



Appendix 4.1.10 Telecommunication Network



Appendix 4.1.11 Carrier Telephone Network (Whole Line)



Line frequency allocation of 12channel system

Frequency Allocation		Contents (Transmission Band)
Type	Detail	
A	A-a	High Send 92to 140 KHz Low Receive 36to 84 KHz
	A-b	Low Send 36to 84 KHz High Receiv 92to 140 KHz

LEGEND

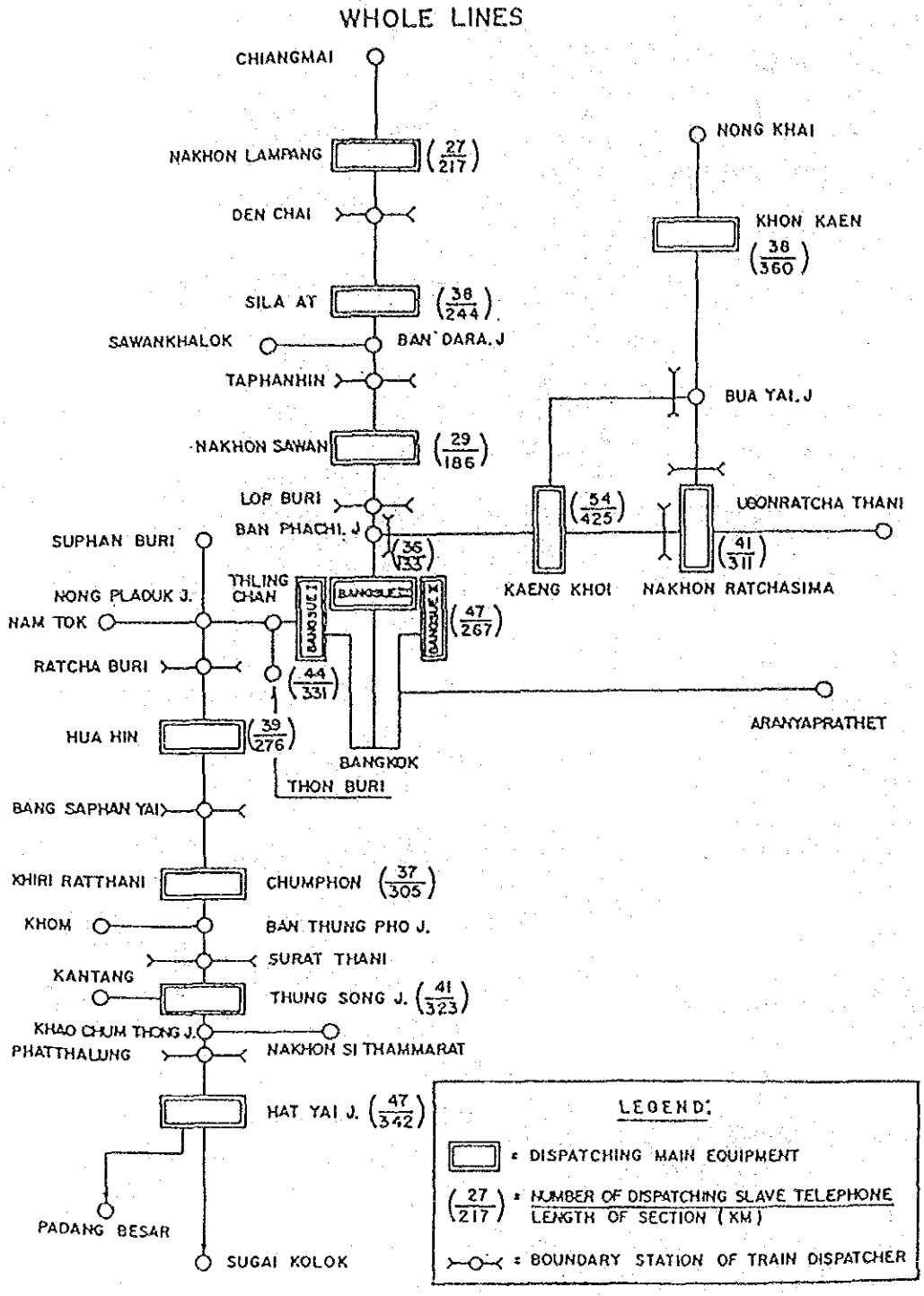
: 12 Channel Carrier equipment

: 3 Channel Carrier equipment

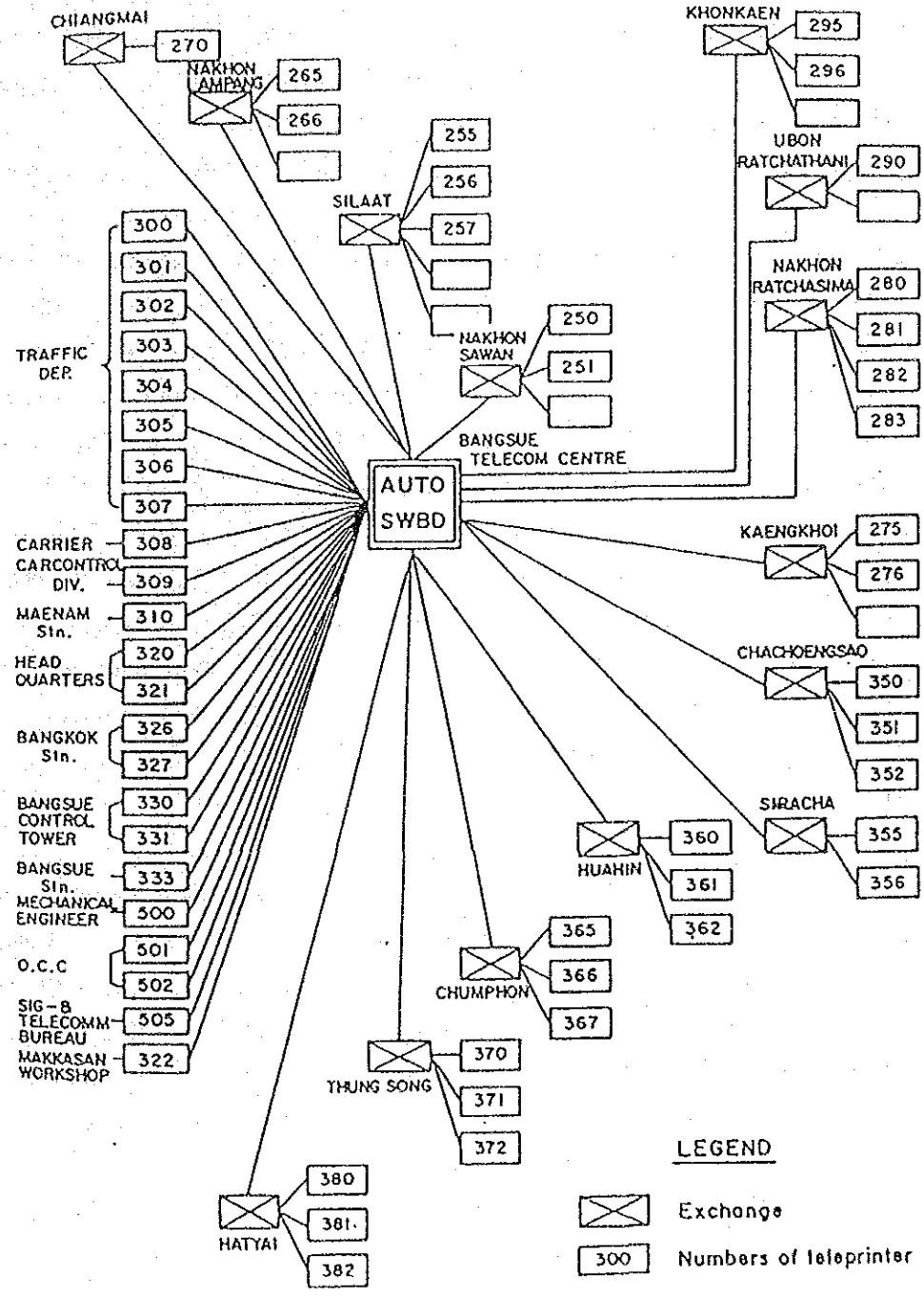
: 12 Channel

: 3 Channel

Appendix 4.1.12 Train Dispatcher Telephone Network



Appendix 4.1.13 Teleprinter Network (Auto Line)



Appendix 4.3.1 Improvement of the Transportation of Agricultural Products

1. Present Condition

Agriculture is the basic industry in Thailand, and its production is very large, accounting for 18% of the total domestic production.

Rice, 18.73 million tons; Maize, 3.55 million tons

Cassava, 20.00 million tons; Sugarcane, 23.87 million tons (for fiscal 1983)

The railway traffic shares of these materials are very small. Both rice and maize are showing a decreasing trend with peaks of 570,000 tons in 1977 for rice and 330,000 tons in 1982 for maize. In 1985, rice was 440,000 tons, maize was 220,000 tons, and both cassava and sugar molasses were zero.

The transportation of agricultural products is a wide-area-dispersion type, and a railway transportation system connecting limited points with lines has limits in inducing shipments even if a number of small stations were installed. Rather, the installation of small stations is apt to degrade the quality of transportation service on the whole. Moreover, transportation services via yards are greatly inferior to trucks in speed and punctual delivery.

2. Future Direction

Thus, in the future, it will be necessary to induce such commodities to use the railway by providing a stock point at each center of collection and distribution for them. The commodities will be collected in their vicinity, arranged, stored, and their transportation standardized; thus, offering them direct transportation services (station-to-station transportation) from dispatch to arrival.

3. Proposed Sites for Bases and Handling Items

(1) Rice

About 420,000 tons of rice was transported in 1985, departing mainly from Sila-At, Phitsanulok and Taphan Hin along the Northern Line, Nakhon Ratchasima, Khon Kaen, Udon Thani, Ubon Ratchathani and Surin along the Northeastern Line and Nakhon Pathom along the Southern Line

and arriving mainly at Mae Nam and Thung Song, and Hat Yai and Yala in southern Thailand.

The future traffic volume of rice is estimated at 450,000 tons for 1996 and 480,000 tons for 2006. To secure such traffic volumes, it is desired to provide a stock point in each of the following stations that are located at the centers of departure and arrival and, at the same time, improve the transportation services through the standardization of transportation or uni-product transportation.

o Proposed stations in the departure zones (figures in parentheses show the handling tonnage for 1985 in units of thousands of tons)

Northern Line	Sila-At (30), Phitsanulok (15), Tahan Hin (35)
Northeastern Line	Nakhon Ratchasima (15), Si Saket (15), Surin (15), Ubon Ratchathani (30), Khon Kaen (25), Udon Thani (30)
Southern Line	Nakhon Pathom (30)

o Proposed stations in the arrival zones

Eastern Line	Mae Nam (100)
Southern Line	Thung Song (50), Hat Yai (50), Yala (60), Sungai Padi (50)

(2) Maize

The amount of maize transported was 22,000 tons in 1985, departing from Den Chai, Sila-At, and Sawankhalok along the Northern Line, and arriving for the greater part at Malaysia via Padang Besar. Regarding the future traffic volume, some increase is expected for both 1996 and 2006. Thus, it is desirable to provide a stock point in each of the following stations that are located at the centers of the departure zones, thereby improving the services through standardization, and of the transportation for securing the traffic volume.

o Proposed stations in the departure zones

Northern Line	Den Chai (50), Sila-At (30) Sawankhalok (30)

Note: The volume passing through Padang Besar is 140,000 tons a year.

(3) Cassava, etc.

Cassava is transported generally by trucks at present. But the short-circuit line will induce the cassava flow from the northern and northeastern parts to the Laem Chabang Port by railway. Thus, it is desirable to provide stock points in each of the following stations that are located at the centers of the departure zones; thereby improving services through the standardization and the like of transportation for securing the traffic volume.

o Proposed stations in the departure zones

Northern Line	Nakhon Sawan, Phitsanulok
Northeastern Line	Khon Kean, Nakhon Ratchasima, Si Sa Ket

4. Others

Selection, functions, scales, method of maintenance, and other specific matters concerning the stock points will be examined later.

Appendix 4.3.2 Promotion of Container Transportation

1. Containable Cargo Volume

As the result of a survey, with the flow of cargo in 1985 taken as a base, the containable cargo volume is estimated at 671,000 tons.

SRT 1985 traffic volume	.....	5,596,000
Uni-product freight car transportation	.....	△4,115,000
Oil 2,575,000		
Cement 1,298,000		
Gypsum 242,000		
Designed for uni-product freight car transportation	.....	△ 633,000
Rice 418,000		
Maize 215,000		
Non-containable cargo due to shape, etc.	.....	△ 177,000
Containable cargo volume	.....	671,000 tons

2. Selection of Handling Stations

As container transportation is outstanding in rapidness and punctuality, it is suitable for transportation of general cargo. The following 14 stations that were chosen are located in cities that have large populations, and would serve as pivotal points of transportation.

Central part	Mae Nam, Bang Sue (4,950)
Northern Line	Nakhon Sawan (95), Phitsanulok (72), Nakhon Lampang (72), Chiang Mai (150)
Northeastern Line	Nakhon Ratchasima (191), Surin (34), Ubon Ratchathani (100), Udon Thani (81), Khon Kaen (116)
Southern Line	Surat Thani (64), Thung Song (pivotal point of transportation), Hat Yai (114)

Note: Figures in parentheses show the population of cities in units of thousands of persons.

3. Flow of Containable Cargo between Handling Bases

For cargo handled by the foregoing stations and within a 20 km radius of their areas, the flow of cargo volume between these 14 stations are calculated by item and by departure and arrival to be 286,000 tons (See Table 1).

4. Determination of Handling Bases

It is proposed to promote container transportation tentatively for Mae Nam, Bang Sue, Chiang Mai, Surat Thani, and Thung Song and Hat Yai, of which the collection of a considerable amount of cargo is expected from the foregoing 14 stations. The container traffic volume between 6 stations is 262,000 tons. Particularly, container trains may be set up between two stations versus three stations, vis-a-vis Mae Nam and Bang Sue versus Surat Thani, Thung Song and Hat Yai.
Marine container transport from the Laem Chabang Port to Bang Sue is not included.

5. Prospects of Container Traffic Volume in the Future

Traffic volume in the future is estimated at 360,000 tons in 1996 and 400,000 tons for 2006; if better transportation services are offered, transfer of transportation shares from trucks to the railway is expected.

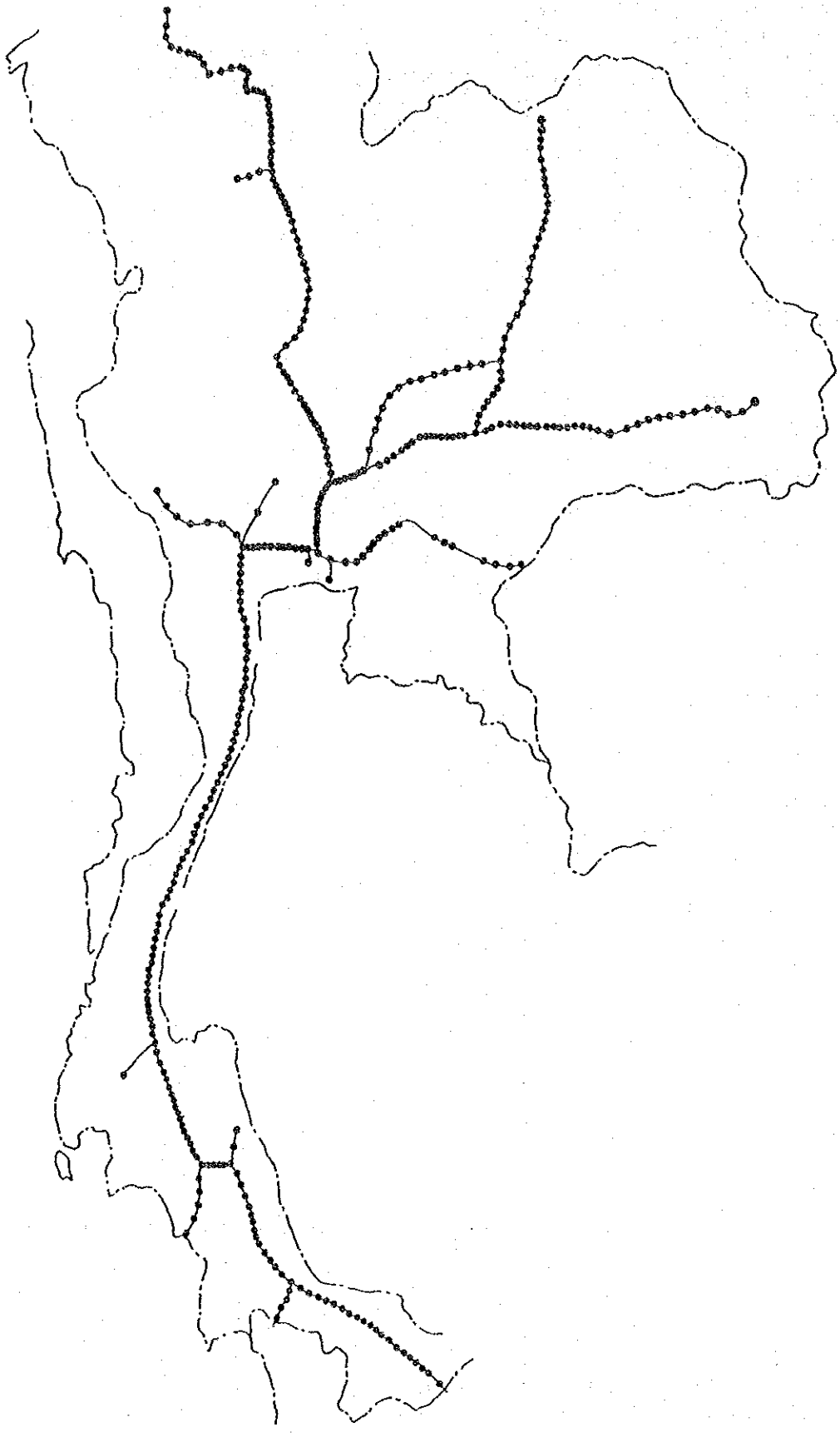
Table 1 Flow of Containable Cargo between 14 Stations

(Unit: ton/year)
(1985)

O \ D	Mae Nam	Bang Sue	Nakhon Sawan	Phitsanulok	Nakhon Lampang	Chiang Mai	Nakhon Ratchasima	Surin	Ubon Ratchathani	Khon Kaen	Udon Thani	Surat Thani	Thung Song	Hat Yai	Total
Mae Nam		2,551	24			13,772							40	6,500	(20,312) 22,881
Bang Sue	136		613	543	2,596	6,589	1	957	6,054	1,063	2,482	3,306	7,582	79,308	(96,785) 111,230
Nakhon Sawan		3		15	11		4	8						4	45
Phitsanulok		87													87
Nakhon Lampang		194		13		31	9	2					4	923	1,176
Chiang Mai	22,463	858		2					2		647		9	3	(23,321) 23,984
Nakhon Ratchasima	1	9				6		3	2	15	1		14		51
Surin		99					14		26					130	269
Ubon Ratchathani		1,911	1			1	1	16			1			163	2,094
Khon Kaen		107					1	1			15			107	231
Udon Thani	364	465					3		11				15	37	895
Surat Thani	32,022	120											12	617	(32,142) 32,771
Thung Song	35,757	16,068	1			1	4	2		3	3	9		127	(51,825) 51,975
Hat Yai	21,668	16,884	209		2	1	2						2		(38,552) 38,768
Total	(111,910) 112,411	(33,930) 39,356	848	573	2,609	(20,361) 20,401	39	989	6,095	1,081	3,149	(3,306) 3,315	(7,622) 7,678	(85,808) 87,919	(262,937) 286,463

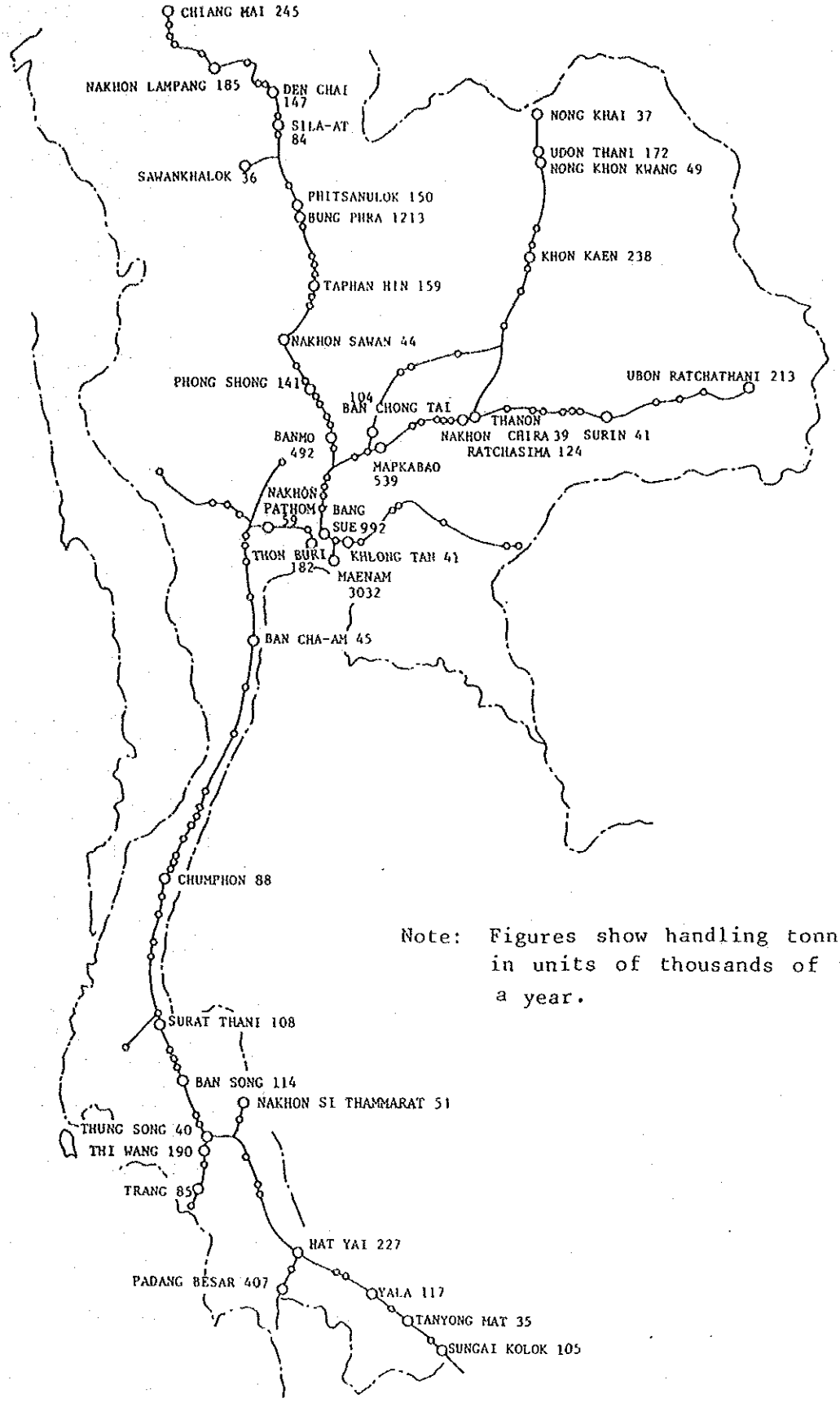
Note: Figures in parentheses are the forecasted container traffic volume for the present

Appendix 4.3.3-(1) SRT Freight Handling Stations (1985 - 359 Stations)



Appendix 4.3.3-(2) SRT Main Freight Handling Stations

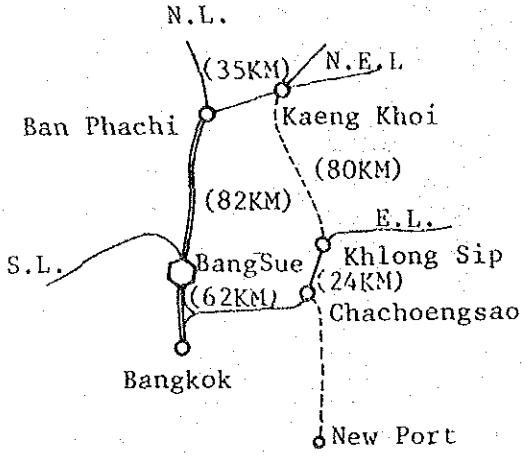
(1985 - Handling Volume 1000 Tons or More, 140 Stations)



Note: Figures show handling tonnage in units of thousands of tons a year.

Appendix 4.3.4 Freight Transportation Routes After Opening of New Port Route and Northeastern Route

1. Outline



2. No. of Freight Cars Operated Among New Port and Other Lines

O \ D	Northern Line	North-eastern Line	Southern Line	Bang Sue	New Port
Northern Line					38 28 (24)
Northeastern Line					41 (21) 57 (29)
Southern Line					16 20
Bang Sue					20 (32) 26 (38)
New Port	18 19 (24)	26 (21) 28 (29)	57 72	14 (32) 12 (38)	115 (53) 131 (91)

Note 1: The top row is for fiscal 1996, while the bottom row is for fiscal 2006.

Note 2: Figures within parentheses are for the number of direct freight cars separately.

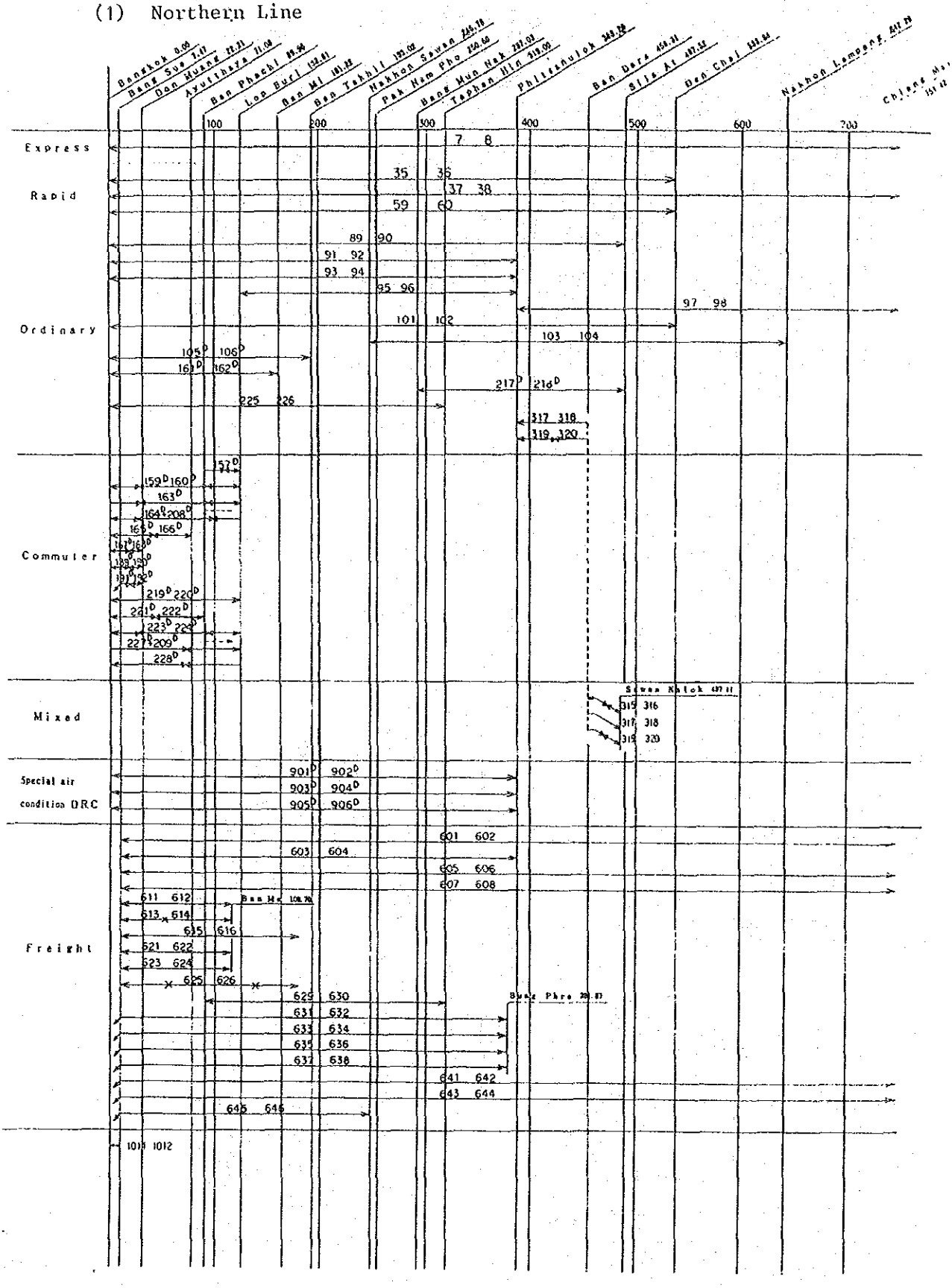
3. Comparison of Transportation Distance and Arrival Times

Section	Via Existing Lines		Via New Line				
	Distance	Arrival Time	Distance	Arrival Time			
				C.K.P Relay	C.K Relay	K.P Relay	K Relay
New Port Line (Chachoengsao) and Northeastern Line (Kaeng Khoi)	Chachoengsao - Bang Sue 63 km Bang Sue - Ban Phachi 82 Ban Phachi - Kaeng Khoi 35	Running 4.5 h Relay 12.0	Chachoengsao - Khlong Sip 24 km Khlong Sip - Kaeng Khoi 80		Running 2.6 h Relay 16.0		Running 2.6 h Relay 8.0
	Total 180 km	Total 16.5 h	Total 104 km		Total 18.6 h		Total 10.6 h
New Port Line (Chachoengsao) and Northern Line (Ban Phachi)	Chacheongsao - Bang Sue 63 Bang Sue - Ban Phachi 82	Running 3.6 Relay 12.0	Chachoengsao - Khlong Sip 24 Khlong Sip - Kaeng Khoi 80 Kaeng Khoi - Ban Phachi 35	Running 3.47 h Relay 24.0		Running 3.47 h Relay 16.0	
	Total 145 km	Total 15.6 h	Total 139 km	Total 27.47 h		Total 19.47 h	

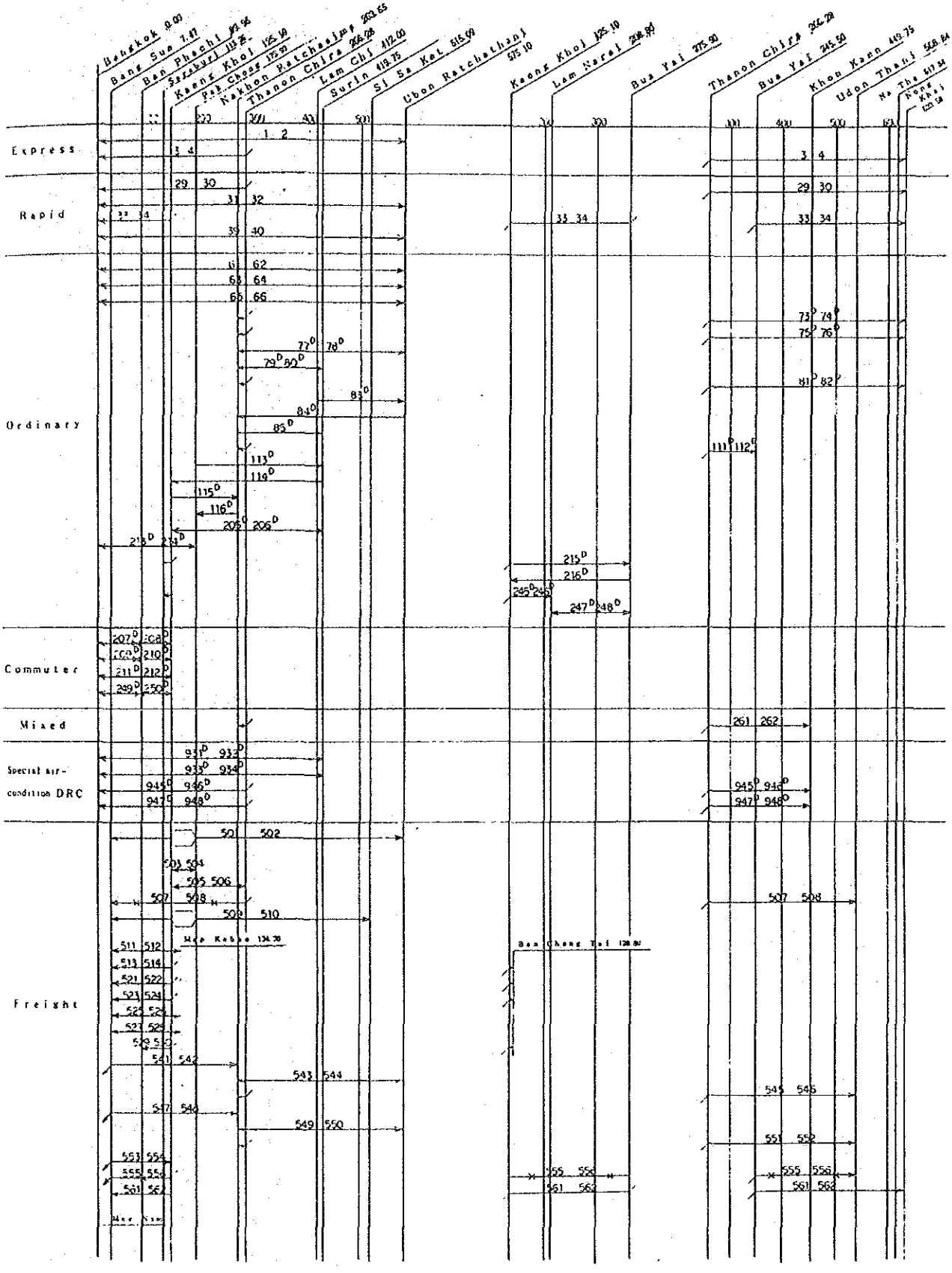
Note: Calculations use a travelling speed of 40 km/h, and a yard relay time of 12 hours for Bang Sue and 8 hours for other yards.

Appendix 4.4.1 Train Operation Section

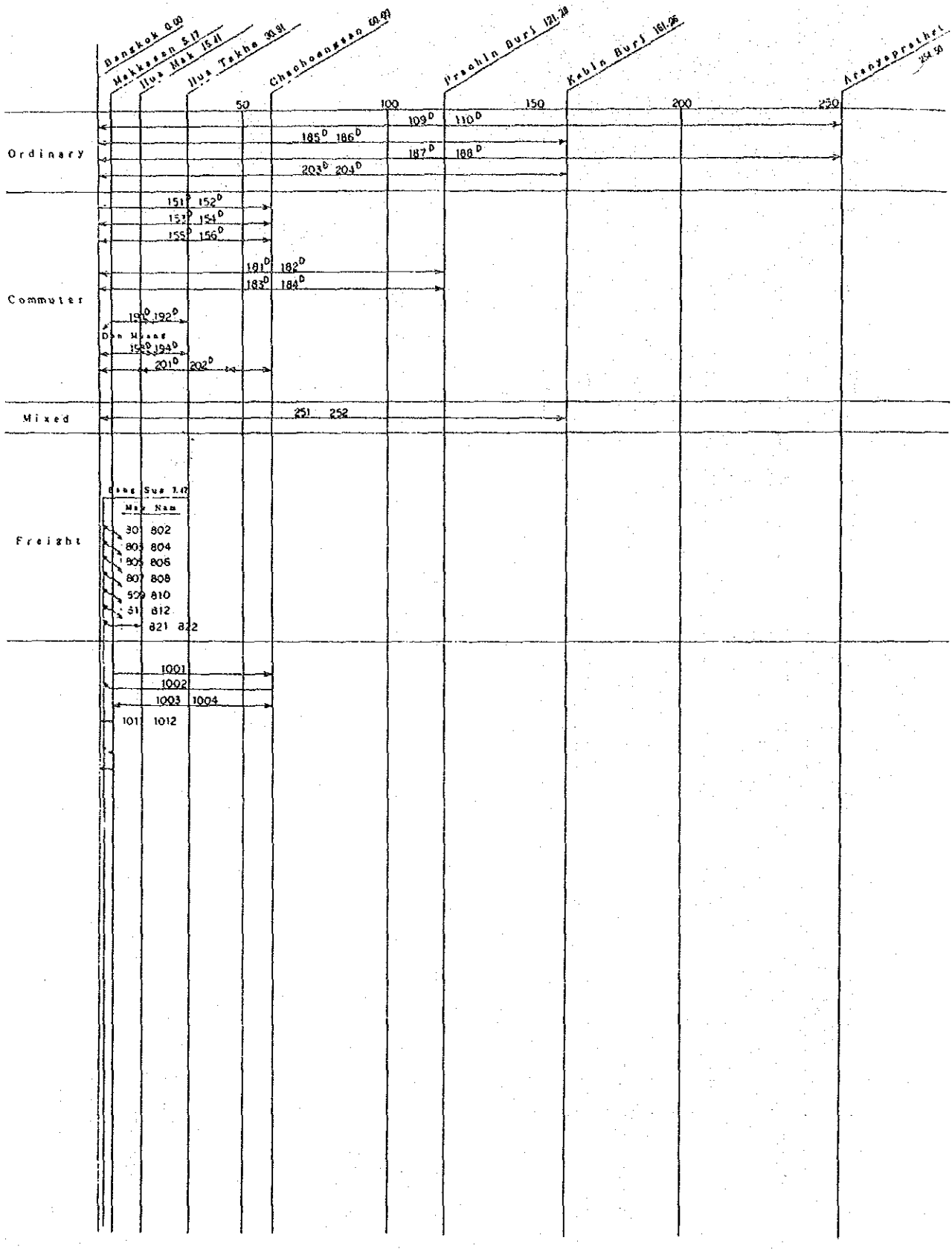
(1) Northern Line



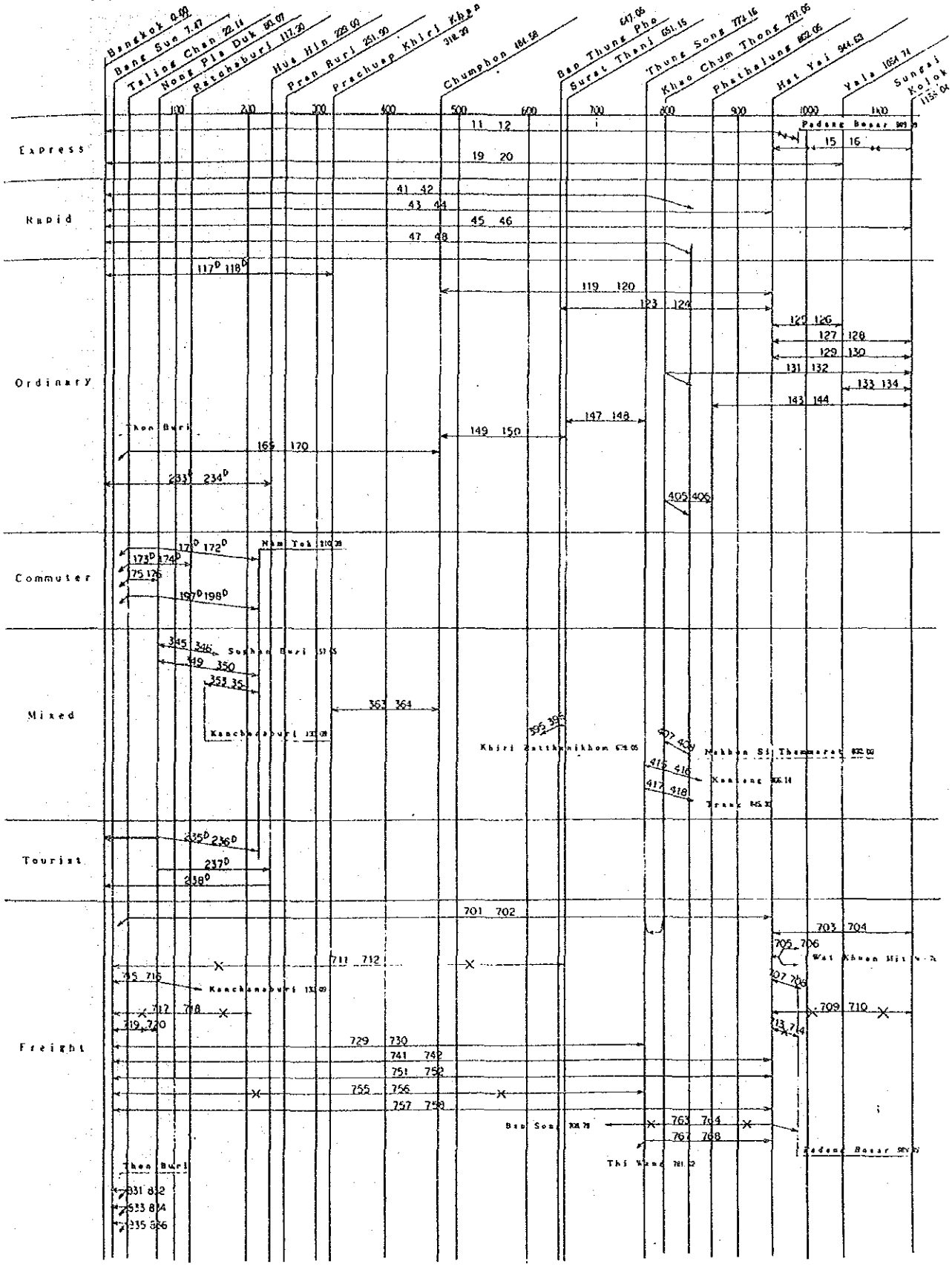
(2) Northeastern Line



(3) Eastern Line



(4) Southern Line



Appendix 4.4.2 Passenger Train Consist

(1) Express, Rapid

TRAIN NO.	TRAIN CONSIST																	
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1/2 D.	BFP.	BFV.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BBT.	BSC.	BSC.	BNS.	BNS.	ANS.	ANF.			
3/4 D.	BFP.	BFV.	BTC.	BTC.	BTC.	BTC.	BTC.	BBT.	BSC.	BNS.	BNS.	BNS.	BNS.	ANF.				
31/32 D.	BTV.	BSC.	BTC.	BTC.	BTC.	BTC.	BBT.	BTC.										
39/40 D.	BTV.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BBT.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BSC.
29/30 D.	BSC.	BTC.	BTC.	BFV.	BBT.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.				
33/34 D.	BSC.	BTC.	BTC.	BFV.	BBT.	BTC.	BTC.	BTC.										
7/8 D.	BFP.	BFV.	BNS.	BTC.	BTC.	BTC.	ASC.	BSC.	BRC.	BNS.	BNS.	BNS	BNS.	BNS.	ANS.	ANF.		
35/36 D.	BFV.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BBT.	BTC.	BTC.	BSC.	ASC.	BNS.				
37/38 D.	BFV.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BBT.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BSC.	ASC.	BNS.
59/60 D.	BFV.	BNS.	BSC.	BTC.	BTC.	BBT.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.						
11/12 D.	BFP.	BFV.	ANS.	BNS.	BNS.	BNS.	BNS.	BNS.	BRC.	BSC.	BNS.	BNS.	BNS.	BNF.	ANF.			
15/16 D.	BFP.	BFV.	ANS.	BNS.	BNS.	BNS.	BNS.	BRC.	BSC.	BNS.	BNS.	BNS.	BNS.	BNF.	ANF.			
19/20 D.	BFV.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BSC.	BRC.	BNS.	BNS.	ANS	ASC.	ANS.	BNS.	BNS		
41/42 D.	BFV.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC	BTC.	BBT.	BTC.	BTC.	BSC.	BNS.	BNS.	BNS.	BNS.
43/44 D.	BFV.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BRC.	BTC.	BTC.	BTC.	BTC.	BTC.	BSC.	BSC.	BNS.	
45/46 D.	BFV.	BFV.	BTC.	BTC.	BTC.	BTC.	BBT.	BTC.	BTC.	BTC.	BTC.	BSC.						
47/48 D.	BFV.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BTC.	BBT.	BTC.	BTC.	BTC.	BSC.	BNS	BNS.	ANS.

(2) Ordinary, Commuter, Mixed

TRAIN NO.		TRAIN CONSIST
89	D..	BFV. 6BTC. BBT. BST. BSC =10
90	D..	BFV. 6BTC. BBT. BST. BSC =10
91	D..	BFV. 6BTC. BBT. BST. =9
92	D..	BFV. 8BTC. BBT. BST. =11
93	D..	BFV. 8BTC. BBT. BST. =11
94	D..	BFV. 10.BTC. BBT. BST. =13
95/96	D..	BTV. 6.BTC. BBT. =8
97/98	D..	BTV. 5.BTC. BBT =7
101	D..	BTV. 8.BTC. BBT. BST =11
102	D..	BTV. 4.BTC. BBT BST. =7
103/104	D..	BTV. 4.BTC. BBT. =6
225/226	D..	BTV. 6.BTC. BBT. BST. =9
315/316 317/318,319/320	D..	BTV. 2.BTC. =3
251/252	D..	BTV. 4.BTC. =5
61	D..	BTV. 4.BTC. BBT. BST. =7
62	D..	BTV. 5.BTC. BBT. BST. =8
63	D..	BFV. 10BTC. BBT. BST. =13
64	D..	BFV. 13.BTC. BBT. BST. =16
65	D..	BFV. 13.BTC. BBT. BST. =16
66	D..	BFV. 7.BTC. BBT BST =10
261/262	D..	BTV. 2.BTC. =3
119/120	D..	BFV. 7.BTC. BBT. BST. =10
123	D..	BTV. 5.BTC. BBT. BST. =8

TRAIN NO.		TRAIN CONSIST
124	D..	BTV. 7.BTC. BBT. BST. =10
125/126	D..	BTV. 5.BTC. BBT. BST. =8
127/128	D..	BTV. 5.BTC. BBT. BST. =8
131/132/133/134	D..	BTV. 5.BTC. BBT. BST. =8
129/130/143/144	D..	BTV. 5.BTC. BBT. =7
147/148	D..	BTV. 4.BTC. =5
149/150	D..	BTV. 4.BTC. =5
169/170	D..	BTV. BBT. 4.BTC =6
175/176	D..	BTV. 11.BTC. =12
346/349 354/353/350/345	D..	BTV. BTC. =2
363/364	D..	BTV. 3.BTC. =4
395/396	D..	BTV. 3.BTC. =4
405/406/407/408	D..	BTV. 4.BTC. =5
415/416/417/418	D..	BTV. BTC =2

Note

ANF : Air-conditioned First Class Day and Night Coach
AFC : Air-conditioned First Class Carriage
ANS : Air-conditioned Second Class Day and Night Coach
ASC : Air-conditioned Second Class Carriage
BNF : Bogie First Class Day and Night Coach
BNS : Bogie Second Class Day and Night Coach
BSC : Bogie Second Class Carriage
BST : Bogie Second and Third Class Carriage
BTC : Bogie Third Class Cariage
BRC : Bogie Restaurant Car
BBT : Bogie Buffet Third Class Carriage
BTV : Bogie Third Class and Van
BFV : Bogie Full Van
BFP : Bogie Postal Van

Appendix 4.4.3 Main Particulars of Diesel Locomotives

ITEM.	TECHNICAL SCHEDULE	NUMBER AND NAME OF LOCOMOTIVES.				
		DIESEL ELECTRIC			DIESEL HYDRAULIC	
		616 — 630 661 — 670	4001 — 4050	4101 — 4154	3001 — 3022	3101 — 3130
		HI.	GE.	ALS.	HE.	KP.
1	LOCOMOTIVE MAKER	HITACHI. JAPAN	GENERALELECTRIC U.S.A	ALSTHOM. FRANCE	HENSCHEL GERMANY	KRUPP GERMANY
2	YEAR IN SERVICE. B.E. (A.D.)	2504 — 2505 (1961)-(1962)	2507 — 2509 (1964) — (1966)	2518 (1975)	2507 (1964)	2512 (1969)
3	WHEEL ARRANGEMENT.	Co — Co	Co — Co	Co — Co	B' — B'	B' — B'
4	OVERALL WIDTH. MM.	2815	2794	2800	2800	2800
5	OVERALL HEIGHT (ABOVE RAIL LEVEL.) MM.	3820	3753	3880	3800	3875
6	LENGTH OVER AUTOMATIC COUPLERS. MM.	14300	16288	16258	12800	12800
7	AUTOMATIC COUPLER HEIGHT (ABOVE RAIL LEVEL) MM.	850	850	850	850	850
8	WHEEL BASE OF ONE BOGIE MM.	3500	3714	3300	2200	2200
9	TOTAL WHEEL BASE MM.	11200	11932	12370	8700	8200
10	DISTANCE BETWEEN BOGIE CENTERS. MM.	9200	8326	9070	6500	6000
11	WHEEL DIAMETER, NEW. MM.	914	914	914	914	914
12	EMPTY WEIGHT. KGS	67250	70178	77500	46500	50500
13	SERVICE WEIGHT. KGS	72000	75000	82500	52000	55000
14	MAXIMUM AXLE LOAD. TONS	12	12.5	13.75	13	13.75
15	GEAR RATO BETWEEN MOTOR AND AXLE(AXLE GEAR)	15 : 76	18 : 93	79 : 18	1 : 3.62	1 : 3.94
16	ENGINE & MODEL.	M.A.N. W8V22/30mA u L	CUMMINS VT12-825 BIVTA-1710-L	S.E.M.T.PIELSTICK 16 PA 4 V.185	MAYBACH MB.12V 493.TY10	MAYBACH MB.12V 652TB10
17	NUBER OF ENGINE / LOCOMOTIVE	1	2	1	1	1
18	CYLINDER X BORE X STROKE MM.	8 X 220 X 300	12V X 139.7 X 152	16V X 185 X 210	12VX 175 X 205	12 V X 190 x 230
19	MAXIMUM OUTPUT & R.P.M. HP@R.P.M	1040 @ 1000	2 X 660@ 2000	2570 @ 1500	1200 @ 1500	1500 @ 1400
20	ENGINE OUT PUT, CONTINUOUS HP.	950	2 X 600	2250	1100	1500
21	MAXIMUM TRACTIVE EFFORT AT WHEEL RIM, KG @% ADHESION WEIGHT	21600@ 30 %	22500 @ 30%	24800@ 30%	17160 @ 33%	18150 @ 33 %
22	MINIMUM CONTINUOUS TRACTIVE EFFORT KGS@KM/H	13140@ 12.76	17963@ 13	20600@20.8	14900@ 11	15250@ 14.5
23	MAXIMUM SPEED. KM/H	70	103	95	90	90
24	BRAKING	AIR ON LOCO. VACUUM ON TRAIN	AIR ON LOCO. VACUUM ON TRAIN	AIR ON LOCO. VACUUM ON TRAIN	AIR ON LOCO VACUUM ON TRAIN	AIR ON LOCO VACUUM ON TRAIN
25	CAPACITY OF FUEL TANK. (PER CAR) L.	3300	3500	3500	3500	3500
26	CAPACITY OF LUBRICATING OIL (PER ENGINE) L.	230	265	450	110	220
27	CAPACITY OF HYDRAULIC OIL (") L.	—	—	—	200	380
28	CAPACITY OF COOLING WATER (") L.	800	303	800	875	850
29	CAPACITY OF SAND BOX (PER CAR) L.	420	500	500	410	450
30	CAPACITY OF AIR COMPRESSOR.	1026L / MIN. AT 430 RPM	2X1614L / MIN. AT 2000 RPM	1299 L / MIN. AT 1500 RPM	810L / MIN AT 2000 RPM	1300L / MIN AT 2000 RPM
31	NUMBER OF BATTERY CELL AND CAPACITY———, AH.	78 , 220	48 , 180	36 , 380	18 , 250	48 , 140
32	TOTAL BATTERY VOLTAGE V.	94 — 110	64 — 75	72	24	64
33	NUMBER OF LOCOS ON ORDER OR SETS FOR DRC (EXISTING LOCOS.)	25(18)	50	54(52)	27	30(29)
34	MINIMUM CURVE RADIUS NEGOTIABLE M.	160	57.9	122	120	80
35	DIAGRAM NUMBER	D 12 / 1	D 14 / 1	D 18	D 15/1	D 17

Appendix 4.4.4 Hauling Capacities by Line

(1) Northern Line

		Bangkok	Sila At	Ban Dan	Den Chai	Nakhon Lampang	Hang Chat	Lamphung	Chiang Mai
Effective Length of Track in the Station (m)		500	450						400
Passenger (ton)	Alsthom	720	600	600	720	500	720		
	G. E	600	520	520	600	440	600		
	Krupp	600	440/480	400	600	360	600		
	Henschel	560	400/440	360	560	320	560		
	Hitachi	420	260/300	240	420	200	420		
Freight (ton)	Alsthom	1280	600	600	1280	500	1280		
	G. E	1200	520	520	1200	440	1200		
	Krupp	1200	480/520	440	1200	400	1200		
	Henschel	900	400/440	400	900	320	900		
	Hitachi	820	260/300	260	820	240	820		

(2) Northeastern Line

		Bangkok	Kaeng Khoi	Map Kabao	Pak Chong	Nakhon Ratchasima	Ubon Ratchathani	Kaeng Khoi	Khok Khli	Bamnet Narong	Bua Yai	Nakhon Ratchasima	Nong Khai
Effective Length of Track in the Station (m)		500						500				500	
Passenger (ton)	Alsthom	720	560 / 720	560 / 720	720	720	720	720	720	720		720	
	G. E	600	480 / 520	480 / 520	560	560	560	560	560	560		560	
	Krupp	600	480 / 520	480 / 520	560	560	560	560	560	560		560	
	Henschel	560	440 / 480	440 / 480	520	520	520	480 / 560	560			520	
	Hitachi	420	300 / 320	300 / 320	380	380	380	320 / 360	420			380	
Freight (ton)	Alsthom	1280	680 / 1200	560 / 850	1280	1280	1280	1000	1280			1280	
	G. E	1200	600 / 900	520 / 640	960	1060	1200	800 / 840	1200			1060	
	Krupp	1200	520 / 960	520 / 640	960	1060	1200	800 / 840	1200			1060	
	Henschel	900	440 / 720	440 / 560	800	800	900	600 / 680	900			800	
	Hitachi	660	320 / 420	320 / 420	660	660	660	420 / 440	820			660	

(3) Eastern Line

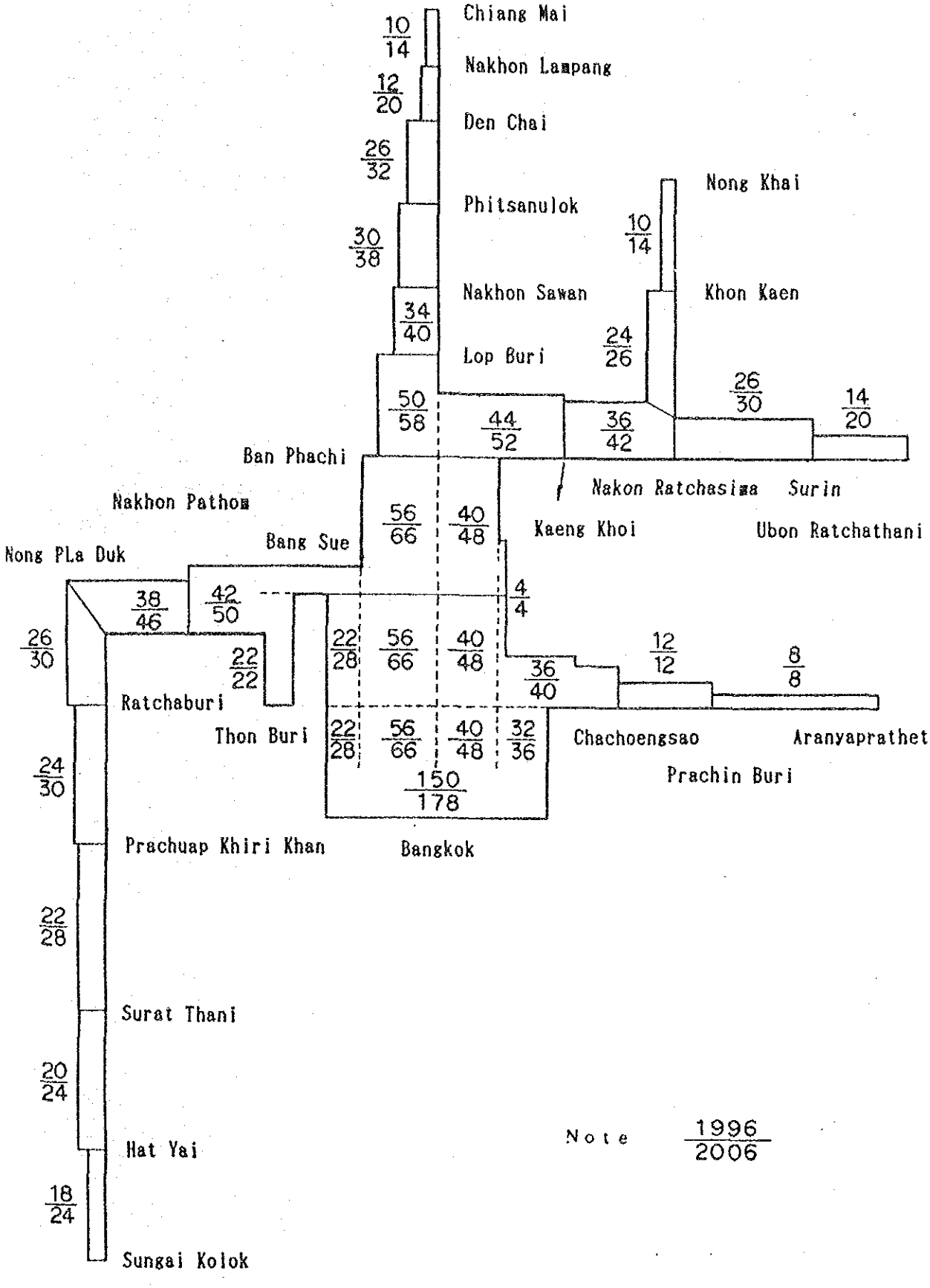
		Bangkok	Chachoengsao	Prachin Buri	Kabin Buri	Aranyaprathat
Effective Length of Track in the Station (m)		←	500	430	300	430 →
Passenger (ton)	Alsthom	720				
	G. E	600				
	Krupp	600				
	Henschel	560				
	Hitachi	420				
Freight (ton)	Alsthom	1280				
	G. E	1200				
	Krupp	1200				
	Henschel	900				
	Hitachi	820				

(4) Southern Line

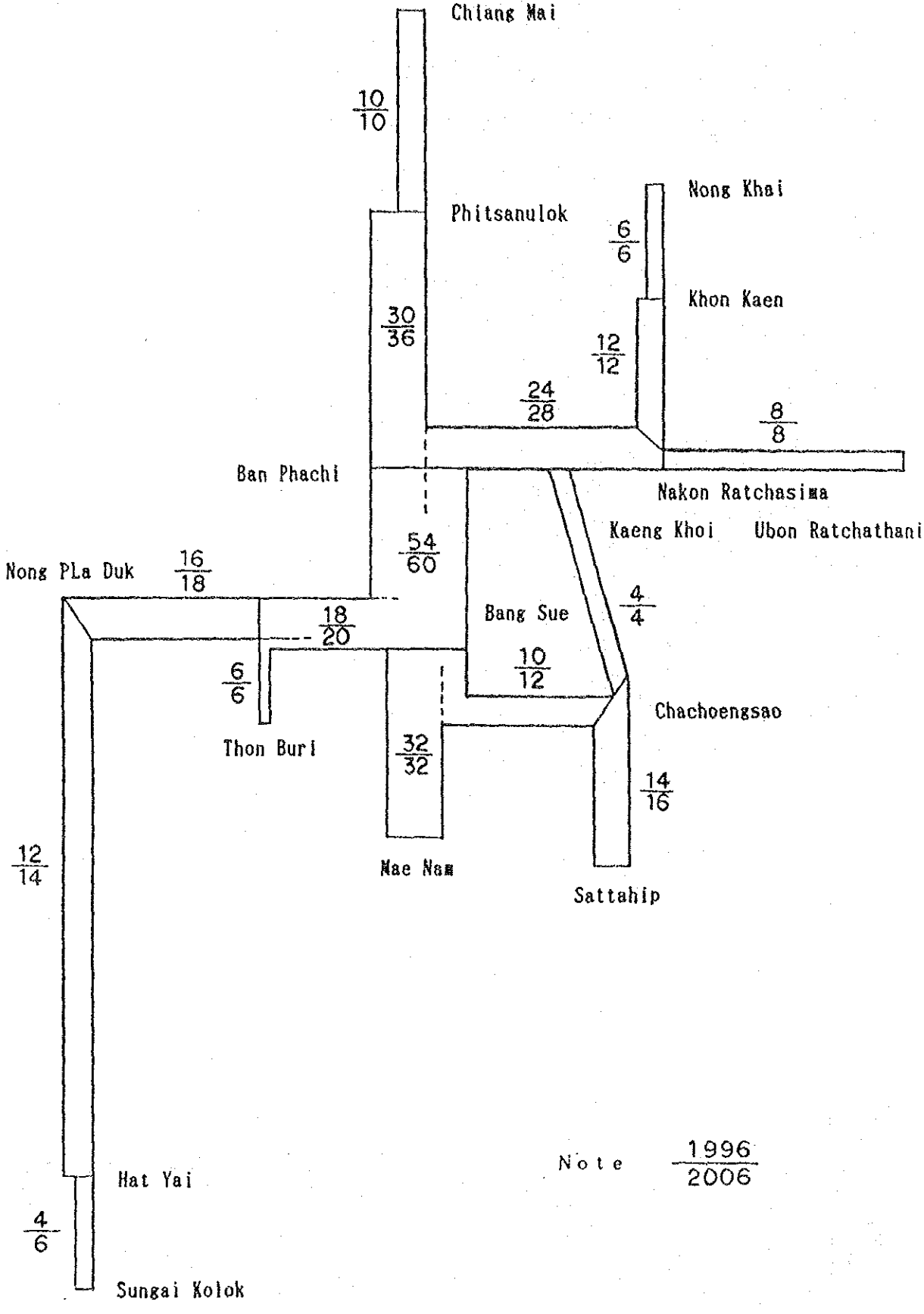
		Bang Sue / Thon Buri	Bang Saphan Yai	Chumphon	Thung Song	Ron Phibun	Hat Yai	Na Muang	Wat Khuan Mit	Yala	Sungkai Koluk
Effective Length of Track in the Station (m)		← 500					← 400			→ 250	
Passenger (ton)	Alsthom	720	720	720	720/600	720	720	720	720	720	
	G. E	620	620	620	560	600	600	560	600	600	
	Krupp	600	600	600	560	600	600	560	600	600	
	Henschel	560	560	560	520	560	560	520	560	560	
	Hitachi	420	420	420	380/360	420	420	360	420	420	
Freight (ton)	Alsthom	1280	1200	1280	1200/600	1280	1280	850/1000	1280	1280	
	G. E	1200	1060	1200	1100/560	1200	1200	760/900	1200	1200	
	Krupp	1200	1060	1200	1100/560	1200	1200	690/800	1200	1200	
	Henschel	900	900	900	900/520	900	900	800/700	900	900	
	Hitachi	820	660	660	660/360	820	820	420/480	820	660	

Appendix 4.4.5 Number of Trains by Section

(1) Passenger Train



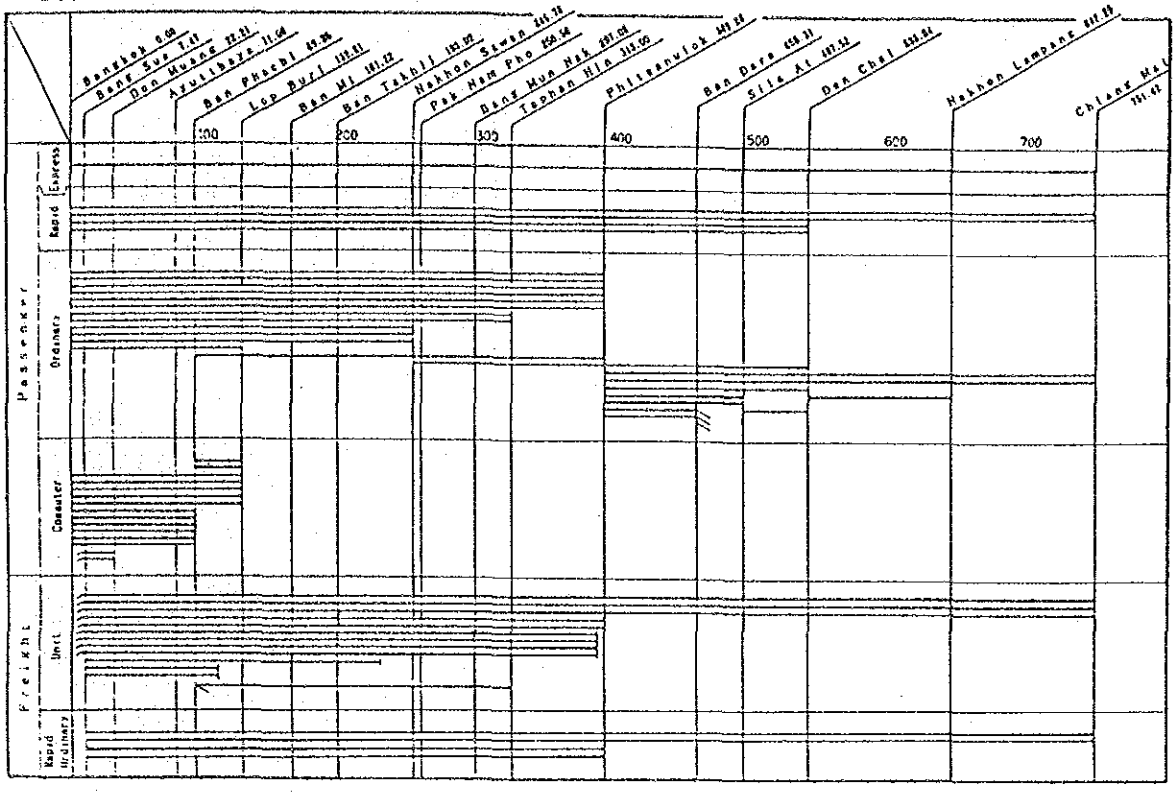
(2) Freight Train



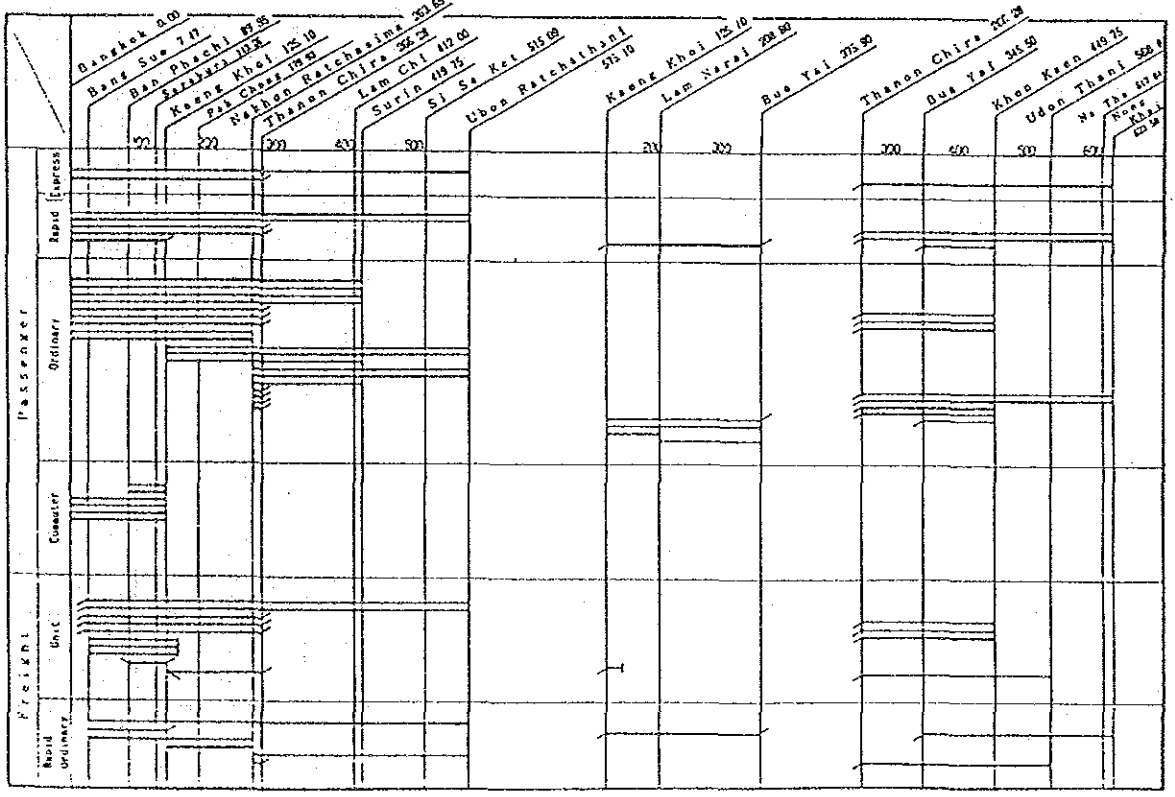
Appendix 4.4.6 Train Operation Section

(1) FY 1996

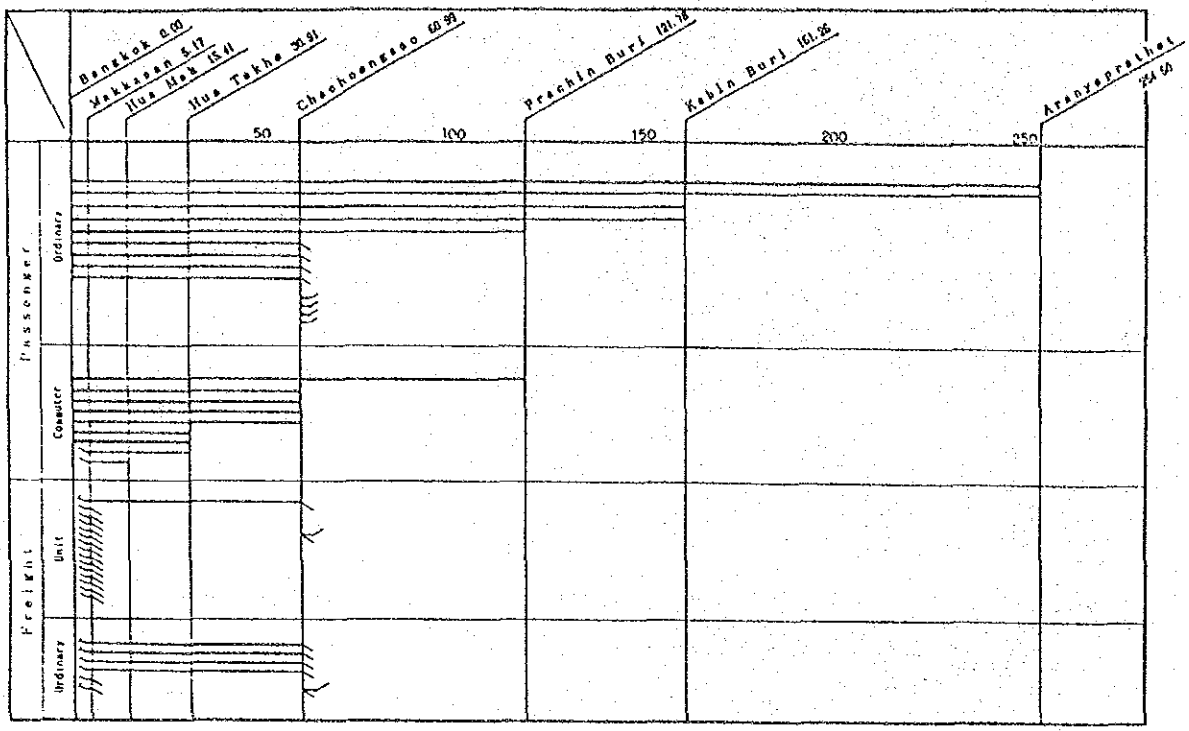
Northern Line



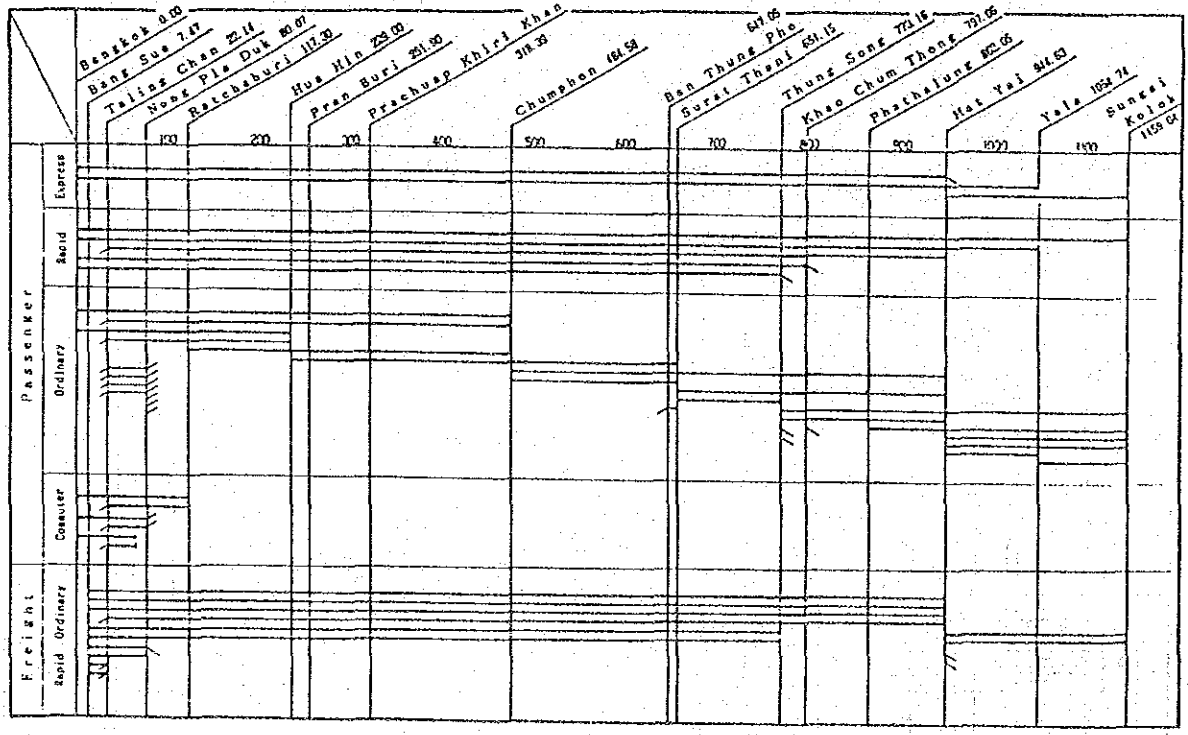
Northeastern Line



Eastern Line

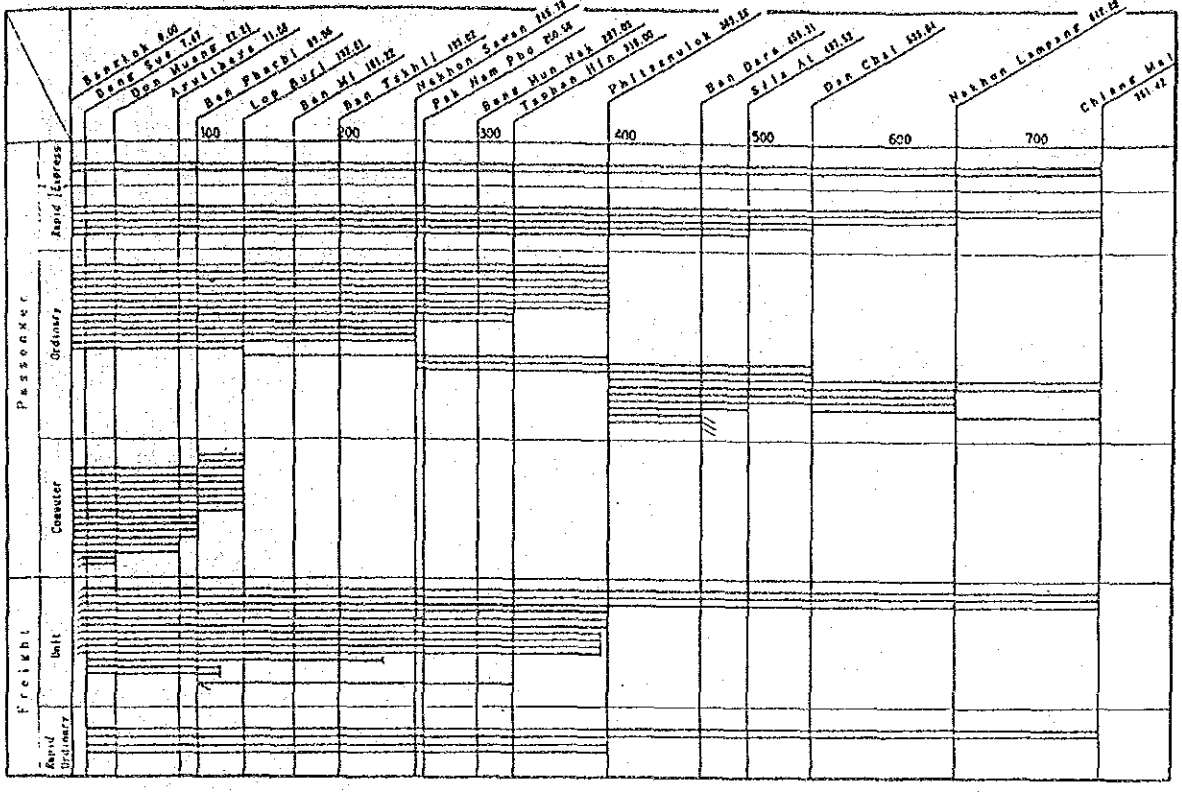


Southern Line

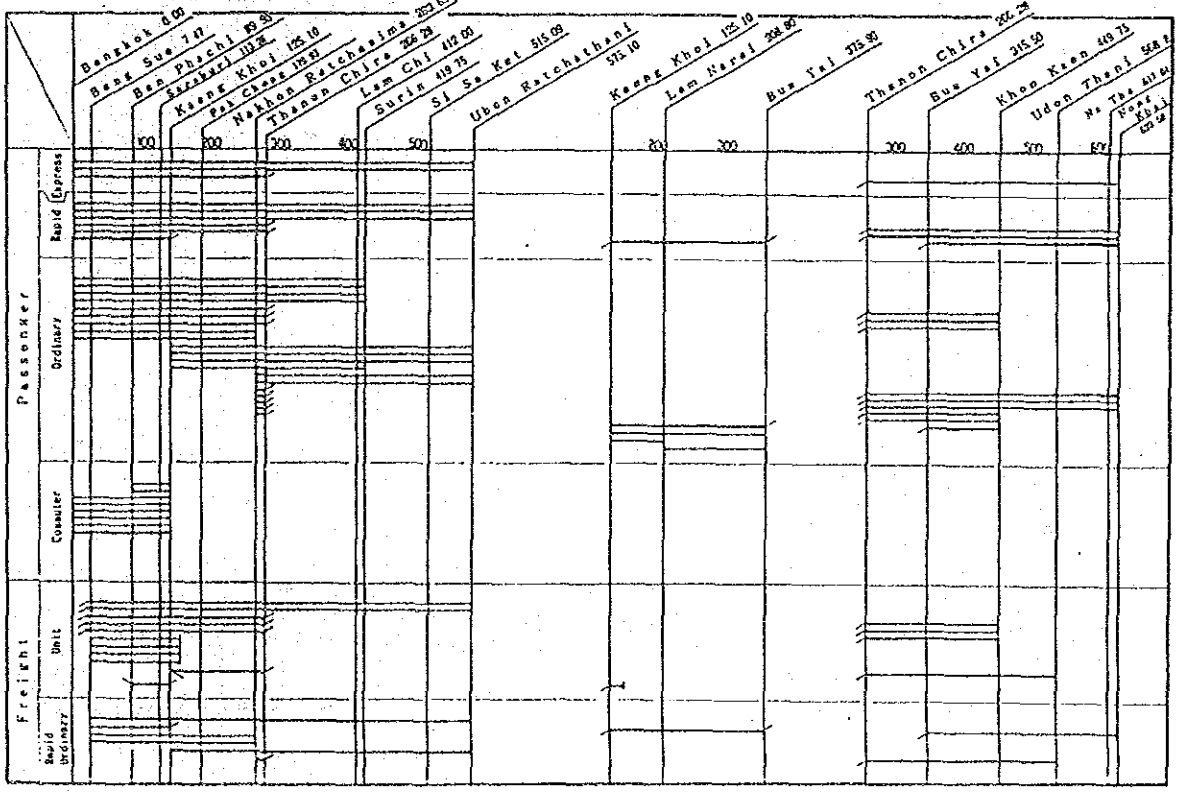


(2) FY 2006

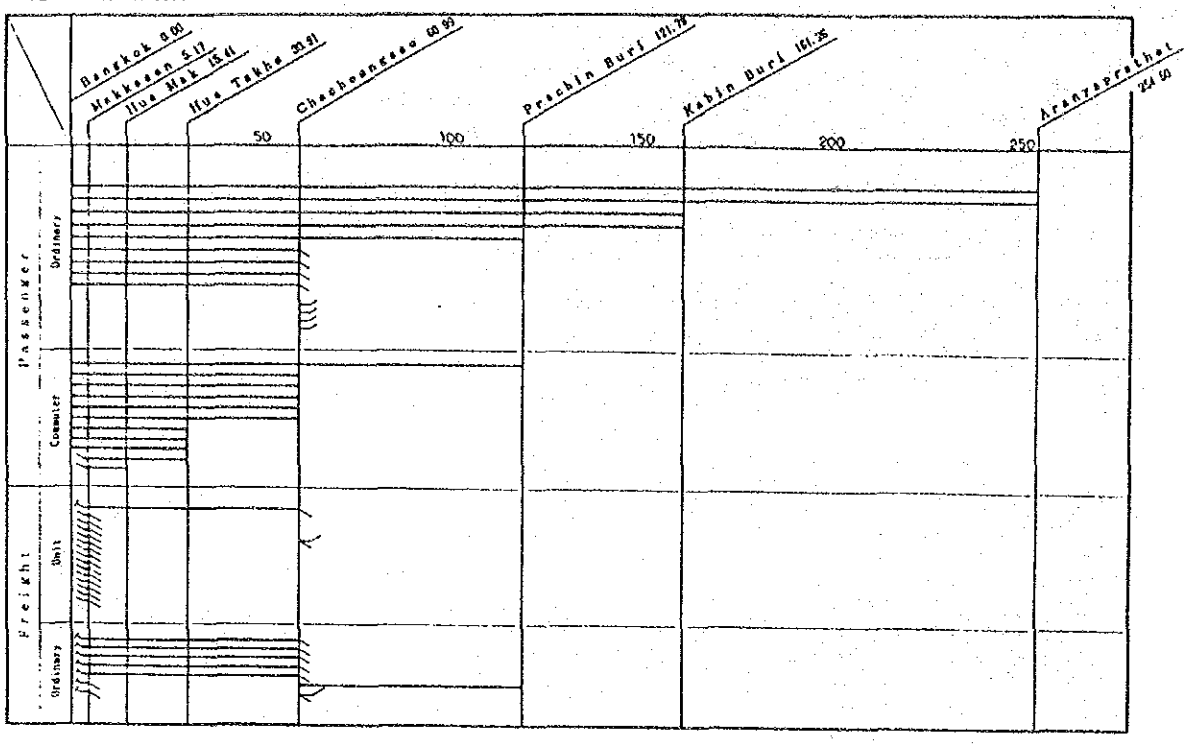
Northern Line



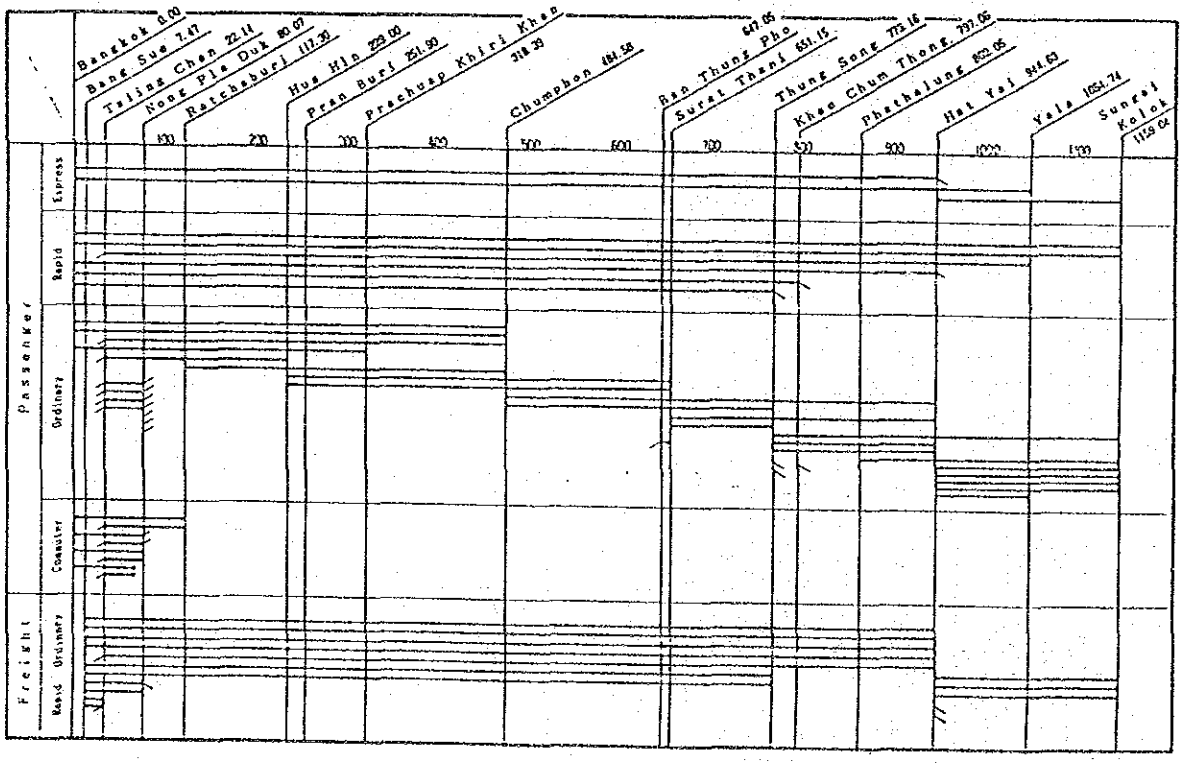
Northeastern Line



Eastern Line

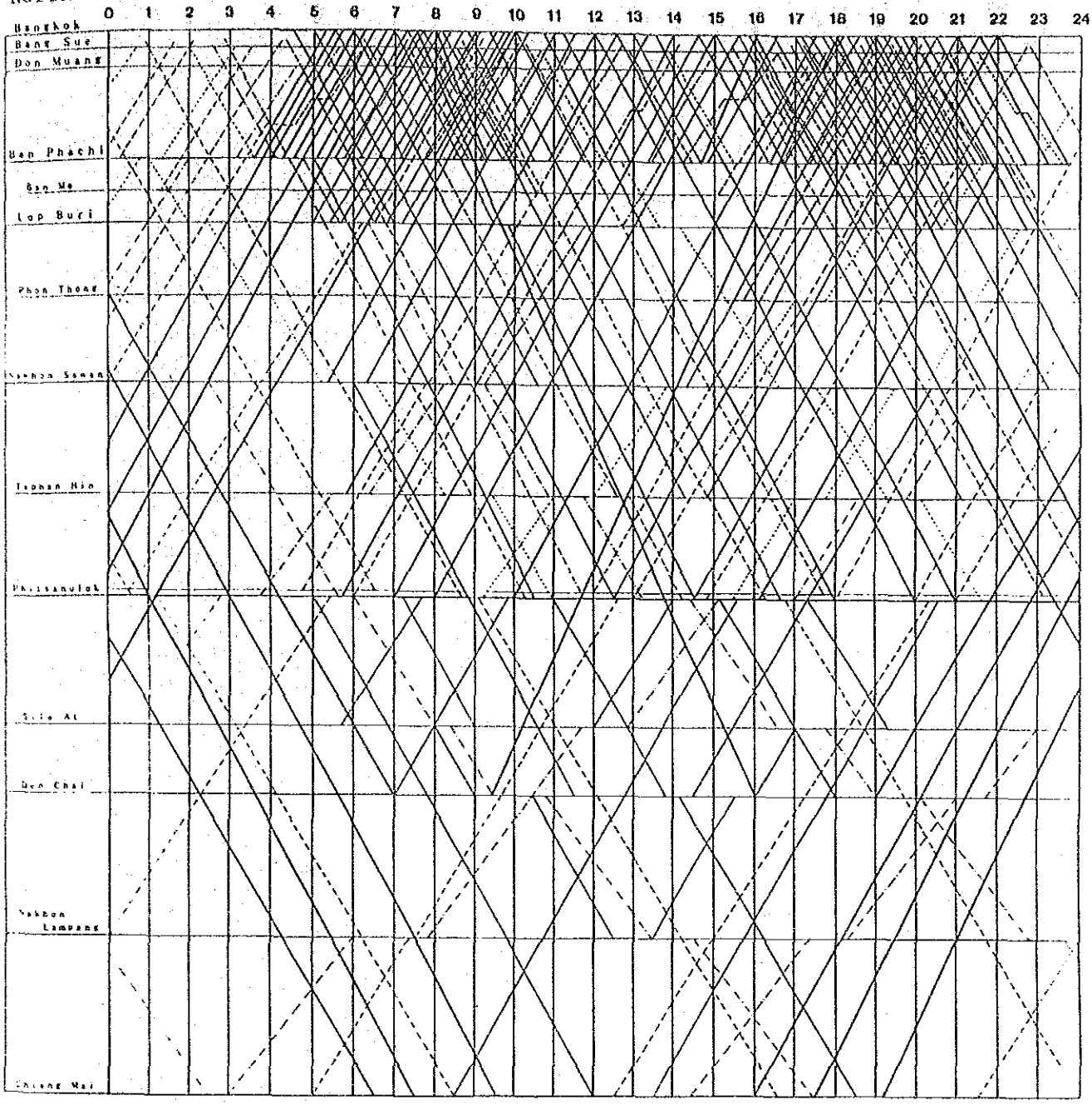


Southern Line

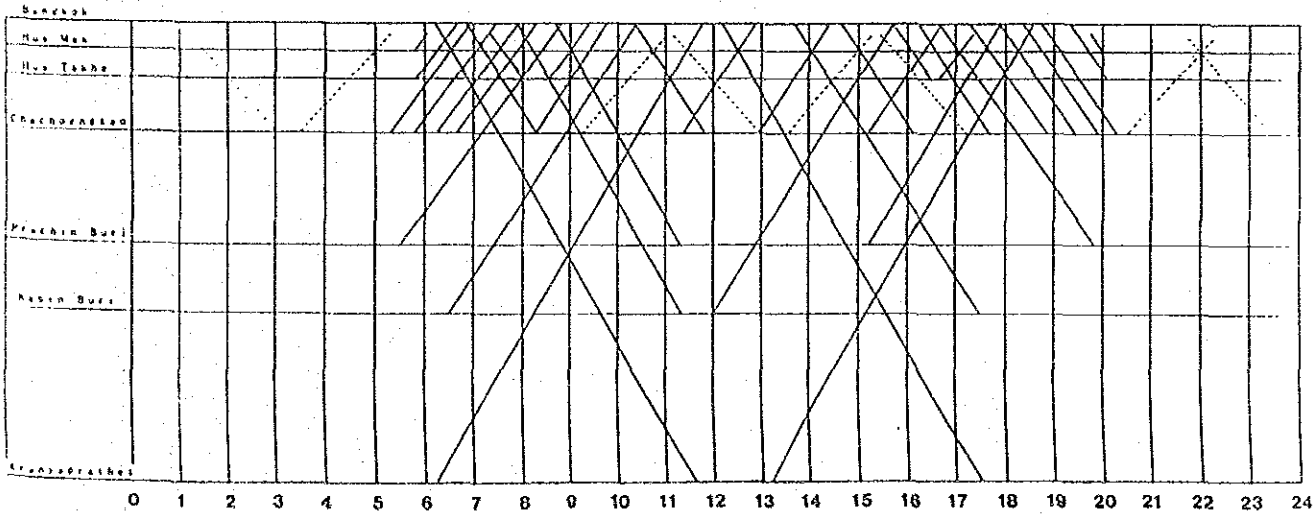


Appendix 4.4.7 Train Diagram (FY 1996)

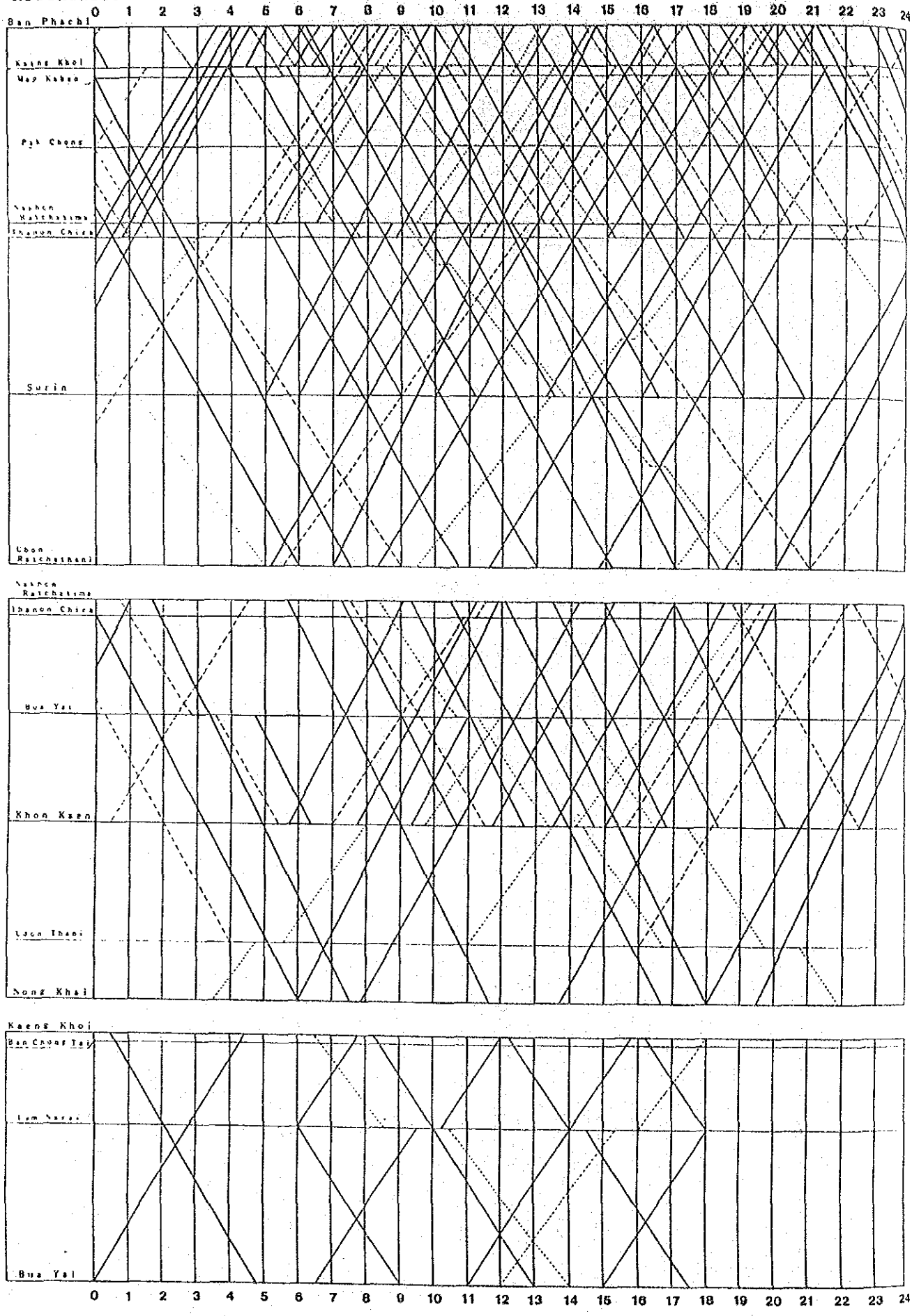
Northern Line



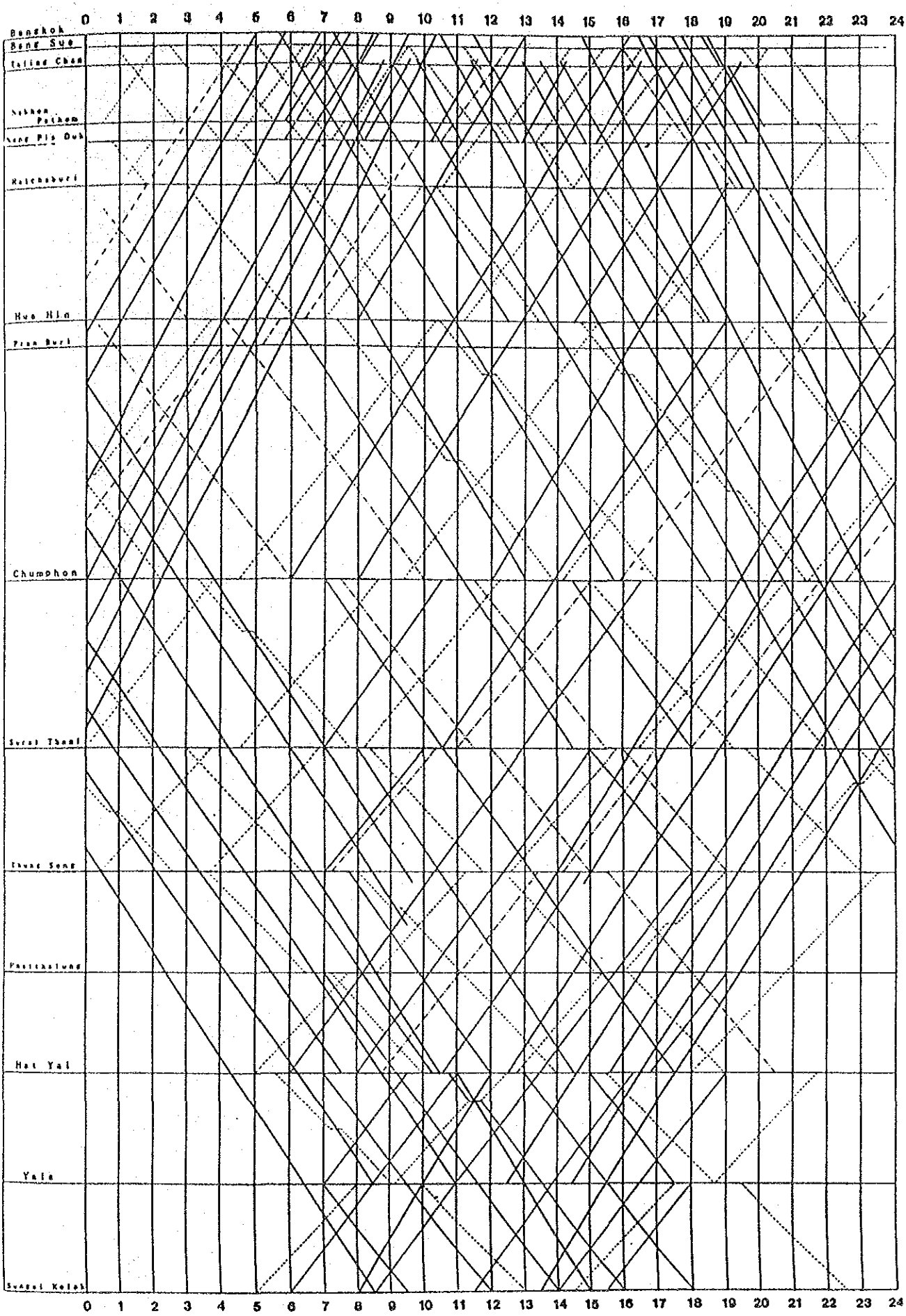
Eastern Line



Northeastern Line



Southern Line

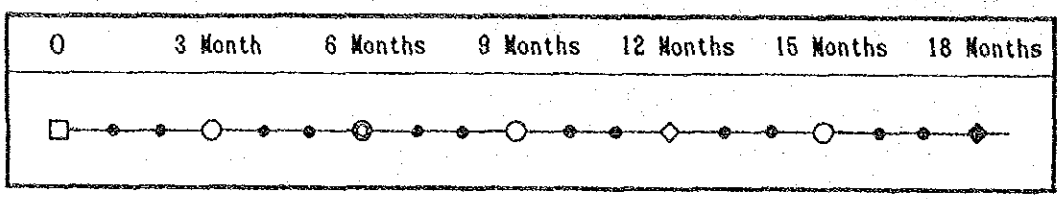


Appendix 4.4.8 Ban Phachi Car Base Plan

As described in section 4-4-3, increasing the number of DRCs to approximately 780 requires at least one car base be newly constructed because the present bases will not be able to cope.

There are presently 204 DRCs kept and managed at Bangkok, Nakhon Ratchasima, Thon Buri and Uttaradit.

The period for car inspection is as shown in Fig. 1. The number of cars requiring inspection and the capacities of facilities have been calculated as shown in Table 1, under the assumption that the present inspection system remains unchanged in the future.



Note
□ : Overhaul (6 Years)
● : 1 Month Inspection
○ : 3 Months Inspection
◎ : 6 Months Inspection
◇ : 12 Months Inspection
◈ : 18 Months Inspection

Fig. 1 Inspection Period

Table 1 Number of Cars Requiring Inspection and Capacities of Facilities

	Number of Cars	Capacities
1 month	18	15
3 months	5	8
6 months	3	4
12 months	1	3
18 months	1	8
Total	28	38

The following formula was used for the calculation of the capacities of facilities.

$$A = \frac{N}{T} \cdot \beta \cdot \gamma \cdot D$$

A: Scale of inspection lines (No. of cars)

N: Number of cars

T: Number of days for inspection period

β: Duplication coefficient of superior inspection

$$\beta = 1 - \frac{\text{Number of days for the concerned inspection period}}{\text{Number of days for superior inspection}}$$

γ: Actual operation and fluctuation ratios

$$\gamma = \frac{365}{\text{Number of days operated}} \times \text{fluctuation ratio}$$

D: Number of days for inspection

(Where the number of days operated is 260, at a fluctuation ratio of 20%)

Accordingly, the number of cars for inspection is 28 per day, but it is necessary to have inspection facilities with a 38-car capacity. Because of this, the inspections are to be divided between each of the car bases as shown in Table 2, with the bases having the facility performances shown in Table 3.

Table 2 Kinds of Inspection and Number of Cars Assigned

	1 month	3 months	6 months	12 months	18 months
Bangkok	○	○	○	○	○
Nakhon Ratchasima	○				
Thon Buri	○				
Uttaradit	○				
Thung Song (Chumphon)	○				
Ban Phachi	○	○	○	○	○

Table 3 Capacities of Facilities

	1 month	3 months	6 months	12 months	18 months	Total	Number of cars
Bangkok	5	4	2	2	4	17	300
Nakhon Ratchasima	2					2	100
Thon Buri	1					1	30
Uttaradit	1					1	20
Thung Song (Chumphon)	1					1	30
Ban Phachi	5	4	2	1	4	16	300
Total	15	8	4	3	8	38	780

In other words, in addition to the various inspections for cars assigned to its base, the Bangkok base also has to perform 3-month or more superior inspections for the cars assigned to Thon Buri and Thung Song or Chumphon.
At the new base of Ban Phachi, in addition to the various inspections for cars assigned to it, there are also 3-month or more superior inspections for cars assigned to Nakhon Ratchasima and Uttaradit.
The scale of the base at Ban Phachi is such that there are three inspection tracks for six-car formations (to be increased to eight in the future), as well as one track for repairs. There is also a yard facility that can store 180 carriages.
The reasons for selecting Ban Phachi are the following.

(1) It is a branching point between the Northern and Northeastern Lines.

(2) It is a terminus of double-tracked sections.

(3) It is near Lop Buri and Kaeng Khoi, that is, an originating/terminating station for commuter trains.

(4) The storage tracks at Ban Phachi Station can be used.

(5) Site for construction can be readily available.

The required facilities and investment amount are as follows:

(1) Required facilities

1) Track facilities

Table 4 Number of Tracks and Effective Length

Track Name	Number of Tracks	Effective Length	Track Number
Repair tracks	1	310 m	R1
Regular inspection track	3	300 - 310 m	R1.1 - R1.3
Washing and lubrication tracks	2	270, 300 m	W1, W2
Daily inspection and lubrication tracks	2	270 m	D1, D2
Washing tracks	1	180 m	W3
Assembly tracks	1	330 m	C1
Storage tracks	19	60 - 260 m	S1 - S19

2) Buildings

a) Depot office: 640 m^2

b) Inspection shed: Length 126 m (166 m in the future)

c) Workplace: 350 m^2

d) Warehouse and other facilities: 100 m^2

3) Lubrication facilities:

4) Water supply and discharge facilities:

5) Machine facilities:

6) Lighting and power facilities

7) Telecommunications facilities

Moreover, the track layout within the yard is shown in Fig. 2.

(2) Facility investment 400 million bahts

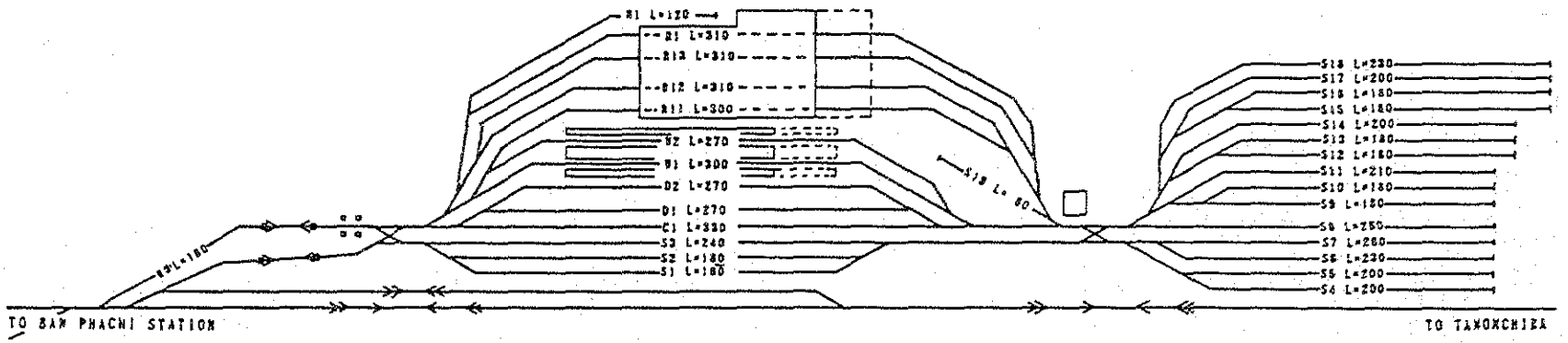


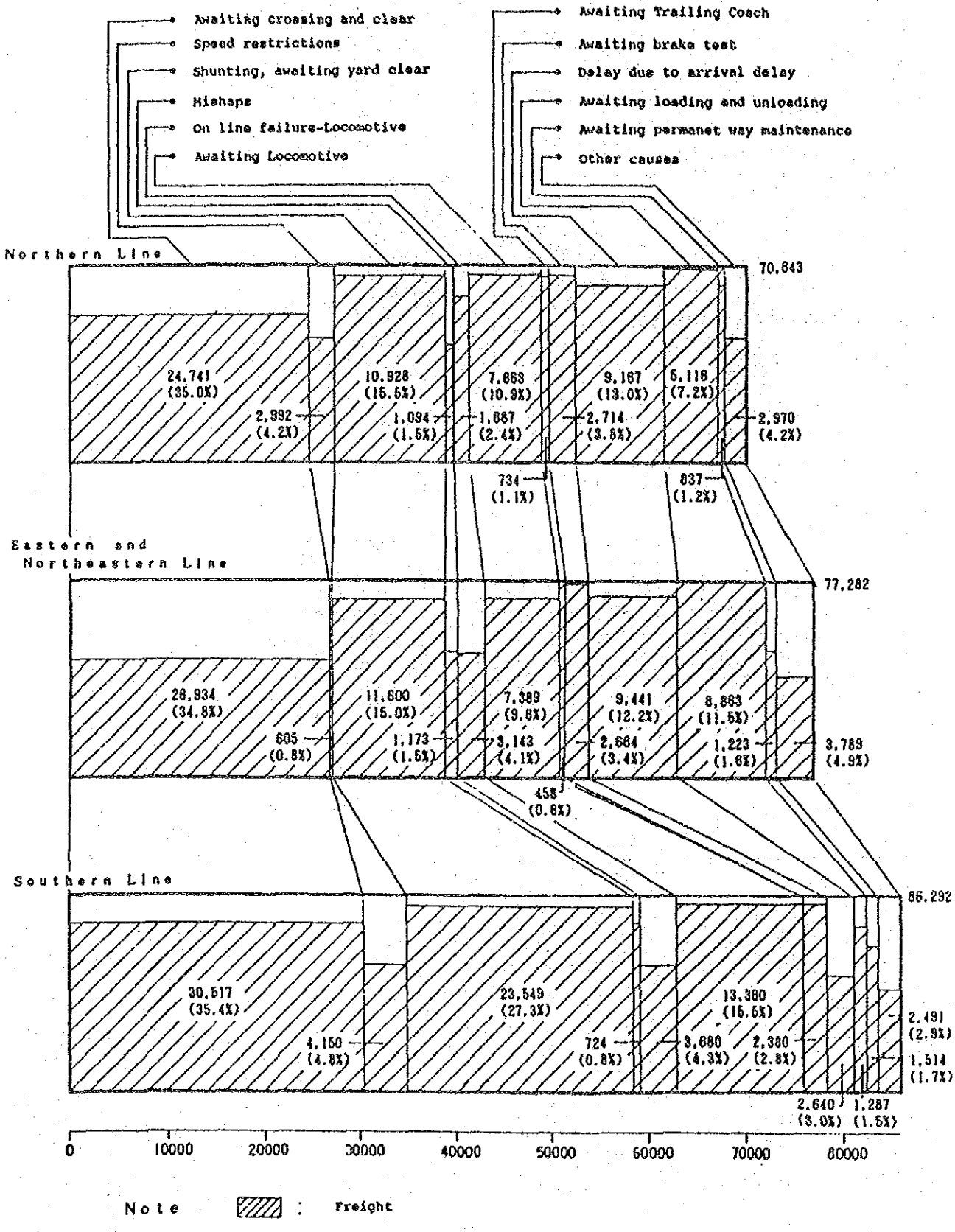
Fig. 2 Ban Phachi Car Base Track Layout

Appendix 4.4.9 Main Facilities of Car Bases

Inspection Facilities	Inspection Track Inspection Shed Inspection Pit Electric Power Supply Divice Compressed Air Duct
Lifting Machines	Ceiling Crane Lifting Jack Monorail Crane Drop-pit Jack Forklift
Machines for Inspection and Repair	Multi-purpose Machine Lathe Drilling Machine Grinding Machine Parts Cleaning Machine Nozzle Tester
Electrical Machines	Generator Tester Electric Welding Machine AC-DC Converter Air Compressor
Others	Oil Supply Device Water Supply Device Car Washing Device Waste Oil Disposal Device Water Cleaning Device Ventilator Boiler Lighting Equipment Telecommunication Equipment

Appendix 4.4.10 Train Delay Time by Cause

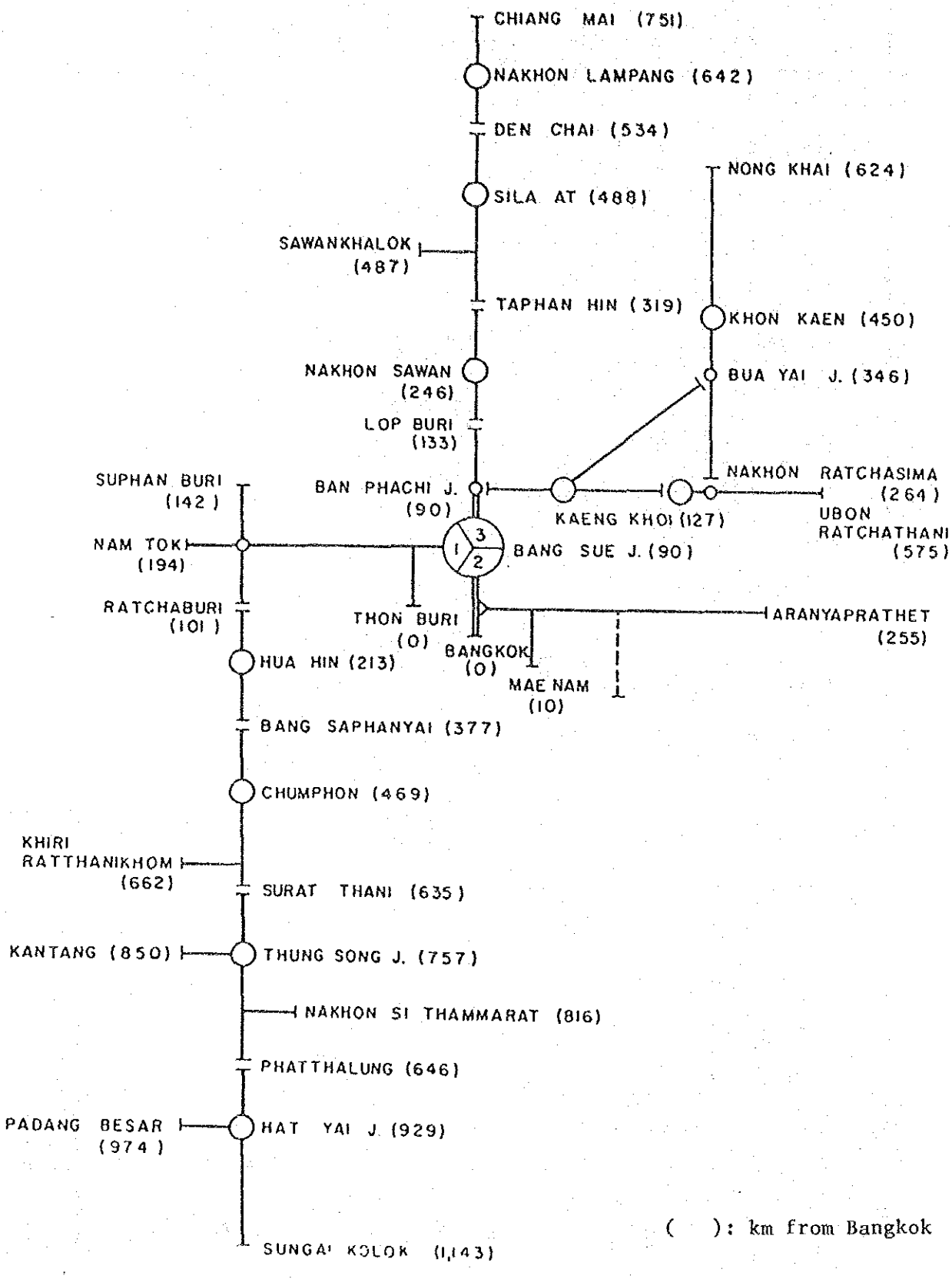
Train Delay Time (Oct. 20 - Nov. 9, 1985)



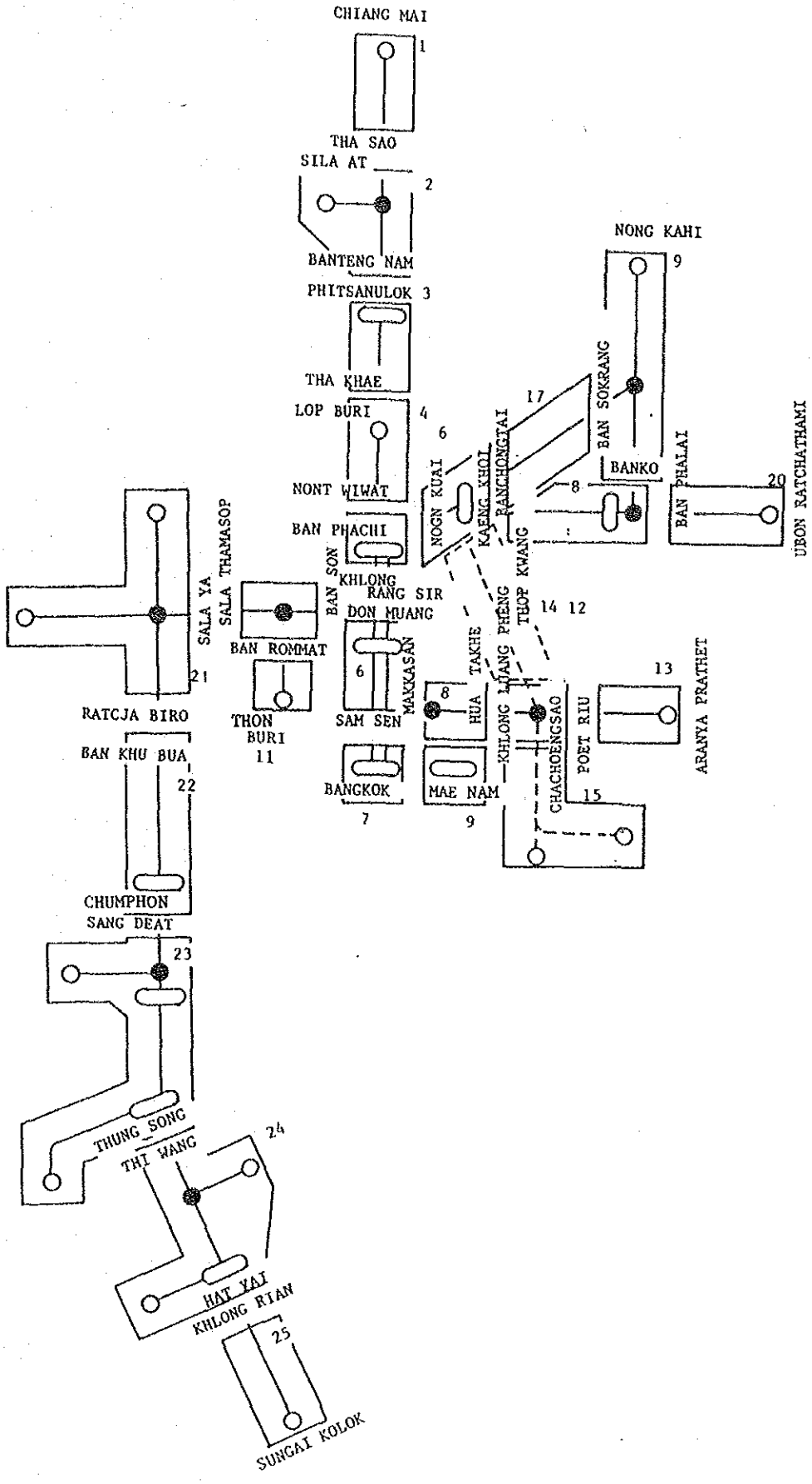
Appendix 4.4.11 Train Accident by Cause

Causes	Oct.1984-Sep.1985 A	Oct.1983-Sep.1984 B	Difference A−B
General Causes			
Train Derailment	44	41	3
Car Derailment	93	72	21
Train Crash to PMC	5	5	−
Train Crash to Auto	144	97	47
Damaged Locomotives	1,949	1,905	44
Thrown to Locomotives	379	333	46
Crash to Animals	191	223	−32
Car Crash Crossing Protection	428	337	91
Train Cutting Off	13	21	− 8
Fired at Car,Bridge etc	24	14	10
Damaged Rail	106	109	− 3
Flood,earth and stone tumbled down to Track,dilapidated Bridge	15	11	4
Important Causes			
Loco. Crash	−	3	− 3
Loco. Derailment	−	1	− 1
Loco. Crash to Auto	−	6	− 6
Serious Causes			
Loco. Crash	−	1	− 1
Loco. Derailment	−	−	−
Sabotage	−	−	−
Total	3,391	3,179	212

Appendix 4.4.12 Train Dispatching System



Appendix 5.2.1 Zoning



Appendix 5.2.2-(1) Total OD for 1996

Unit: car/day

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	0.7	0.1	2.0	0.0	0.0	0.4	0.0	0.0	4.0	1.0	0.0	0.0	0.1	0.0	4.5	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.8	1.7	2.1	17.9
2	0.6	0.2	2.4	0.0	0.1	0.3	0.0	0.0	5.0	0.5	0.1	0.0	0.1	0.1	5.2	0.0	0.0	0.0	0.1	0.0	0.2	0.2	1.2	3.5	4.6	24.5
3	5.0	0.7	3.2	0.2	0.3	31.5	0.0	8.8	231.3	0.0	6.0	0.0	0.1	0.2	23.1	0.2	20.2	0.1	0.2	0.4	0.5	0.3	1.3	5.4	7.0	346.2
4	0.3	0.0	0.4	0.0	0.0	70.0	0.0	1.1	0.1	0.0	2.8	0.0	0.3	0.1	4.7	0.0	0.8	0.5	1.9	2.2	1.0	0.0	0.1	0.1	0.1	86.3
5	0.4	0.0	0.6	0.0	0.0	0.0	0.0	1.8	0.2	0.0	4.6	0.1	0.4	0.1	7.2	0.0	1.4	0.8	3.2	3.6	1.5	0.0	0.1	0.1	0.1	26.3
6	2.2	0.7	1.5	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.8	0.3	7.4	0.1	0.2	0.2	1.4	2.2	1.5	3.2	5.9	5.7	6.0	39.8
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	3.2	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3
9	68.0	7.0	34.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.8	0.0	0.0	0.0	2.0	2.0	65.4	35.0	2.0	0.9	2.6	5.7	7.1	233.5
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.0	2.1
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.1	0.5	2.7	4.6	5.6	16.4
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
13	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
14	0.2	0.0	0.3	0.0	0.0	0.0	0.0	1.0	0.1	0.0	2.3	0.0	0.2	0.1	3.6	0.0	0.7	0.4	1.5	1.8	0.8	0.0	0.0	0.1	0.1	13.3
15	8.5	2.1	6.9	0.7	0.7	31.5	0.0	0.1	2.0	0.1	13.8	0.0	0.1	0.4	0.0	0.4	4.0	1.4	8.0	11.9	1.7	2.2	11.8	13.1	14.6	135.9
16	0.3	0.0	0.4	0.0	0.0	4.8	0.0	1.1	0.1	0.0	2.8	0.0	0.3	0.1	4.3	0.0	0.8	0.5	1.9	2.2	1.0	0.0	0.1	0.1	0.1	20.8
17	0.2	0.0	0.3	0.1	0.1	0.0	0.0	0.8	0.7	0.0	2.0	0.0	0.2	0.1	12.7	0.1	0.7	0.4	1.5	1.6	0.9	0.2	0.4	0.4	0.5	24.0
18	0.2	0.0	0.3	0.0	0.0	86.5	0.0	0.8	0.5	0.0	2.0	0.0	0.2	0.1	7.4	0.0	0.6	0.4	1.5	1.6	0.8	0.1	0.2	0.3	0.4	103.9
19	0.1	0.1	0.7	0.0	0.0	0.6	0.0	0.0	4.8	0.1	0.0	0.0	0.0	0.0	23.5	0.0	0.1	0.1	0.2	0.1	0.5	0.4	1.3	2.6	3.2	38.2
20	0.1	0.0	0.1	0.1	0.1	0.8	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.1	16.4	0.1	0.2	0.1	0.1	0.2	0.7	0.9	1.1	4.7	6.2	39.3
21	0.0	0.0	0.7	0.2	0.3	5.0	0.0	0.0	3.3	1.3	2.4	0.0	0.0	0.1	3.2	0.2	0.1	0.1	0.0	0.0	0.4	0.4	1.0	4.3	5.6	28.5
22	1.0	0.5	1.3	0.1	0.1	5.0	0.0	0.0	4.9	1.0	2.4	0.0	0.0	0.0	2.1	0.0	0.3	0.1	0.6	0.2	3.2	0.7	1.3	3.7	4.7	33.0
23	1.3	0.3	1.0	0.1	0.2	2.6	0.0	0.0	15.0	2.4	4.8	0.0	0.0	0.1	3.2	0.1	0.9	0.6	1.0	0.7	3.0	2.9	7.5	13.0	15.7	76.2
24	0.4	0.1	0.3	0.0	0.1	1.5	0.0	0.0	6.1	0.6	2.6	0.0	0.0	0.0	1.5	0.0	0.2	0.1	0.2	0.2	0.7	0.7	1.8	3.8	4.8	25.6
25	0.1	0.0	0.1	0.0	0.0	1.3	0.0	0.0	1.9	0.1	2.1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	1.4	1.8	10.4
26	89.6	11.8	57.4	1.6	2.2	241.9	0.0	15.6	287.4	6.8	50.6	0.7	6.9	2.7	135.6	1.3	33.3	7.9	89.1	64.2	20.7	13.8	41.2	74.5	90.3	1347.1

Appendix 5.2.2-(2) Direct Car 1996

Unit: Car/day

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1																										
2																										
3						30.0			230.0								20.0									280.0
4						70.0																				70.0
5																										
6																										
7																										
8																										
9	65.0		35.0																65.0	35.0						200.0
10																										
11																										
12																										
13																										
14																										
15						32.0																				32.0
16																										
17																										
18						83.0																				83.0
19															21.0											21.0
20																										
21																										
22																										
23																										
24																										
25																										
26	65.0		35.0			215.0			230.0						21.0		20.0		65.0	35.0						686.0

Appendix 5.2.2-(3) OD of Requiring/Uncoupling for 1996

Unit: car/day

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	0.7	0.1	2.0	0.0	0.0	0.4	0.0	0.0	4.0	1.0	0.0	0.0	0.1	0.0	4.5	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.8	1.7	2.1	17.9
2	0.6	0.2	2.4	0.0	0.1	0.3	0.0	0.0	5.0	0.5	0.1	0.0	0.1	0.1	5.2	0.0	0.0	0.0	0.1	0.0	0.2	0.2	1.2	3.5	4.6	24.5
3	5.0	0.7	3.2	0.2	0.3	1.5	0.0	8.8	1.3	0.0	6.0	0.0	0.1	0.2	23.1	0.2	0.2	0.1	0.2	0.4	0.5	0.3	1.3	5.4	7.0	66.2
4	0.3	0.0	0.4	0.0	0.0	0.0	0.0	1.1	0.1	0.0	2.8	0.0	0.3	0.1	4.7	0.0	0.8	0.5	1.9	2.2	1.0	0.0	0.1	0.1	0.1	16.3
5	0.4	0.0	0.6	0.0	0.0	0.0	0.0	1.8	0.2	0.0	4.6	0.1	0.4	0.1	7.2	0.0	1.4	0.8	3.2	3.6	1.5	0.0	0.1	0.1	0.1	26.3
6	2.2	0.7	1.5	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.8	0.3	7.4	0.1	0.2	0.2	1.4	2.2	1.5	3.2	5.9	5.7	6.0	39.8
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	3.2	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	4.3
9	3.0	7.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.8	0.0	0.0	0.0	2.0	2.0	0.4	0.0	2.0	0.9	2.6	5.7	7.1	33.5
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.0	2.1
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.1	0.5	2.7	4.6	5.6	16.4
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
13	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6
14	0.2	0.0	0.3	0.0	0.0	0.0	0.0	1.0	0.1	0.0	2.3	0.0	0.2	0.1	3.6	0.0	0.7	0.4	1.5	1.8	0.8	0.0	0.0	0.1	0.1	13.3
15	8.5	2.1	6.9	0.7	0.7	-0.5	0.0	0.1	2.0	0.1	13.8	0.0	0.1	0.4	0.0	0.4	4.0	1.4	8.0	11.9	1.7	2.2	11.8	13.1	14.6	103.9
16	0.3	0.0	0.4	0.0	0.0	4.8	0.0	1.1	0.1	0.0	2.8	0.0	0.3	0.1	4.3	0.0	0.8	0.5	1.9	2.2	1.0	0.0	0.1	0.1	0.1	20.8
17	0.2	0.0	0.3	0.1	0.1	0.0	0.0	0.8	0.7	0.0	2.0	0.0	0.2	0.1	12.7	0.1	0.7	0.4	1.5	1.6	0.9	0.2	0.4	0.4	0.5	24.0
18	0.2	0.0	0.3	0.0	0.0	3.5	0.0	0.8	0.5	0.0	2.0	0.0	0.2	0.1	7.4	0.0	0.6	0.4	1.5	1.6	0.8	0.1	0.2	0.3	0.4	20.9
19	0.1	0.1	0.7	0.0	0.0	0.6	0.0	0.0	4.8	0.1	0.0	0.0	0.0	0.0	2.5	0.0	0.1	0.1	0.2	0.1	0.5	0.4	1.3	2.6	3.2	17.2
20	0.1	0.0	0.1	0.1	0.1	0.8	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.1	16.4	0.1	0.2	0.1	0.1	0.2	0.7	0.9	1.1	4.7	6.2	39.3
21	0.0	0.0	0.7	0.2	0.3	5.0	0.0	0.0	3.3	1.3	2.4	0.0	0.0	0.1	3.2	0.2	0.1	0.1	0.0	0.0	0.4	0.4	1.0	4.3	5.6	28.4
22	1.0	0.5	1.3	0.1	0.1	5.0	0.0	0.0	4.9	1.0	2.4	0.0	0.0	0.0	2.1	0.0	0.3	0.1	0.6	0.2	3.2	0.7	1.3	3.7	4.7	33.1
23	1.3	0.3	1.0	0.1	0.2	2.6	0.0	0.0	15.0	2.4	4.8	0.0	0.0	0.1	3.2	0.1	0.9	0.6	1.0	0.7	3.0	2.9	7.5	13.0	15.7	76.2
24	0.4	0.1	0.3	0.0	0.1	1.5	0.0	0.0	6.1	0.6	2.6	0.0	0.0	0.0	1.5	0.0	0.2	0.1	0.2	0.2	0.7	0.7	1.8	3.8	4.8	25.6
25	0.1	0.0	0.1	0.0	0.0	1.3	0.0	0.0	1.9	0.1	2.1	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	1.4	1.8	10.4
26	24.6	11.8	22.4	1.6	2.2	26.9	0.0	15.6	57.4	6.8	50.6	0.7	6.9	2.7	114.6	1.3	13.3	7.9	24.1	29.2	20.7	13.8	41.2	74.5	90.3	661.1

Appendix 5.2.2-(4) Empty Car OD for 1996

Unit: Car/day

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1		6.7																								6.7
2																										
3																										
4																										
5																										
6																										
7																										
8		6.0	5.2																							11.3
9			23.9																							23.9
10			4.7																							4.7
11			9.9	14.7	9.6																					34.2
12					0.6																					0.6
13					6.3																					6.3
14																										
15					7.6	3.1																				10.7
16																										
17																										
18																										
19						6.9																				6.9
20																										
21																										
22																										
23																										
24						2.9								10.6		19.5	10.0	5.2								48.9
25																		7.8		10.1	7.7	19.3	35.0			79.9
26		12.7	43.8	14.7	24.1	12.9								10.6		19.5	10.7	13.0		10.1	7.7	19.3	35.0			234.1

Appendix 5.2.2-(5) Loaded/Empty Car OD 1996

Unit: Car/day

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	0.7	6.8	2.0	0.0	0.0	0.4	0.0	0.0	4.0	1.0	0.0	0.0	0.1	0.0	4.5	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.8	1.7	2.1	24.6
2	0.6	0.2	2.4	0.0	0.1	0.3	0.0	0.0	5.0	0.5	0.1	0.0	0.1	0.1	5.2	0.0	0.0	0.0	0.1	0.0	0.2	0.2	1.2	3.5	4.6	24.5
3	5.0	0.7	3.2	0.2	0.3	1.5	0.0	8.8	1.3	0.0	6.0	0.0	0.1	0.2	23.1	0.2	0.2	0.1	0.2	0.4	0.5	0.3	1.3	5.4	7.0	66.2
4	0.3	0.0	0.4	0.0	0.0	0.0	0.0	1.1	0.1	0.0	2.8	0.0	0.3	0.1	4.7	0.0	0.8	0.5	1.9	2.2	1.0	0.0	0.1	0.1	0.1	16.3
5	0.4	0.0	0.6	0.0	0.0	0.0	0.0	1.8	0.2	0.0	4.6	0.1	0.4	0.1	7.2	0.0	1.4	0.8	3.2	3.6	1.5	0.0	0.1	0.1	0.1	26.3
6	2.2	0.7	1.5	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.8	0.3	7.4	0.1	0.2	0.2	1.4	2.2	1.5	3.2	5.9	5.7	6.0	39.8
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	6.0	5.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	3.2	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	15.6
9	3.0	7.0	23.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.8	0.0	0.0	0.0	2.0	2.0	0.4	0.0	2.0	0.9	2.6	5.7	7.1	57.4
10	0.0	0.0	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.7	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.1	0.0	0.0	6.8
11	0.0	0.0	9.9	14.7	9.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	0.0	0.0	0.0	0.0	0.0	0.1	0.5	2.7	4.6	5.6	50.6
12	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7
13	0.0	0.0	0.1	0.0	6.3	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.9
14	0.2	0.0	0.3	0.0	0.0	0.0	0.0	1.0	0.1	0.0	2.3	0.0	0.2	0.1	3.6	0.0	0.7	0.4	1.5	1.8	0.8	0.0	0.0	0.1	0.1	13.3
15	8.5	2.1	6.9	0.7	8.3	2.6	0.0	0.1	2.0	0.1	13.8	0.0	0.1	0.4	0.0	0.4	4.0	1.4	8.0	11.9	1.7	2.2	11.8	13.1	14.6	114.6
16	0.3	0.0	0.4	0.0	0.0	4.8	0.0	1.1	0.1	0.0	2.8	0.0	0.3	0.1	4.3	0.0	0.8	0.5	1.9	2.2	1.0	0.0	0.1	0.1	0.1	20.8
17	0.2	0.0	0.3	0.1	0.1	0.0	0.0	0.8	0.7	0.0	2.0	0.0	0.2	0.1	12.7	0.1	0.7	0.4	1.5	1.6	0.9	0.2	0.4	0.4	0.5	24.0
18	0.2	0.0	0.3	0.0	0.0	3.5	0.0	0.8	0.5	0.0	2.0	0.0	0.2	0.1	7.4	0.0	0.6	0.4	1.5	1.6	0.8	0.1	0.2	0.3	0.4	20.9
19	0.1	0.1	0.7	0.0	0.0	7.5	0.0	0.0	4.8	0.1	0.0	0.0	0.0	0.0	2.5	0.0	0.1	0.1	0.2	0.1	0.5	0.4	1.3	2.6	3.2	24.1
20	0.1	0.0	0.1	0.1	0.1	0.8	0.0	0.0	7.1	0.0	0.0	0.0	0.0	0.1	16.4	0.1	0.2	0.1	0.1	0.2	0.7	0.9	1.1	4.7	6.2	39.3
21	0.0	0.0	0.7	0.2	0.3	5.0	0.0	0.0	3.3	1.3	2.4	0.0	0.0	0.1	3.2	0.2	0.1	0.1	0.0	0.0	0.4	0.4	1.0	4.3	5.6	28.4
22	1.0	0.5	1.3	0.1	0.1	5.0	0.0	0.0	4.9	1.0	2.4	0.0	0.0	0.0	2.1	0.0	0.3	0.1	0.6	0.2	3.2	0.7	1.3	3.7	4.7	33.1
23	1.3	0.3	1.0	0.1	0.2	2.6	0.0	0.0	15.0	2.4	4.8	0.0	0.0	0.1	3.2	0.1	0.9	0.6	1.0	0.7	3.0	2.9	7.5	13.0	15.7	76.2
24	0.4	0.1	0.3	0.0	0.1	4.4	00	0.0	6.1	0.6	2.6	0.0	0.0	10.6	1.5	19.5	10.9	5.3	0.2	0.2	0.7	0.7	1.8	3.8	4.8	74.5
25	0.1	0.0	0.1	0.0	0.0	1.3	0.0	0.0	1.9	0.1	2.1	0.0	0.0	0.0	1.0	0.0	0.0	7.8	0.1	10.2	7.8	19.4	35.2	1.4	1.8	90.3
26	24.6	24.5	66.2	16.3	26.3	39.8	0.0	15.6	57.4	6.8	50.6	0.7	6.9	13.3	114.6	20.8	24.0	20.9	24.1	39.3	28.4	33.2	76.2	74.5	90.3	895.2

Appendix 5.2.3-(1) Total OD for 2006

Unit: Car/day

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	0.8	0.1	2.1	0.0	0.0	0.4	0.0	0.0	4.0	1.0	0.0	0.0	0.1	0.0	6.3	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.7	1.8	2.3	20.3
2	0.5	0.3	2.3	0.0	0.1	0.3	0.0	0.0	5.0	0.5	0.1	0.0	0.1	0.1	7.2	0.0	0.0	0.0	0.1	0.0	0.2	0.2	1.0	3.8	4.9	26.9
3	5.0	0.8	3.6	0.2	0.4	35.2	0.0	9.3	233.6	0.0	6.3	0.0	0.1	0.2	31.5	0.2	20.2	0.2	0.2	0.6	0.4	0.3	1.3	5.7	7.5	362.8
4	0.3	0.0	0.4	0.0	0.0	75.0	0.0	1.2	0.1	0.0	2.9	0.1	0.4	0.1	7.2	0.0	1.0	0.6	2.4	2.7	1.0	0.0	0.1	0.1	0.1	95.6
5	0.5	0.0	0.7	0.0	0.0	0.0	0.0	2.0	0.2	0.0	4.8	0.1	0.6	0.1	11.1	0.0	1.7	1.0	3.8	4.4	1.8	0.0	0.1	0.1	0.1	33.2
6	2.4	0.7	1.8	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.1	1.0	0.4	9.1	0.1	0.3	0.2	1.6	2.6	1.7	3.6	6.8	6.4	6.8	46.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	4.6	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3
9	78.0	7.2	44.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.1	0.0	0.0	0.0	2.0	2.2	80.5	40.1	7.1	1.0	3.2	5.7	6.8	274.7
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.1	0.0	0.0	2.6
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.1	0.6	3.0	5.1	6.1	18.5
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
13	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
14	0.2	0.0	0.4	0.0	0.0	0.0	0.0	1.0	0.1	0.0	2.4	0.0	0.3	0.1	5.6	0.0	0.9	0.5	1.9	2.2	0.9	0.0	0.1	0.1	0.1	16.7
15	8.8	2.2	7.2	0.7	0.7	37.8	0.0	0.1	2.0	0.1	16.6	0.0	0.2	0.4	0.0	0.4	4.2	1.5	8.9	13.1	1.9	2.8	15.0	16.8	18.6	159.9
16	0.3	0.0	0.4	0.0	0.0	4.8	0.0	1.2	0.1	0.0	2.9	0.1	0.4	0.1	6.8	0.0	1.0	0.6	2.4	2.7	1.0	0.0	0.1	0.1	0.1	24.9
17	0.2	0.0	0.3	0.1	0.1	0.0	0.0	0.8	0.8	0.0	2.1	0.0	0.3	0.1	17.2	0.1	0.9	0.5	1.9	2.0	1.0	0.2	0.3	0.5	0.6	29.9
18	0.2	0.0	0.3	0.0	0.0	99.2	0.0	0.8	0.5	0.0	2.1	0.0	0.3	0.1	10.3	0.0	0.8	0.4	1.8	1.9	0.9	0.1	0.2	0.3	0.4	120.9
19	0.1	0.1	0.9	0.0	0.0	0.7	0.0	0.0	5.9	0.1	0.0	0.0	0.0	0.0	32.2	0.0	0.1	0.1	0.3	0.1	0.5	0.3	1.3	2.9	3.6	49.0
20	0.1	0.0	0.1	0.1	0.2	0.9	0.0	0.0	9.1	0.0	0.0	0.0	0.1	0.1	19.7	0.1	0.2	0.1	0.2	0.3	0.7	0.7	1.0	5.1	6.7	45.5
21	0.0	0.0	0.7	0.2	0.4	5.0	0.0	0.0	3.5	1.4	2.6	0.0	0.0	0.1	4.0	0.2	0.1	0.1	0.0	0.0	0.4	0.4	1.0	4.3	5.7	29.5
22	0.8	0.4	1.1	0.1	0.1	5.0	0.0	0.0	5.4	1.0	2.7	0.0	0.0	0.0	3.0	0.0	0.3	0.1	0.6	0.2	3.4	0.8	1.6	4.2	5.3	36.2
23	1.3	0.2	0.9	0.1	0.2	2.9	0.0	0.0	15.0	2.7	5.3	0.0	0.0	0.1	4.3	0.1	1.0	0.7	1.0	0.7	3.5	3.4	9.1	15.2	16.2	85.9
24	0.4	0.1	0.2	0.0	0.1	1.6	0.0	0.0	6.7	0.6	2.8	0.0	0.0	0.0	1.9	0.0	0.2	0.1	0.2	0.2	0.8	0.8	2.2	4.3	5.4	28.9
25	0.1	0.0	0.1	0.0	0.0	1.4	0.0	0.0	2.1	0.1	2.3	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	1.5	1.9	11.2
26	100.1	12.3	68.5	1.8	2.3	270.3	0.0	16.4	294.4	7.5	55.8	1.0	9.6	3.4	184.3	1.5	34.9	9.1	107.9	73.8	22.7	15.7	48.1	83.9	101.3	1526.6

Appendix 5.2.3-(2) Direct Car OD for 2006

Unit: Car/day

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1																										
2																										
3						34.0			232.0						24.0		20.0									310.0
4						75.0																				75.0
5																										
6																										
7																										
8																										
9	75.0		45.0																80.0	40.0						240.0
10																										
11																										
12																										
13																										
14																										
15						38.0																				38.0
16																										
17																										
18						95.0																				95.0
19															29.0											29.0
20																										
21																										
22																										
23																										
24																										
25																										
26	75.0		45.0			242.0			232.0						53.0		20.0		80.0	40.0						787.0

Appendix 5.2.3-(3) OD of Cars Requiring Coupling/Uncoupling for 2006

Unit: Car/day

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	0.8	0.1	2.1	0.0	0.0	0.4	0.0	0.0	4.0	1.0	0.0	0.0	0.1	0.0	6.3	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.7	1.8	2.3	20.3
2	0.5	0.3	2.3	0.0	0.1	0.3	0.0	0.0	5.0	0.5	0.1	0.0	0.1	0.1	7.2	0.0	0.0	0.0	0.1	0.0	0.2	0.2	1.0	3.8	4.9	26.9
3	5.0	0.8	3.6	0.2	0.4	1.2	0.0	9.3	1.6	0.0	6.3	0.0	0.1	0.2	7.5	0.2	0.2	0.2	0.2	0.6	0.4	0.3	1.3	5.7	7.5	52.8
4	0.3	0.0	0.4	0.0	0.0	0.0	0.0	1.2	0.1	0.0	2.9	0.1	0.4	0.1	7.2	0.0	1.0	0.6	2.4	2.7	1.0	0.0	0.1	0.1	0.1	20.6
5	0.5	0.0	0.7	0.0	0.0	0.0	0.0	2.0	0.2	0.0	4.8	0.1	0.6	0.1	11.1	0.0	1.7	1.0	3.8	4.4	1.8	0.0	0.1	0.1	0.1	33.2
6	2.4	0.7	1.8	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.1	1.0	0.4	9.1	0.1	0.3	0.2	1.6	2.6	1.7	3.6	6.8	6.4	6.8	46.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	4.6	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.3
9	3.0	7.2	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.1	0.0	0.0	0.0	2.0	2.2	0.5	0.1	2.0	1.0	3.2	5.7	6.8	34.7
10	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.1	0.0	0.0	2.6
11	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.1	0.6	3.0	5.1	6.1	18.5
12	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
13	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.8
14	0.2	0.0	0.4	0.0	0.0	0.0	0.0	1.0	0.1	0.0	2.4	0.0	0.3	0.1	5.6	0.0	0.9	0.5	1.9	2.2	0.9	0.0	0.1	0.1	0.1	16.7
15	8.8	2.2	7.2	0.7	0.7	-0.2	0.0	0.1	2.0	0.1	16.6	0.0	0.2	0.4	0.0	0.4	4.2	1.5	8.9	13.1	1.9	2.8	15.0	16.8	18.6	121.9
16	0.3	0.0	0.4	0.0	0.0	4.8	0.0	1.2	0.1	0.0	2.9	0.1	0.4	0.1	6.8	0.0	1.0	0.6	2.4	2.7	1.0	0.0	0.1	0.1	0.1	24.9
17	0.2	0.0	0.3	0.1	0.1	0.0	0.0	0.8	0.8	0.0	2.1	0.0	0.3	0.1	17.2	0.1	0.9	0.5	1.9	2.0	1.0	0.2	0.3	0.5	0.6	29.9
18	0.2	0.0	0.3	0.0	0.0	4.2	0.0	0.8	0.5	0.0	2.1	0.0	0.3	0.1	10.3	0.0	0.8	0.4	1.8	1.9	0.9	0.1	0.2	0.3	0.4	25.9
19	0.1	0.1	0.9	0.0	0.0	0.7	0.0	0.0	5.9	0.1	0.0	0.0	0.0	0.0	3.2	0.0	0.1	0.1	0.3	0.1	0.5	0.3	1.3	2.9	3.6	20.0
20	0.1	0.0	0.1	0.1	0.2	0.9	0.0	0.0	9.1	0.0	0.0	0.0	0.1	0.1	19.7	0.1	0.2	0.1	0.2	0.3	0.7	0.7	1.0	5.1	6.7	45.5
21	0.0	0.0	0.7	0.2	0.4	5.0	0.0	0.0	3.5	1.4	2.6	0.0	0.0	0.1	4.0	0.2	0.1	0.1	0.0	0.0	0.4	0.4	1.0	4.3	5.7	29.6
22	0.8	0.4	1.1	0.1	0.1	5.0	0.0	0.0	5.4	1.0	2.7	0.0	0.0	0.0	3.0	0.0	0.3	0.1	0.6	0.2	3.4	0.8	1.6	4.2	5.3	36.2
23	1.3	0.2	0.9	0.1	0.2	2.9	0.0	0.0	15.0	2.7	5.3	0.0	0.0	0.1	4.3	0.1	1.0	0.7	1.0	0.7	3.5	3.4	9.1	15.2	18.2	85.9
24	0.4	0.1	0.2	0.0	0.1	1.6	0.0	0.0	6.7	0.6	2.8	0.0	0.0	0.0	1.9	0.0	0.2	0.1	0.2	0.2	0.8	0.8	2.2	4.3	5.4	28.9
25	0.1	0.0	0.1	0.0	0.0	1.4	0.0	0.0	2.1	0.1	2.3	0.0	0.0	0.0	1.3	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.2	1.5	1.9	11.2
26	25.1	12.3	23.5	1.8	2.3	28.3	0.0	16.4	62.4	7.5	55.8	1.0	9.6	3.4	131.3	1.5	14.9	9.1	27.9	33.8	22.7	15.7	48.1	83.9	101.3	739.5

Appendix 5.2.3-(4) Empty Car OD 2006

Unit: Car/day

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1		4.8																								4.8
2																										
3																										
4																										
5																										
6																										
7																										
8		9.8	0.3																							10.1
9			27.7																							27.7
10			1.3	3.6																						4.9
11				15.2	22.1																					37.3
12					0.9																					0.9
13					7.9	0.9																				8.8
14																										
15						9.4																				9.4
16																										
17																										
18																										
19						7.4								0.5												7.9
20																										
21																										
22																										
23																										
24														12.8		23.4	15.0	3.8								55.0
25																		13.0		11.6	6.9	20.5	37.8			90.1
26		14.6	29.3	18.8	30.9	17.7								13.3		23.4	15.0	16.8		11.6	6.9	20.5	37.8			256.9

Appendix 5.2.3-(5) Loaded/Empty Car OD for 2006

Unit:Car/day

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
1	0.8	4.9	2.1	0.0	0.0	0.4	0.0	0.0	4.0	1.0	0.0	0.0	0.1	0.0	6.3	0.0	0.0	0.0	0.1	0.0	0.1	0.1	0.7	1.8	2.3	25.1
2	0.5	0.3	2.3	0.0	0.1	0.3	0.0	0.0	5.0	0.5	0.1	0.0	0.1	0.1	7.2	0.0	0.0	0.0	0.1	0.0	0.2	0.2	1.0	3.8	4.9	26.9
3	5.0	0.8	3.6	0.2	0.4	1.2	0.0	9.3	1.6	0.0	6.3	0.0	0.1	0.2	7.5	0.2	0.2	0.2	0.2	0.6	0.4	0.3	1.3	5.7	7.5	52.8
4	0.3	0.0	0.4	0.0	0.0	0.0	0.0	1.2	0.1	0.0	2.9	0.1	0.4	0.1	7.2	0.0	1.0	0.6	2.4	2.7	1.0	0.0	0.1	0.1	0.1	20.6
5	0.5	0.0	0.7	0.0	0.0	0.0	0.0	2.0	0.2	0.0	4.8	0.1	0.6	0.1	11.1	0.0	1.7	1.0	3.8	4.4	1.8	0.0	0.1	0.1	0.1	33.2
6	2.4	0.7	1.8	0.1	0.2	0.0	0.0	0.0	0.1	0.0	0.0	0.1	1.0	0.4	9.1	0.1	0.3	0.2	1.6	2.6	1.7	3.6	6.8	6.4	6.8	46.0
7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8	0.0	9.8	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	4.6	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	16.4
9	3.0	7.2	27.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	1.1	0.0	0.0	0.0	2.0	2.2	0.5	0.1	2.0	1.0	3.2	5.7	6.8	62.4
10	0.0	0.0	1.3	3.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.1	0.0	0.0	7.5
11	0.0	0.0	0.0	15.2	22.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.5	0.0	0.0	0.0	0.0	0.0	0.1	0.6	3.0	5.1	6.1	55.8
12	0.0	0.0	0.0	0.0	0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.0
13	0.0	0.0	0.1	0.0	2.9	0.9	0.0	0.0	0.2	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	9.6
14	0.2	0.0	0.4	0.0	0.0	0.0	0.0	1.0	0.1	0.0	2.4	0.0	0.3	0.1	5.6	0.0	0.9	0.5	1.9	2.2	0.9	0.0	0.1	0.1	0.1	16.7
15	8.8	2.2	7.2	0.7	0.7	9.2	0.0	0.1	2.0	0.1	16.6	0.0	0.2	0.4	0.0	0.4	4.2	1.5	8.9	13.1	1.9	2.8	15.0	16.8	18.6	131.3
16	0.3	0.0	0.4	0.0	0.0	4.8	0.0	1.2	0.1	0.0	2.9	0.2	0.4	0.2	6.8	0.0	1.0	0.6	2.4	2.7	1.0	0.0	0.1	0.1	0.1	24.9
17	0.2	0.0	0.3	0.1	0.1	0.0	0.0	0.8	0.8	0.0	2.1	0.0	0.3	0.1	17.2	0.1	0.9	0.5	1.9	2.0	1.0	0.2	0.3	0.5	0.6	29.9
18	0.2	0.0	0.3	0.0	0.0	4.2	0.0	0.8	0.5	0.0	2.1	0.0	0.3	0.1	10.3	0.0	0.8	0.4	1.8	1.9	0.9	0.1	0.2	0.3	0.4	25.9
19	0.1	0.1	0.9	0.0	0.0	8.1	0.0	0.0	5.9	0.1	0.0	0.0	0.0	0.5	3.2	0.0	0.1	0.1	0.3	0.1	0.5	0.3	1.3	2.9	3.6	27.9
20	0.1	0.0	0.1	0.1	0.2	0.9	0.0	0.0	9.1	0.0	0.0	0.0	0.1	0.1	19.7	0.1	0.2	0.1	0.2	0.3	0.7	0.7	1.0	5.1	6.7	45.5
21	0.0	0.0	0.7	0.2	0.4	5.0	0.0	0.0	3.5	1.4	2.6	0.0	0.0	0.1	4.0	0.2	0.1	0.1	0.0	0.0	0.4	0.4	1.0	4.3	5.7	29.6
22	0.8	0.4	1.1	0.1	0.1	5.0	0.0	0.0	5.4	1.0	2.7	0.0	0.0	0.0	3.0	0.0	0.3	0.1	0.6	0.2	3.4	0.8	1.6	4.2	5.3	36.2
23	1.3	0.2	0.9	0.1	0.2	2.9	0.0	0.0	15.0	2.7	5.3	0.0	0.0	0.1	4.3	0.1	1.0	0.7	1.0	0.7	3.5	3.4	9.1	15.2	18.2	85.9
24	0.4	0.1	0.2	0.0	0.1	1.6	0.0	0.0	6.7	0.6	2.8	0.0	0.0	12.8	1.9	23.4	15.2	3.9	0.2	0.2	0.8	0.8	2.2	4.3	5.4	53.9
25	0.1	0.0	0.1	0.0	0.0	1.4	0.0	0.0	2.1	0.1	2.3	0.0	0.0	0.0	1.3	0.0	0.0	13.0	0.1	11.7	7.0	20.6	38.0	1.5	1.9	101.3
26	25.1	26.9	52.8	20.6	33.2	46.0	0.0	16.4	62.4	7.5	55.8	1.0	9.6	16.7	131.3	24.9	29.9	25.9	27.9	45.4	29.6	36.2	85.9	83.9	101.3	996.5

Appendix 6.1.1-(1) Frequencies of Inbound and Outbound Trains at Each Yard

Trains / Direction / Yards	Passenger Train			Freight Train			Mixed Train			Total			Remarks
	Outbound	Inbound	Total	Outbound	Inbound	Total	Outbound	Inbound	Total	Outbound	Inbound	Total	
Bangkok													(Note) Outbound means trains starting from Bangkok, and inbound trains going to Bangkok.
Arrival or departure													
Arrival		59	59								59	59	
Departure	59		59							59		59	
Total	59	59	118							59	59	118	
Mae Nam													
Arrival or departure													
Arrival					18	18					18	18	
Departure				18		18				18		18	
Total				18	18	36				18	18	36	
Bang Sue													
Arrival or departure													
Arrival					39	39					39	39	
Departure				39		39				39		39	
Total				39	39	78				39	39	78	
Ban Phachi													
Arrival or departure	34	34	68	31	31	62				65	65	130	
Arrival	1		1		2	2				1	2	3	
Departure		1	1	2		2				2	1	3	
Total	35	35	70	33	33	66				68	68	136	
Phitsanulok													In the column "freight train," 4 trains among the 5 outbound trains and 4 trains among the 5 inbound trains are single locomotives forwarded for trains starting from or arriving at Bung Phra.
Arrival or departure	8	8	16	5	5	10				13	13	26	
Arrival	6	3	9	5		5				11	3	14	
Departure	3	6	9		5	5				3	11	14	
Total	17	17	34	10	10	20				27	27	54	
Nakhon Ratchasima													
Arrival or departure	15	15	30	3	3	6				18	18	36	
Arrival	1	6	7	3	4	7				4	10	14	
Departure	6	1	7	4	3	7	1	1	2	11	5	16	
Total	22	22	44	10	10	20	1	1	2	32	32	64	
Chumphon													
Arrival or departure	6	6	12	7	7	14				13	13	26	
Arrival	1	2	3					1	1	1	3	4	
Departure	2	1	3				1		1	3	1	4	
Total	9	9	18	7	7	14	1	1	2	17	17	34	

Trains / Direction / Yards	Passenger Train			Freight Train			Mixed Train			Total			Remarks
	Outbound	Inbound	Total	Outbound	Inbound	Total	Outbound	Inbound	Total	Outbound	Inbound	Total	
Surat Thani													
Arrival or departure	7	7	14	6	6	12				13	13	26	
Arrival	1	2	3		1	1		1	1	1	3	4	
Departure	2	1	3	1		1	1		1	3	1	4	
Total	10	10	20	7	7	14	1	1	2	17	17	34	
Thung Song													
Arrival or departure	8	8	16	5	5	10				13	13	26	
Arrival		1	1	2	3	3		2	2	2	4	6	
Departure	1		1	1	1	3	2		2	4	2	6	
Total	9	9	18	8	8	16	2	2	4	19	19	38	
Hat Yai													
Arrival or departure	5	5	10	1	1	2				6	6	12	
Arrival	3	4	7	5	5	10				8	9	17	
Departure	4	3	7	5	5	10				9	8	17	
Total	12	12	24	11	12	22				23	23	46	

Note: Freight trains include temporarily operated trains

Appendix 6.1.1-(2) Train Frequencies Yard and Direction

Yards	Train status		Passenger train				Freight Train				Total
		Trains	Passing	Originating	Terminating	Sub total	Passing	Originating	Terminating	Sub total	
Bangkok	Down	N.L		21		21					21
		N.E.L		18		18					18
		S.L		9		9					9
		E.L		11		11					11
		Subtotal		59		59					59
	Up	N.L			21	21					21
		N.E.L			18	18					18
		S.L			9	9					9
		E.L			11	11					11
		Subtotal			59	59					59
	Total			59	59	118					118
Bang Sue	Down	N.L						(2) 8		(2) 8	(2) 8
		N.E.L						(2) 8		(2) 8	(2) 8
		S.L						(4) 8		(4) 8	(4) 8
		E.L						7		7	7
		Subtotal						(8) 31		(8) 31	(8) 31
	Up	N.L							(2) 8	(2) 8	(2) 8
		N.E.L							(2) 8	(2) 8	(2) 8
		S.L							(4) 8	(4) 8	(4) 8
		E.L							7	7	7
		Subtotal							(8) 21	(8) 31	(8) 31
	Total							(8) 31	(8) 31	(16) 62	(16) 62
Ban Phachi	Down	UP. L			1	1					1
		N.L	18			18	(2) 15	1		(2) 16	(2) 34
		N.E.L	16			16	(3) 11	1		(3) 12	(3) 28
		Subtotal	34		1	35	(5) 26	2		(5) 28	(5) 63
	Up	UP. L		1		1					1
		N.L	18			18	(2) 15		1	(2) 16	(2) 34
		N.E.L	16			16	(3) 11		1	(3) 12	(3) 28
		Subtotal	34	1		35	(5) 26		2	(5) 28	(5) 63
	Total		68	1	1	70	(10) 52	2	2	(10) 56	(10) 126
Hat Yai	Down	UP. L			3	3			5	5	8
		P.B.	1			1	(1)	(2) 1		(3) 1	(3) 2
		S.K.	4	4		8		2		2	10
		Subtotal	5	4	3	12	(1)	(2) 3	5	(3) 8	(3) 20
	Up	UP. L		3		3		5		5	8
		P.B.	1			1	(1)		(2) 1	(3) 1	(3) 2
		S.K.	4		4	8			2	2	10
		Subtotal	5	3	4	12	(1)	5	3	(3) 8	(3) 20
	Total		10	7	7	24	(2)	(2) 8	(2) 8	(6) 16	(6) 40

Note: Temporarily operated trains are shown in parentheses.

Appendix 6.1.2 Volume of Cargo Handled at Each Yard

(Unit: Ton/year)

Yards	Forwarded or Received	1982	1985	Remarks (Major items in 1985)
Mae Nam	Forwarded	1,611,535	1,475,435	1.34 million tons of oil on the North and Northeastern lines. 1.21 million tons of crude oil from Bung Phra.
	Received	324,493	1,556,197	
	Total	1,936,028	3,031,632	
Bang Sue	Forwarded	150,085	123,485	51,000 tons of alcoholic products for the whole line. 760,000 tons of cement from Ban Mo, Mapkabao, etc.
	Received	964,408	868,205	
	Total	1,114,493	991,690	
Ban Phachi	Forwarded	468	156	
	Received	2,104	182	
	Total	2,572	338	
Phitsanulok	Forwarded	42,553	9,930	9,000 tons of rice to Mae Nam 93,000 tons of oil from Mae Nam
	Received	193,425	140,149	
	Total	235,978	150,079	
Nakhon Ratchasima	Forwarded	24,278	18,776	15,000 tons of rice to Southern area 87,000 tons of oil from Mae Nam
	Received	96,593	105,174	
	Total	120,871	123,950	
Chumphon	Forwarded	9,158	6,280	59,000 tons of cement from Thiwang
	Received	65,251	81,854	
	Total	74,409	88,134	
Surat Thani	Forwarded	11,640	42,032	3,000 tons of rubber to Mae Nam 37,000 tons of cement from Thiwang
	Received	121,279	66,431	
	Total	132,919	108,463	
Thung Song	Forwarded	17,875	28,660	27,000 tons of rubber to Mae Nam
	Received	11,997	11,344	
	Total	29,872	40,004	
Hat Yai	Forwarded	26,752	33,843	21,000 tons of rubber to Mae Nam 63,000 tons of cement from Thiwang
	Received	300,017	242,683	
	Total	326,769	276,526	

Appendix 6.1.3 Numbers of Freight Cars Handled by Yards

(Daily average for 1984)

Yards	Departure	Arrival	Relay	Total
Mae Nam	500	500		1000
Bang Sue	217	217	436	870
Ban Phachi	1	1	38	40
Phitsanulok	45	45	110	200
Nakhon Ratchasima	40	40	110	190
Chumphon	15	15	30	60
Surat Thani	15	15	20	50
Thung Song	25	25	180	230
Hat Yai	65	65	180	310

Appendix 6.1.4 Car Relay Time Survey

Yards	Date	Number of cars surveyed	Total relay time	Relay Time per car	Remarks
Bang Sue	Jan 29, 1986	25	13,463	538 minutes (8 hours 58 minutes)	
Ban Phachi	Sep, Oct, and Nov, 1985	119	86,226	724 minutes (12 hours 04 minutes)	
Phitsanulok	Jan 18-20, 1986	46	16,767	364 minutes (6 hours 04 minutes)	
Nakhon Ratchasima	Jan 15-23, 1986	Up 91 Down 112 Total 203	Up 48,672 Down 89,883 Total 138,555	658 minutes (10 hours 58 minutes)	
Chumphon	Jan 14-24, 1986	Up 54 Down 60 Total 114	Up 66,524 Down 17,517 Total 84,041	737 minutes (12 hours 17 minutes)	
Surat Thani	Jan 15-20, 1986	24	10,895	454 minutes (7 hours 34 minutes)	
Thung Song	Jan 22-24, 1986	479	288,555	602 minutes (10 hours 02 minutes)	
Hat Yai	Jan 19-20, 1986	For Padang Besar 97 Others 191 Total 288	216,157 314,995 531,152	2228 minutes 1649 minutes 1844 minutes (30 hours 44 minutes)	
	Aug 12-14, 1986	259	239,316	924 minutes (15 hours 24 minutes)	

Note: Survey done by sampling inbound and outbound realy car records.

Appendix 6.1.5 Number of Personnel by Station

Stations	Station Master	Assist. Station Master	Sales	Signalg.	Shuntg.	Assist.	Total
Bangkok	1	11	60	10	25	327	434
Mae Nam	1	2	20	3	36	36	98
Bang Sue (yard)	1	3	34	19	63	122	242
Bang Sue (F.S)	1	1	24	-	-	15	41
Ban Phachi	1	3	7	6	4	24	45
Phitsanulok	1	3	19	3	9	23	58
Nakhon Ratchasima	1	3	19	6	13	44	86
Chumphon	1	2	12	4	11	38	68
Surat Thani	1	4	14	3	6	17	45
Thung Song	1	3	19	4	17	40	84
Hat Yai	1	2	24	4	12	61	104

Notes: Sales includes Clerks, Chiefs of Sales Sections, Drivers, and Radio Telegraph Men.
Assistant includes Watchmen and Guards.

Appendix 6.1.6 Outline of Yard Work

Stations	Shunting Locomotives Allocated	Personnel	Remarks
Bangkok	3	A 3 shunters in 4 shifts B 3 shunters in 2 shifts C 3 shunters in 2 shifts	C Party is DRC zone
Mae Nam	3	A 3 shunters in 3 shifts B 3 shunters in 3 shifts C 3 shunters in 3 shifts	
Bang Sue	4	A 3 shunters in 4 shifts B 3 shunters in 4 shifts C 3 shunters in 4 shifts D 3 shunters in 4 shifts (with 7 shunters in 3 shifts below hump)	
Ban Phachi		A 3 shunters in 3 shifts	
Phitsanulok	1	A 3 shunters in 3 shifts	
Nakhon Ratchasima	2	A 3 shunters in 3 shifts B 3 shunters in 3 shifts	
Chumphon	1	A 3 shunters in 3 shifts	
Surat Thani	1	A 3 shunters in 3 shifts	
Thung Song	1.7	A 3 shunters in 3 shifts B 3 shunters in 1 shift	
Hat Yai	1.3	A 3 shunters in 3 shifts B 3 shunters in 1 shifts	

Appendix 6.2.1 Method of Preparation of Yard Work Diagram

Specifications and method of preparation of the "yard work diagram" employed in JNR are as follows:

1. Specifications of Yard Work Diagram
   Specifications of the yard work diagram and sectioning of the time lines are according to the 2-minute-scale train diagram.

2. Method of Entry in Yard Work Diagram

   (1) The station name and the date of validity are noted on the margin on the left hand side.

   (2) The train diagram for the required range about the station is noted.

   (3) The column for the yard tracks is set forth as below.

      1) According to the sequence of arrangement in the station track layout diagram by yard.

      2) Use one column for each track. However, the sorting tracks, freight tracks, and etc. that are used for the same purpose may be summed up in one column.

      3) On the left side of the column, note what the purpose of use is, effective length (with the length of the car washing platform and number of passenger cars or number of cars that can be accomodated by shunting noted in parentheses) and track name in the order listed, and on the right hand side, note the track name only. However, if a platform is provided, attach [ ] over the track name and enter the length.

4) In the column for tracks used normally for train operation, note the hours of use (including the hours the track was blocked), work hours, arrival or departure time, and coupling or uncoupling, partition or combination, originating or terminating, through or turnaround, and any replacement of tractive locomotives.

5) In the column for tracks storing passenger and washing car track, note the hours of use, operation number, and number of cars.

6) In the column for tracks storing cars always such as the sorting track and freight track, note the hours of use, details of the work, and hours of use of composition completed trains (including partial composition).

7) In the column for tracks not retaining cars usually such as the draw-out track and passage track, note the hours of use and details of the work.

8) When a shunting locomotive moves over tracks, note the condition of movement.

(4) The column for workers in the yard is set forth as below.

1) Use one column for each of the work names of the operation men (in charge of marshalling).

2) On the left side of the column, note the kind of work of the operation men (in charge of marshalling), number of the operation men (in charge of marshalling), their duties, number of the yard men and their duties in the order listed, and on the right side of the column, note the work name of the operation men (in charge of marshalling) only.

3) Regarding the work of the operation men (in charge of marshalling), note the work hours, details of the work, and the hours of work intervals, recess, rest, sleeping, roll call, and transfer. When the work of an operation man (in charge of marshalling) is done by a vicarious person, it should be noted together with 2).

(5) The column for shunting locomotives is set forth as below.

1) Use one column for each shunting locomotive, and note in the order of exclusive use and combined use.

2) Shunting by tractive locomotive should be written in one column using outbound and inbound notation.

3) On the left side of the column, note the name of the shunting locomotive, classification of the shuhting locomotive by exclusive or combined use, type of locomotive, and hours of allocation of the locomotive in the order listed, and on the right side of the column, note the name of locomotives only.

4) For the work of shunting locomotives, note the number of trips, trip hours, work and time for going in and out for supplies of coal, water, or oil.

(6) Symbols used in the yard work diagram are as listed below.

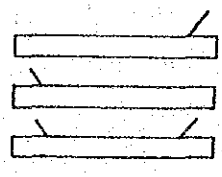
1) Symbols indicating obstruction

o By trains

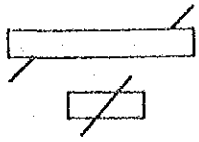
Originating train

Terminating train

Turnaround train



Inbound and outbound trains



Passing train

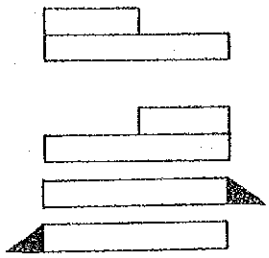
Note: The train lines have their actual direction represented correctly in the train diagram and are in accordance with train times.

Partition of passenger train (including luggage train)

Combination of passenger train (including luggage train)

Decomposition of train

Composition of train



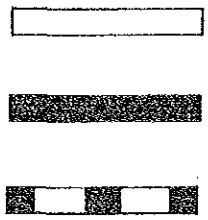
Note: The work hours are indicated in black.

o By work

When the track is obstructed with no work going on.

When the track is obstructed for work purposes

When the track is obstructed by passenger cars in storage



Note: The width of a line indicating an obstruction is 1.5 mm.

2) Symbol indicating the arrival and departure times of trains

Note with a slash the arrival or departure times, and add the train number

3) Symbols indicating works

Replacement of locomotives:

Write the ● mark above the line to indicate the work. When the replacement of a locomotive is not done by a tractive locomotive, write the -● mark for uncoupling or the +● mark for coupling.

By shunting locomotive:

Connect the obstructed tracks with a fine line.

By tractive locomotive:

Connect the obstructed tracks by →.

Uncoupling of passenger or luggage cars:

Write the - mark next to the number of the uncoupled cars

Coupling of passenger or luggage cars:

Write the + mark next to the number of the coupled cars.

Uncoupling of freight cars:

Write the ◣ mark above the line to indicate the work.

Coupling of freight cars:

Write the ◢ mark above the line to indicate the work.

Uncoupling and coupling of freight cars:

Write the ◣◢ mark above the line to indicate the work.

Note: The foregoing symbols should be written with the right side of the train number taken as the front of the train and the left side as the rear.

4) Symbols indicating the works of the yard men

Works (with breaks in work shown by various lines) ————————

Work interval — — — — —

Recess and sleep — —‖—‖— —

Rest ++++++++++++++++++

Roll call and transfer ▬▬▬▬▬▬▬▬

Shop-in: Below the line indicating the work, write the ▩ mark for the shopping-in work starting time and the ↓ mark for the terminating time.

Shop-out: Above the line indicating the work, write the ▩ mark for the shopping-out work starting time ⚲ and the mark for the terminating time.

5) Symbols indicating the works of shunting locomotives

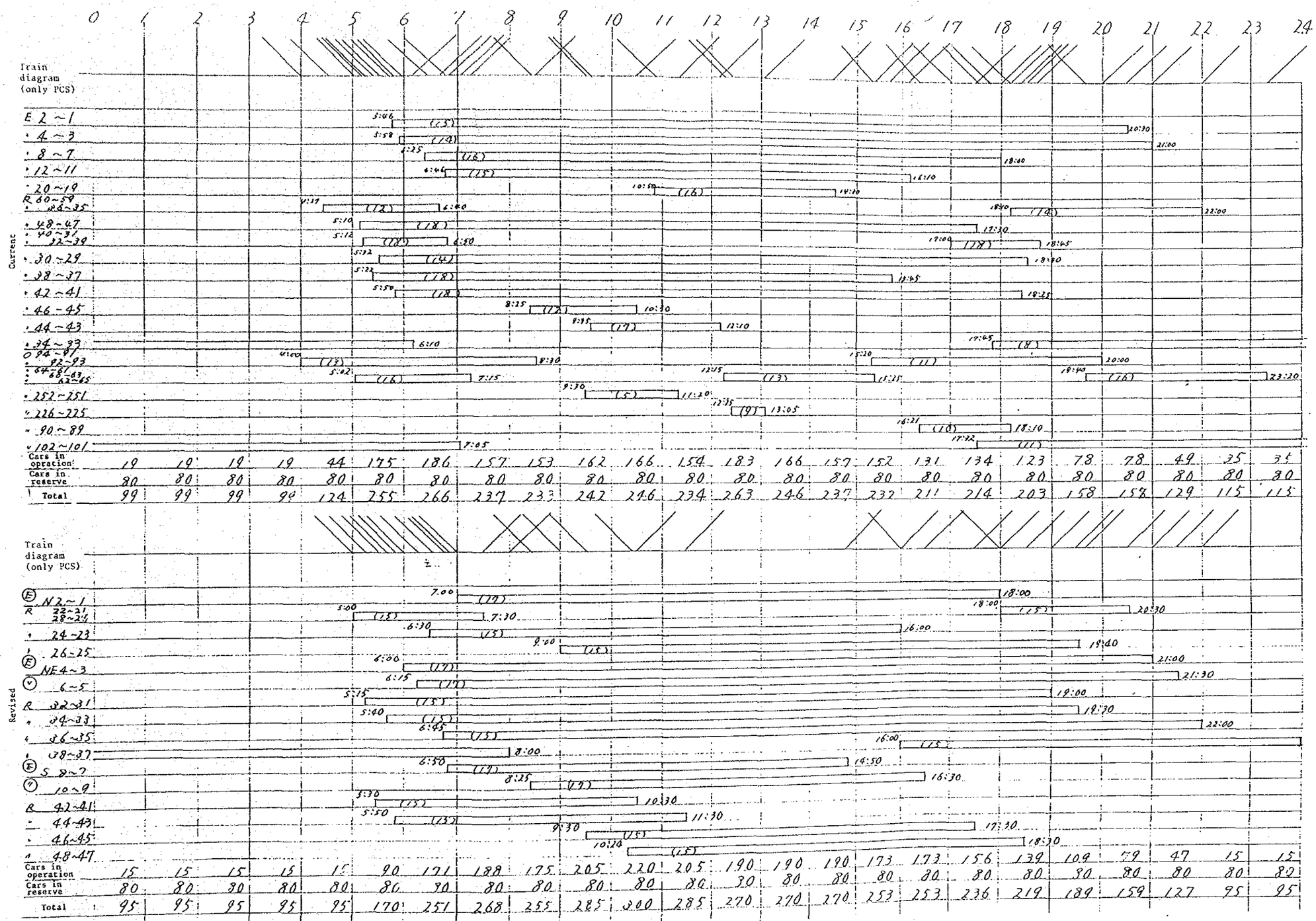
Works (with breaks in work shown by various lines) ————————

Work interval ----------

Water, coal or oil supply 

Shop-in, shop-out: Use symbols in 4).

Appendix 6.2.2 Parking Schedule for Passenger Cars in Bangkok Station



Appendix 6.2.3-(1) How to Improve the Efficiency of Yard Work in Mae Nam

1. Current problems

(1) Congestion of work results from inadequate sorting track capacity for handling cars.

(2) Handling of refined oil cars, which account for most of the cars dealt with, is concentrated during the afternoon and evening, making congestion worse.

(3) Unloaded cars staying in the yard are also a cause of confusion.

(4) Loading/unloading tracks are scattered in several locations and the yard itself is divided into a Main Station and Port Line, leading to poor working efficiency. Our proposal to improve the efficiency of yard work is as follows:

2. Improvement in Yard Work

(1) For refined oil cars

To eliminate competition in work and congestion, it is necessary that unloaded tank trains arrive in the yard after loaded tank trains have departed. This means the present schedule needs revision concerning the arrival/departure of oil tank trains. (see Figure 1.)

In this case, revision of the present schedule for trains in general is also required. As to trains arriving in Mae Nam, their detention or timing adjustment at Bang Sue Yard should be considered, where there is still some margin for yard work left.

Although this may have some impact on loading/unloading work in the Mae Nam Yard, this is to be resolved by reviewing the content of work and revising the procedure of arrival/departure operations to and from the loading/unloading tracks.

In the off season when the demand for oil is slight and the days when train operation is suspended, detention of cars in train units on the directional sorting tracks in Bang Sue is desirable.

(2) For general cars

The amount of cargo being handled at Mae Nam each day, excluding oil, adds up to 140 thousand tons for arriving and 340 thousand tons for departing.

Seventy-five to 100 cars are operated each day one-way throughout the day, all of which come from or arrive at Bang Sue.

Number of Trains that Arrive at Mae Nam		Number of Trains that Depart from Mae Nam	
(Arrival) 801	4:50	(Departure) 802	5:45
803	10:15	804	11:10
805	12:30	806	14:12
807	15:40	808	16:05
809	18:35	810	19:30
811	21:20	812	21:55

However, the cars of three trains, 807, 809 and 811, stay overnight at Mae Nam Yard because unloading work is done only in the daytime (from 8:00 to 18:00) as at other freight stations. As to departing freight trains, the departure times of the three trains 802, 804 and 806 were determined without regard to loading work hours; hence, cars are obliged to stay overnight at the yard waiting for departure after the cars composing them have been loaded with goods, resulting in increased congestion at the Mae Nam Yard. In order to reduce the number of detained cars at Mae Nam Yard to a minimum, the current timetable should be revised so that trains from Bang Sue arrive at Mae Nam early in the morning in accordance with unloading work hours so that departing trains may be sent to Bang Sue immediately after they have been loaded with goods. (See Figure 2.)

(3) Based on the discussions above, we would like to propose a new work diagram for Mae Nam Yard (See Appendix 6.2.3 (2)).

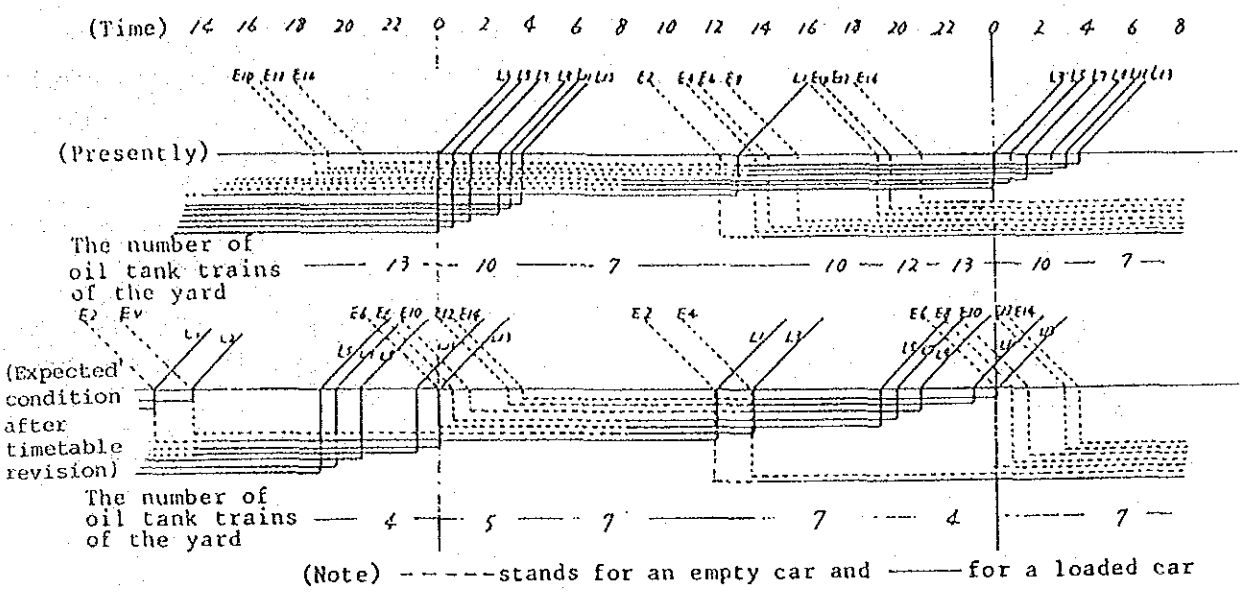


Fig. 1 Improvement in the Efficiency of Yard Work for Oil Tank Cars

-- A chart indicating present and expected conditions of yard work and location of oil tank trains on tracks --

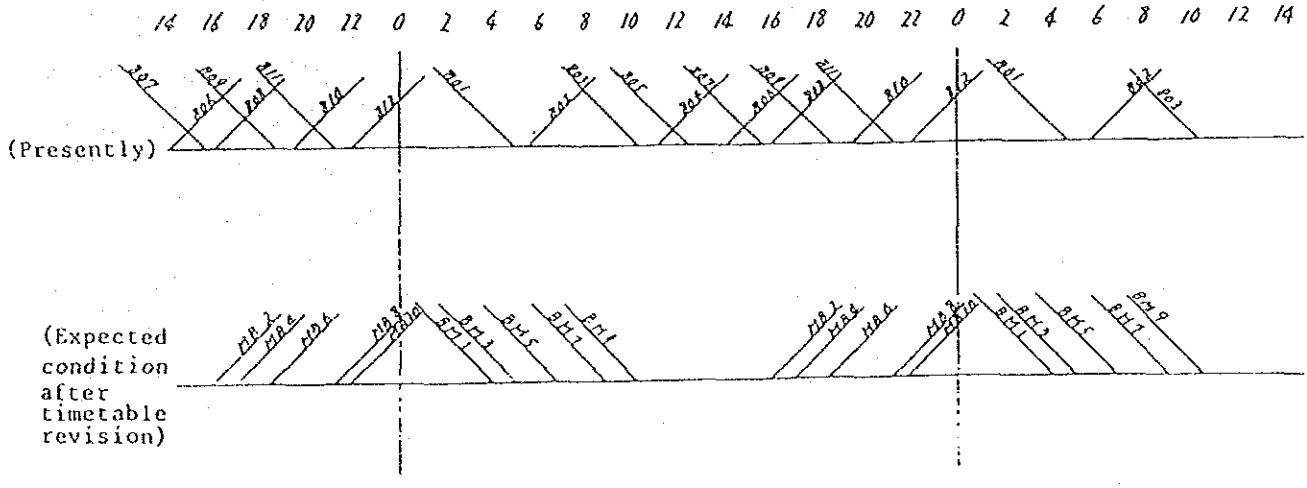


Fig. 2 Improvement in the Efficiency of Yard Work for General Cars

Appendix 6.2.3-(2) Mae Nam Yard Work Diagram (Draft)

1. The Mae Nam yard work diagram (draft) has been made as a provisional objective for the yard work system for 1996 in the case where yard improvements, including track layout changes, are made.

2. In order to configure a feasible work schedule within a yard, it is necessary to conduct a thorough investigation into the transportation and yard work. But since their details have not been yet determined in many respects, this schedule has been prepared under the following premises.

   (1) Number of trains
   32 (according to the estimate for 1996)

   (2) Train arrival/departure times
   Based on the above-mentioned method.

   (3) Time for shunting work
   50 minutes for trains requiring much coupling/uncoupling work, and 30 minutes for others on the basis of current time required

   (4) Work shift
   The current three-party 24-hour work system is planned so that the shunting work of main station and Port Station are done by the party at the main station from 0:00 to 8:00.

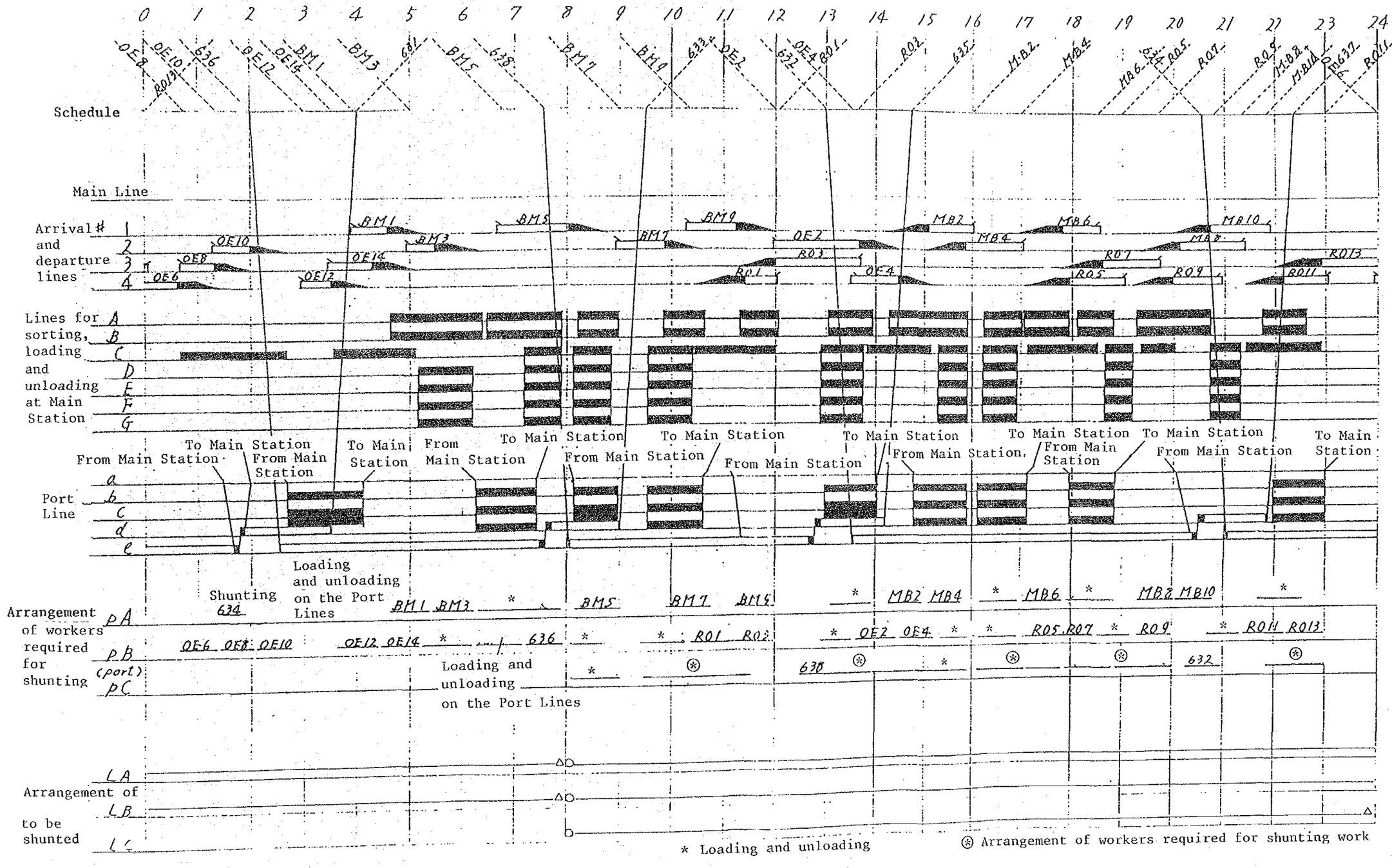


Fig. 3 Mae Nam Yard Work Diagram (Draft)

Appendix 6.2.4-(1) Freight Car Flow Table for Each Direction
(Daily Averages for 1996)

(Bang Sue) Unit: Car/day

O \ D	Northern Line	North-eastern Line	Southern Line	Eastern Line	Mae Nam	Bang Sue	Total
Northern Line			46	70		(100) 7	(100) 123
North-eastern Line			34	60		(83) 22	(83) 116
Southern Line	42	49		61		29	181
Eastern Line Mae Nam	83	30	78	11		(32) 22	(32) 224
Bang Sue	(100) 10	(83) 10	33	(32) 27			(215) 80
Total	(100) 135	(83) 89	191	(32) 229		(215) 80	(430) 724

Note: Figures Within parentheses represent the cars of direct transportation trains.

Appendix 6.2.4-(2) Table of Flows of Freight Cars by Direction
(August 12-14, 1986, Daily Average)

(Bang Sue) Unit: Car/day

O \ D	Northern Line	North-eastern Line	Southern Line	Eastern Line	Mae Nam	Bang Sue	Total
Northern Line			29	7	(57) 76	(5) [75] 9	(62) [75] 121
North-eastern Line			35	12	(31) 34	(5) [69] 11	(36) [69] 92
Southern Line	(30) 36	(16) 20		1	(7) 28	(10) 27	(63) 112
Eastern Line	(8) 9	(5) 6	1		(5) 6	(4) 8	(22) 30
Mae Nam	(25) 50	(20) 58	(3) 25	3		(10) 18	(58) 154
Bang Sue	(5) [75] 20	(5) [69] 16	(8) 20	(4) 7	(10) 10		(32) [144] 73
Total	(68) [75] 115	(46) [69] 100	(11) 110	(4) 30	(110) 154	(34) [144] 73	(273) [288] 582

Note: 1. The number of cars given in terms of two-axial cars.

2. Figures in parentheses are the number of empty cars recounted.

3. The number of unit trains freight collected is shown in brackets.

Appendix 6.2.5 The Bang Sue Yard Work Diagram (Draft)

1. The Bang Sue yard work diagram (draft) has been prepared as a provisional objective, for the yard work system for 1996, in the case that yard improvements (construction of a terminal arrival/departure track) are done.

2. In order to compile a yard work diagram for which implementation is possible, it is necessary to conduct a thorough investigation into the transportation and yard work, but since many details remain as yet undetermined, the following assumptions were made in the compilation.

   (1) Number of trains
   66 (according to the estimate for 1996)

   (2) Train arrival/departure time
   Based on the existing train diagram, with suitable time zones set for the New Port Line trains N1 to N8.

   (3) Time for shunting work
   The current times required for shunting work were used as a reference to calculate the following times: 20 minutes for uncoupling work at 10 minute intervals in the case of the hump; 45 minutes for trains that have a large number of uncouplings and couplings for flat shunting work; and 30 minutes for other trains.

   (4) Handling of special cement trains
   Trains are made to use the new arrival/departure tracks. Cars to be relayed to other stations, but small in number, are handled by a combination of terminal shunting and composition shunting.

   (5) Hump uncoupling work
   With the exception of the special cement trains, all trains are to have hump uncoupling.

(6) All shunting for the freight front and freight car depot is to be done by the freight terminal shunting party.

(7) Formation shunting is to be done according to a plan whereby only part A of the current two parties A and B, operating on a 24-hour work system, is to do the work from 0:00 to 12:00.

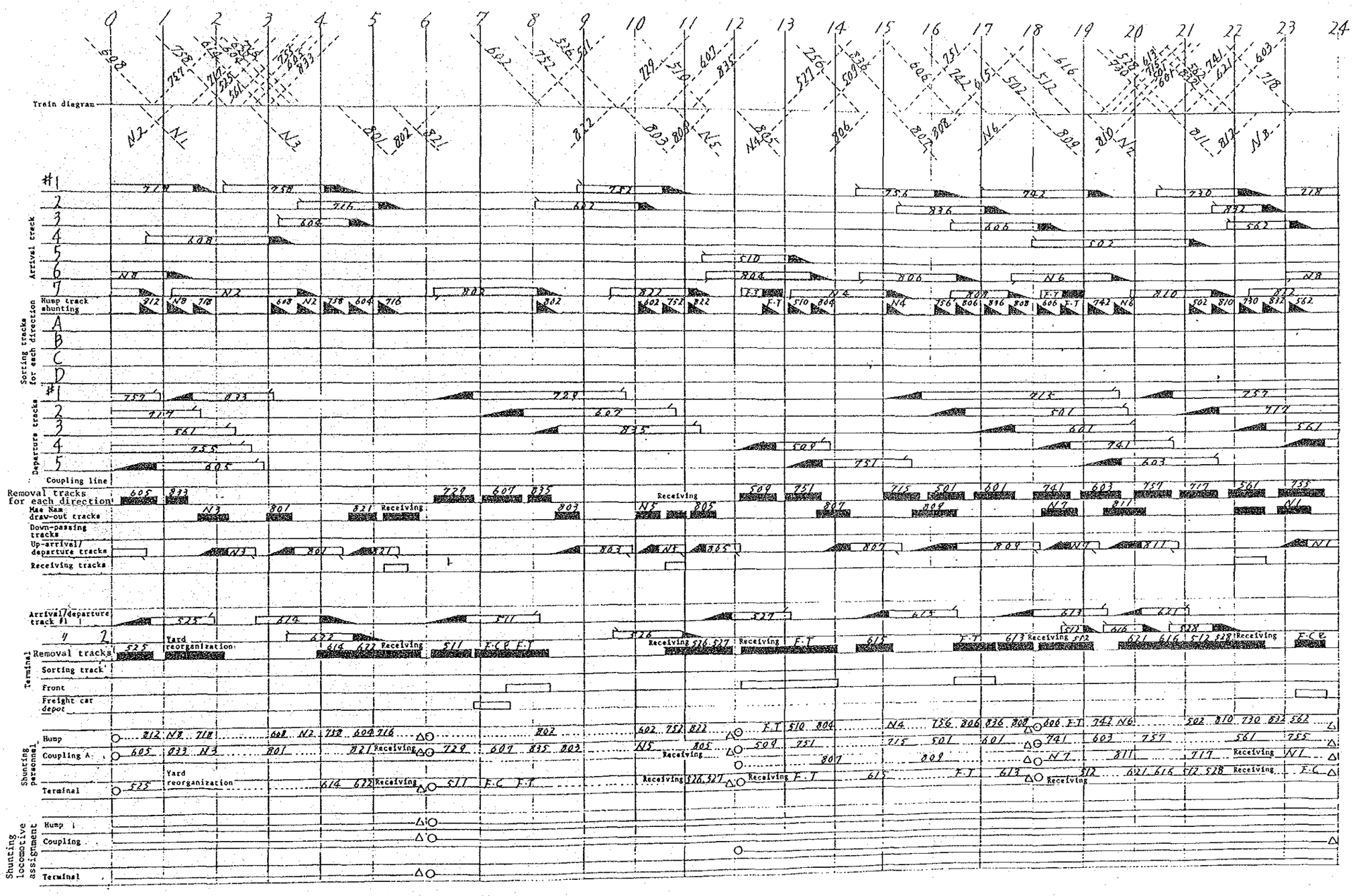


Fig. 1 Bang Sue Yard Work Diagram (Draft)

Appendix 6.2.6 Hat Yai Yard Work Diagram (Draft)

1. The Hat Yai yard work diagram (draft) has been prepared as a provisional objective, for the yard work system for 1996, in the case that yard improvements are done.

2. In order to compile a yard work diagram for which implementation is possible, it is necessary to conduct a thorough investigation into the transportation and yard work, but since many details remain as yet undetermined, the following assumptions were made in the compilation.

   (1) Number of trains
   Passenger trains: 26 (at present 22)
   Freight trains : 22

   (2) Train arrival/departure time
   The existing train diagram was used as the basis. Passenger trains having four new trains suitably incorporated, and the number of freight trains remaining the same.

   (3) Time for shunting work
   New tracks will be provided for sorting so that the shunting work time will become 45 minutes for trains that have a large number of uncouplings and couplings, and 30 minutes for other trains.

   (4) Passenger car shunting work
   Shunting work for passenger cars consists currently of transfers between tracks, uncoupling joint work for originating and terminating trains and replacement of cars for inspection, but since the assignment of passenger cars is as yet unclear, there is a provisional plan for decoupling work for the parts of cars connected to trains 131 and 15 and joint work for the parts of cars connected to trains 132, 15 and 16.

   Moreover, replacement work for the passenger cars for inspection was planned at twice.

(5) Freight front/freight car depot shunting

Freight front shunting is to be done three times, in the morning, afternoon and evening, while freight car depot shunting is to be done twice in the morning and evening.

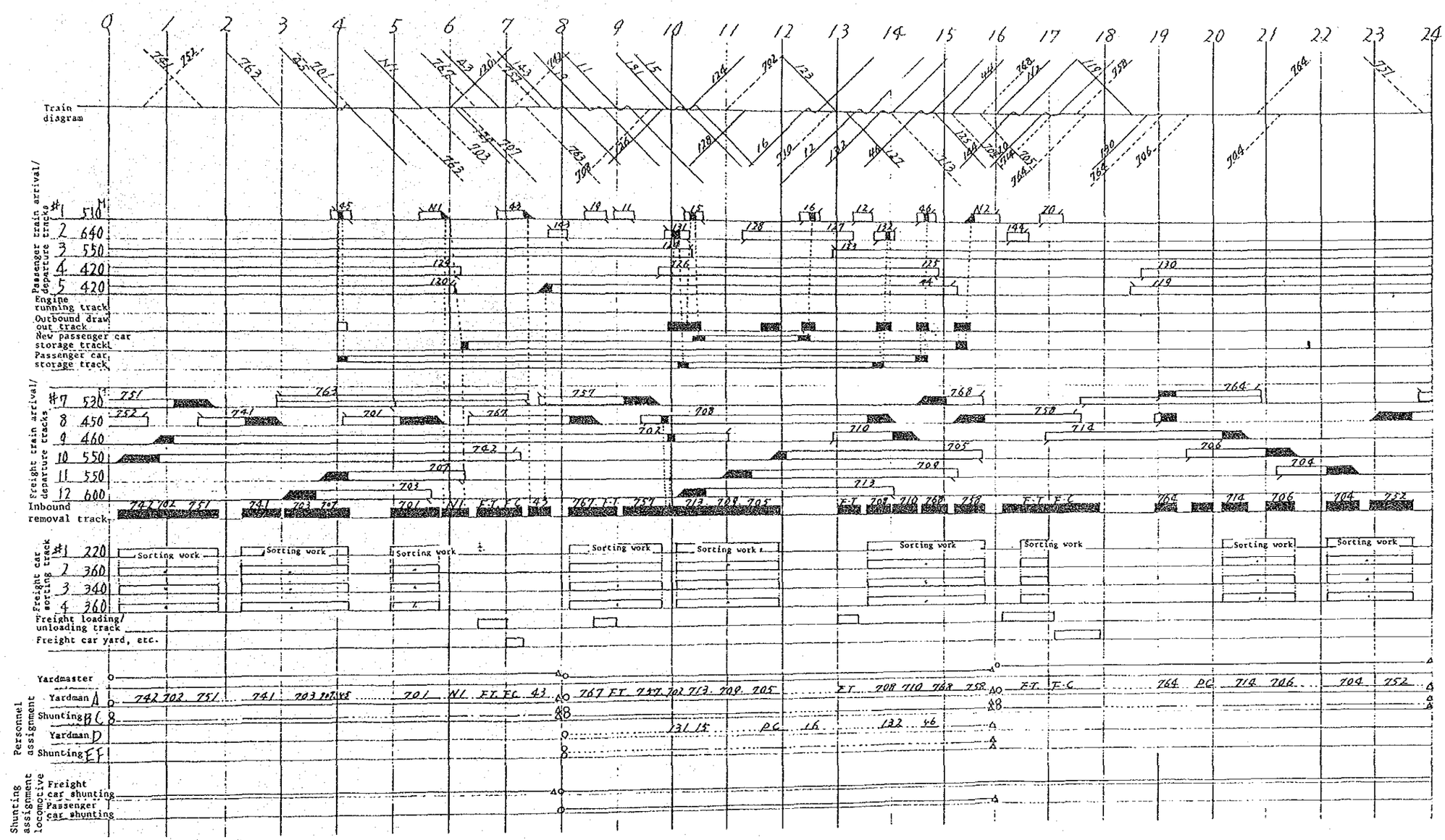


Fig. 1 Hat Yai Yard Work Diagram (Draft)

Appendix 7.2.1 Yard Facilities at Bangkok Station

1. Passenger and Freight Facilities

Track	Platform	Number of Tracks	Effective Length(m)	Track Number
Passenger arrival	Yes	4	300 - 390	1 - 4
Passenger arrival and departure	Yes	2	230	5 and 6
Passenger departure	Yes	5	250 - 390	7 - 11
Spare car storage	Yes	9	30 - 220	16 - 18, and 21-1 - 21-6
Formed train storage	No	10	150 - 370	13, 15, 21, and 22 - 28
Clearing	No	2	270	19 and 20
Shunting pass	No	1	210	14
Engine depot gateway	No	2		30 and 31
Miscellaneous storage	No	3	40 - 70	32 - 34
Draw-out	No	1	680	35

2. DRC Base Station Facilities

Track	Number of Tracks	Effective Length(m)	Track Number
DRC storage	5	130 - 220	D-1, D-2, D-15 — D-17
Daily inspection and refueling	3	130 - 220	D-12 - D-14
DRC inspection	3	190 - 240	D-3 - D-5
Materials	1	80	D-6
PC inspection	3	130 - 180	D-7 - D-9
Inspection tentative	2	100 and 120	D-18 and D-19
Draw-out	1	250	D-20
Painting	2	100 and 110	D-10 and D-11

Appendix 7.2.2 Maximum Frequency of Trains per Unit Time and Train Types

The frequency of trains arriving or departing in a certain period of time was obtained in a cumulative diagram shown in Figure 1.

The maximum frequencies of trains per unit time have been obtained from the diagram and arranged in Table 1. In the table, 60 minutes is taken as a unit time.

Taking the maximum value per hour, the arrival is 8 trains, and the departure is 6 trains.

In Table 1, departure train frequency in the time zone with maximum arrival train frequency in unit time is also shown to indicate that there is leeway on the departure platform side when the arrival platform is clogged.

Moreover, departure trains include DRCs with a relatively short shunting time, but trains with the maximum frequency value are the PC arrival trains that come one after another.

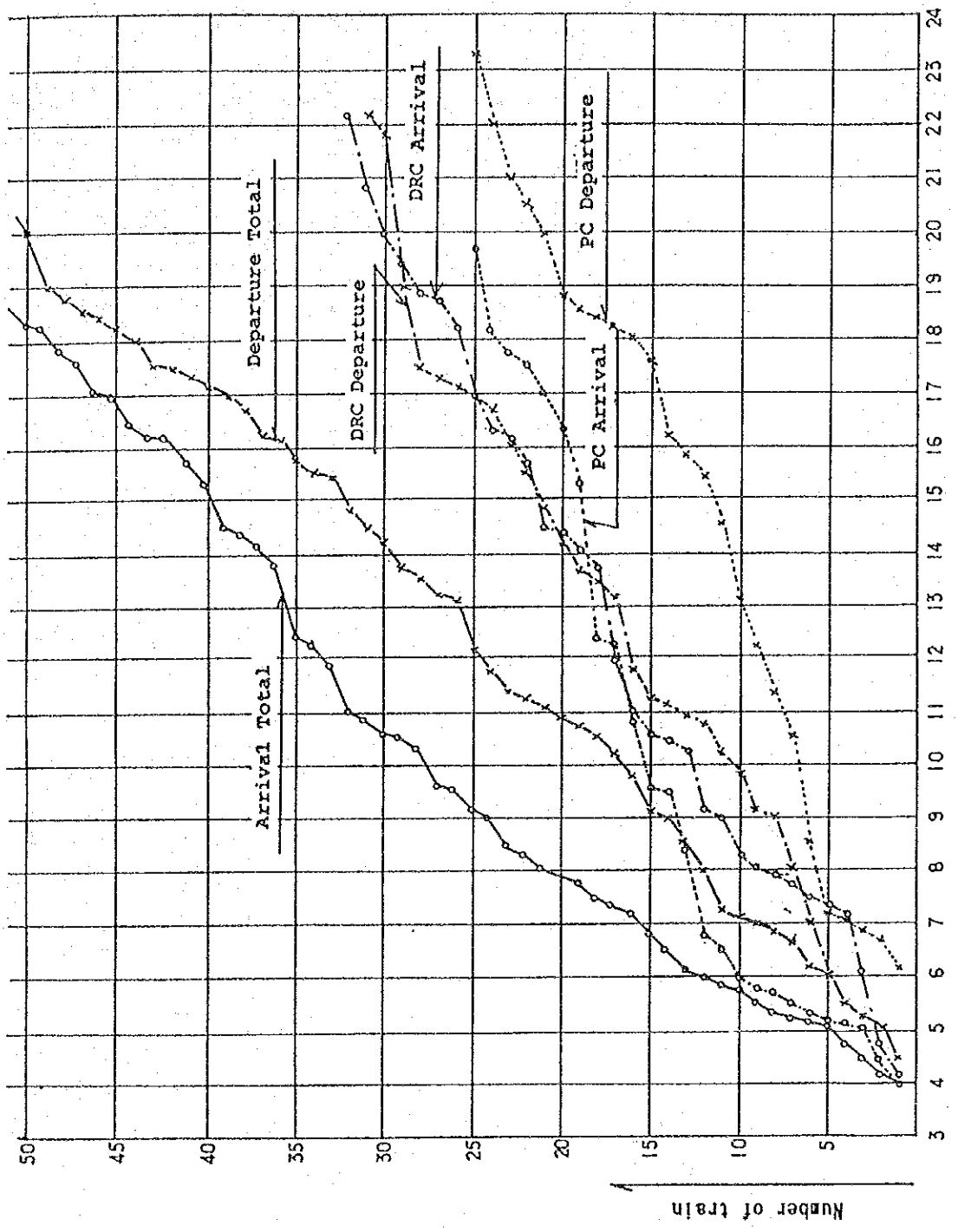


Fig. 1 Cumulative Diagram of Train Frequencies

Table 1 Train Frequencies in Morning and Evening Rush Hours

Arrival or Departure	Type	30 Minutes Max. Train Frequency	60 Minutes Max. Train Frequency	90 Minutes Max. Train Frequency	180 Minutes Max. Train Frequency	Remarks
Arrival	Time zone	5:30～6:00	5:00～6:00	4:45～6:15	4:27～6:27	
	Train frequency	4	8	10	12	
	Including PC trains	4	8	8	10	
	and DRC trains	0	0	2	2	
	Outbound trains in the same time zone	2	4	5	6	
Departure	Time zone	17:00～17:30	17:00～18:00	17:00～18:30	17:00～19:00	
	Train frequency	5	6	9	11	
	Including PC trains	1	2	5	6	
	and DRC trains	4	4	4	5	
	Inbound trains in the same time zone	1	3	5	7	

Appendix 7.2.3 Elements Related to Capacity of Arrival Tracks

1. Measures serving to increase arrival track capacity

To increase arrival track capacity, the following measures are considered to be useful, and will be examined in order.

1) Increase of tracks allowing arrival of trains.
2) Reduction of shunting time.
3) Reduction of passenger handling time.
4) Reduction of headway.

2. Increase of tracks allowing arrival of trains

Tracks presently used for train arrivals are arrival tracks 1-4 and arrival/departure tracks 5 and 6 (Figure 7.2.1).

Increasing the number of tracks allowing arrival is most effective for improving arrival track capacity, and SRT is planning to install 2 arrival tracks on the outside of track 1. The planned tracks will, of course, increase the number of arrival tracks, and at the same time, will be usable as passenger car storage tracks to relieve the burden on the restricted passenger car yard. They can also be used for shunting PC trains to remove tractive locomotives without using the passenger car yard in the morning rush hours. Thus, they are greatly effective.

Also, as stated in Appendix 7.2.2, when the train arrival side is most congested, the departure side is not so busy. Thus, departure tracks 7 and 8 can be converted to arrival/departure tracks to allow for the arrival of trains. This measure serves not only to increase the number of tracks allowing arrival, but also reduces shunting interference in train arrival since shunting work can be done on the departure side, thus contributing to increasing arrival track capacity.

3. Reduction of shunting and passenger handling hours

It takes about 5 minutes for a shunting locomotive at point C in Figure. 1 on the engine running track to remove cars to the arrival track out to point C.

Shunting time is not reducible so long as it is carried out as at present. However, if a arrival/departure track is connected to the departure track side, and removal done at the departure track side, the time the next arrival train is obstructed is reduced to 2-3 minutes. Also, since DRCs are self-running, no time is required for the coupling work of shunting locomotives; thus, shunting time is only 1-2 minutes. The passenger handling time of DRCs is shorter than that of PCs, but this is considered to be due to difference in the types of passengers, and it is not conceivable that the minimum passenger handling time can be reduced further.

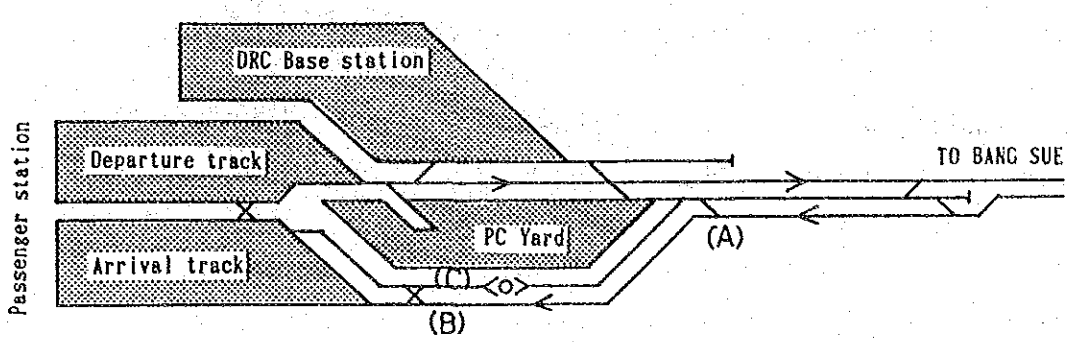


Fig. 1 Schematic Diagram of Bangkok Station

4. Reduction of Headway

SRT uses a minimum of 5 minutes for headway as a standard, and the signals between Bang Sue and Bangkok, in the course of which the Southern Line enters, also have this standard.

It takes about 5 minutes at Bangkok Station for a train to confirm a green signal at point (A) in Figure 1 and enter the station at a speed limit of 20 km/h and stop on the track along the platform: this is the minimum headway of arrival trains for Bangkok station.

To reduce minimum headway from 5 minutes to 3 minutes, it is necessary to control trains by a signal at point (B) with a caution signal (Yellow) provided at point (A) in Figure 1. Here, SRT employs the signal system of 2-position display as a rule, but it is required to improve it to the 3-position display system.