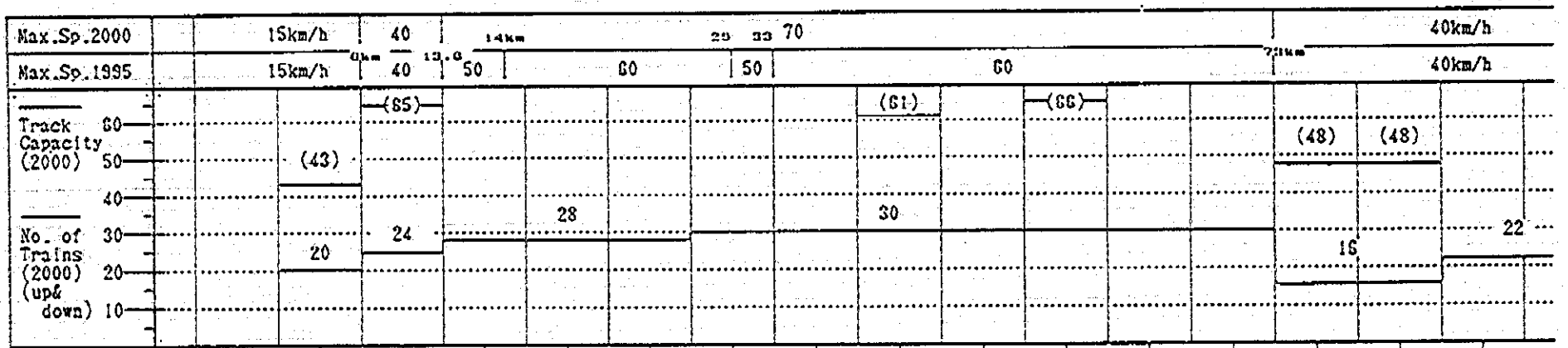
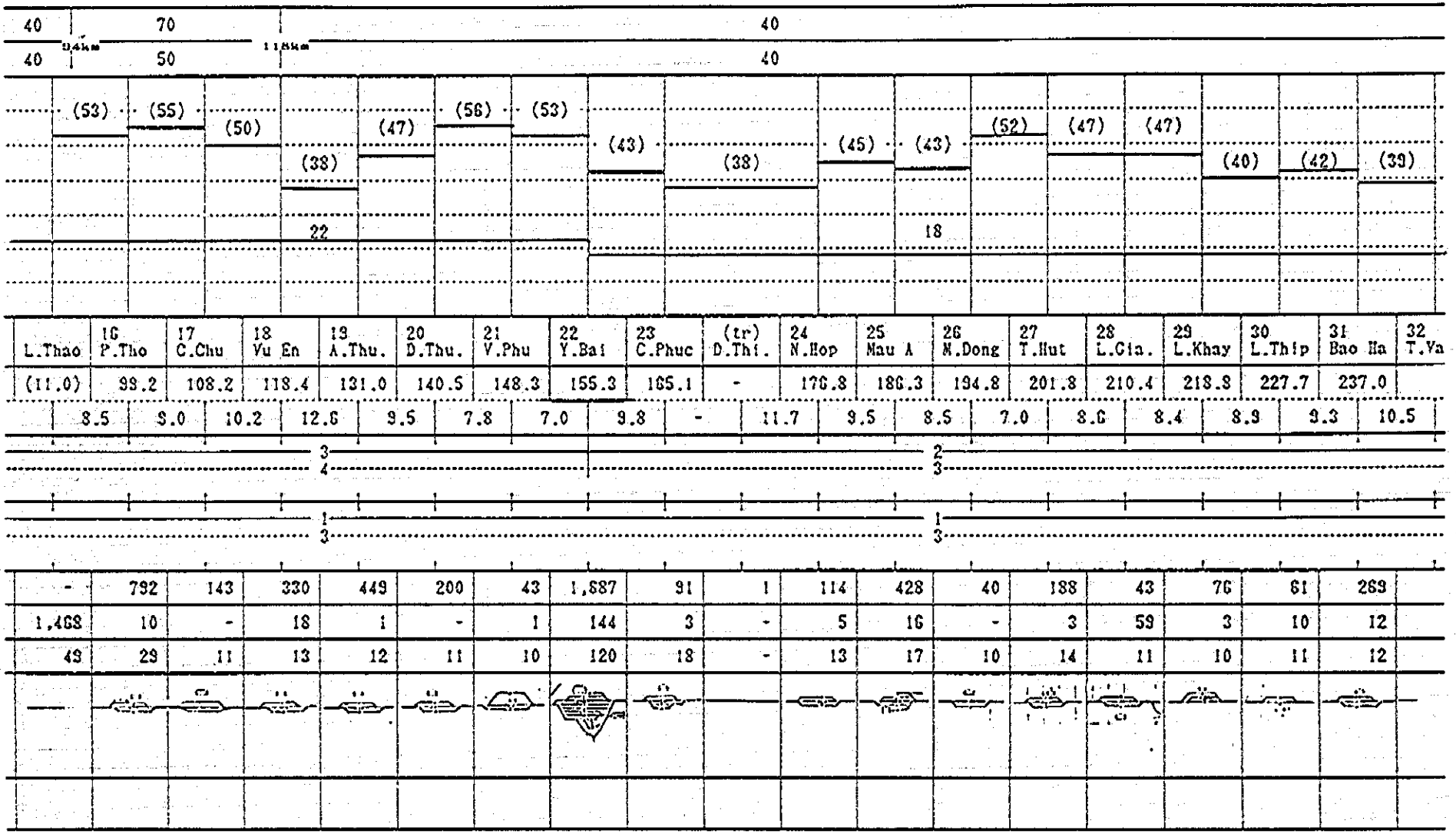
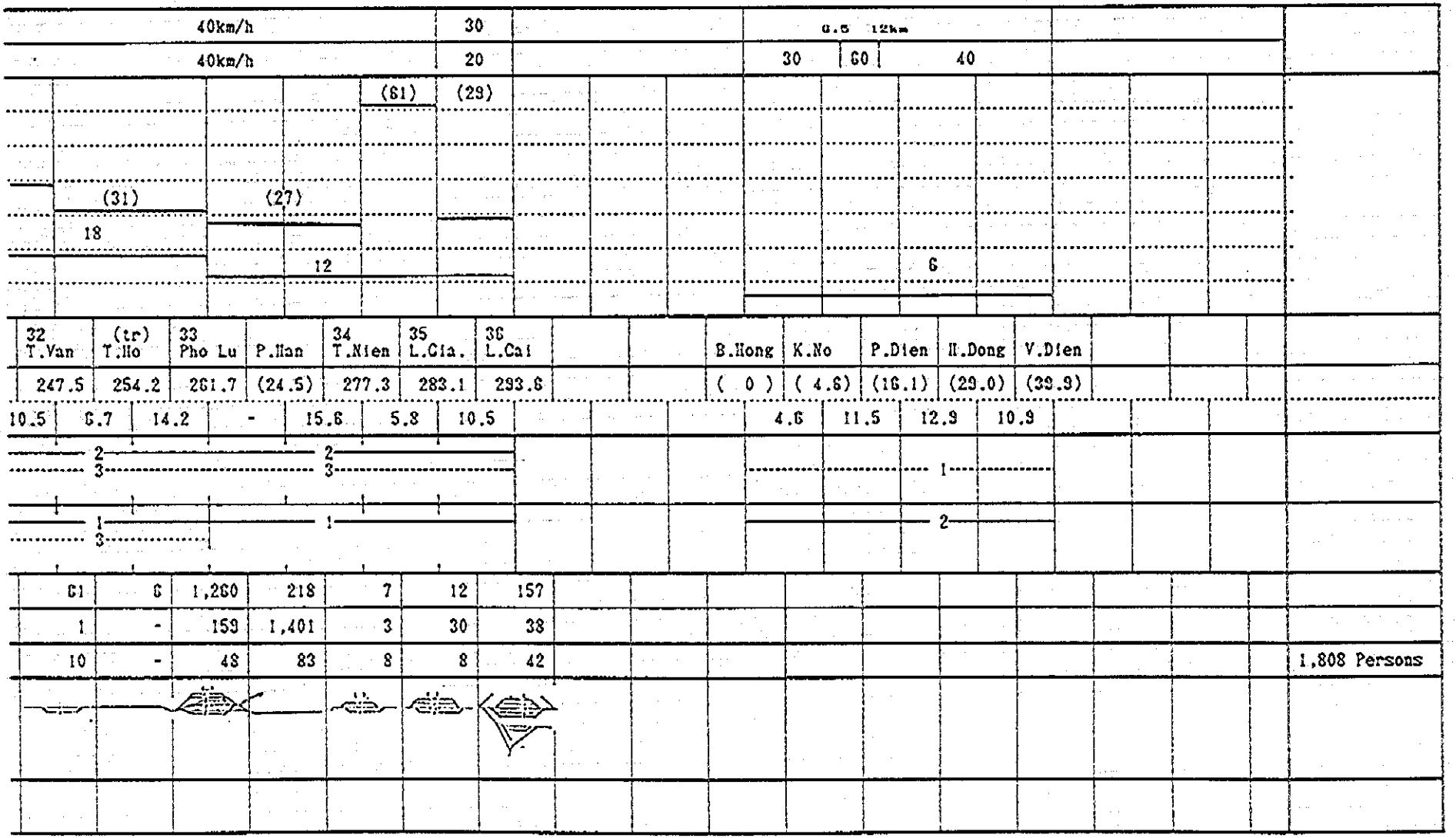
Appendix 9.3.1 Rough drawing of Track Layout and Capacity, etc. (Hanoi~Lao Cai) (1/3)



Station	1 Hanoi	(tr) L.Bien	2 C.Lam	3 Y.Vien	4 C.Loa	5 D.Anh	6 B.Hong	7 T.Lot	8 P.Yen	9 H.Canh	10 V.Yen	11 H.Lai	12 B.Hac	13 V.Tri	14 P.Duc	15 T.Kien	L.Thao
Distance(km)	0	2.0	5.5	10.9	18.0	21.4	27.0	33.2	39.0	47.7	53.5	62.9	68.7	72.7	81.8	90.7	(11.0)
Section (km)		2.0	3.5	5.4	7.1	3.4	5.6	6.2	5.8	8.7	5.8	9.4	5.8	4.0	9.1	8.9	11.0
Train Operation Plan (2000) Exp.			4	4		4								3			
Train Operation Plan (2000) Loc.			6	6			7							4			
Train Operation Plan (2000) F.T.				2		4				4				1		1	
Train Operation Plan (2000) E.T.																3	
Pass.(p/day)	293	13	32	158	-	128	-	45	317	56	323	50	14	655	138	181	-
Carg.(ton/#)	71	-	183	342	350	173	1	2	19	20	37	-	1	56	106	108	1,468
No.of Staff	447	( )	150	236	37	49	13	13	22	13	31	9	9	119	25	50	49
Rough drawing of the Station																	
Remarks																	


40
70
40
0.4km
1.1km
40
50
40
(53)
(55)
(50)
(38)
(47)
(56)
(53)
(43)
(38)
(45)
(43)
(52)
(47)
(47)
(40)
(42)
(39)
22
18
L.Thao
16 P.Tho
17 C.Chu
18 Vu En
19 A.Thu.
20 D.Thu.
21 V.Phu
22 Y.Bai
23 C.Phuc
(tr) D.Thi.
24 N.Hop
25 Mau A
26 M.Dong
27 T.Hut
28 L.Gia.
29 L.Khay
30 L.Thip
31 Bao Ha
32 T.Va
(11.0)
99.2
108.2
118.4
131.0
140.5
148.3
155.3
165.1
-
176.8
186.3
194.8
201.8
210.4
218.8
227.7
237.0
8.5
9.0
10.2
12.6
9.5
7.8
7.0
9.8
-
11.7
9.5
8.5
7.0
8.6
8.4
8.9
9.3
10.5
3
4
2
3
1
3
1
3
-
792
143
330
449
200
43
1,887
91
1
114
428
40
188
43
76
61
269
1,468
10
-
18
1
-
1
144
3
-
5
16
-
3
59
3
10
12
49
29
11
13
12
11
10
120
18
-
13
17
10
14
11
10
11
12


40km/h
30
0.6 12km
40km/h
20
30
60
40
(61)
(29)
(31)
(27)
18
12
6
32 T.Van
(tr) T.Ho
33 Pho Lu
P.Han
34 T.Nien
35 L.Cia.
36 L.Cai
B.Hong
K.No
P.Dien
H.Dong
V.Dien
247.5
254.2
261.7
(24.5)
277.3
283.1
293.6
(0)
(4.6)
(16.1)
(29.0)
(39.9)
10.5
6.7
14.2
-
15.6
5.8
10.5
4.6
11.5
12.9
10.9
2
3
1
61
0
1,260
218
7
12
157
1
-
159
1,401
3
30
38
10
-
48
83
8
8
42
1,808 Persons

Appendix 9.3.2 Operating Accidents and Train Delays

(1993)

Area	1	2	3	4	5	6	Total	Operation Delay
Stations			6		10	111	127	96H37'
Locomotives			2		5	360	367	533H28'
Track			12		1	43	56	68H22'
Rolling Stock			4		1	713	718	464H59'
Telecommunication			–			28	28	9H17'
Bridges			4		2	16	22	37H54'
External		1	25	201	1	331	559	789H14'
Unknown			2				2	114H43'
Total	–	1	55	201	20	1,602	1,879	2,128H30'

(1994)

Area	1	2	3	4	5	6	Total	Operation Delay
Stations			5		2	72	79	61H06'
Locomotives			3		7	354	364	503H00'
Track			9		1	29	39	58H23'
Rolling Stock			9		2	656	666	430H43'
Telecommunication			1		–	20	22	4H26'
Bridges			3		2	6	11	72H30'
External	2	1	24	214	2	217	460	758H21'
Unknown			7		–	–	7	293H46'
Total	2	1	61	214	16	1,354	1,647	2,181H21'

Appendix 9.3.3 Operation Regulations (JR case example)

1. Operation Regulations for Heavy Rain

Lines and sections that may be vulnerable to damage from heavy rain are designated in advance, and rain alarms are installed in necessary areas.

The rain alarms go off in the following manner according to the type of rain alarm installed in each operation regulation section, and operation regulations are implemented in response to these alarm operations.

Table 1 Alarm Displays and Regulation Speeds, etc.

Type	Alarm Display	A Section	B Section	C Section
Security ringing	White lamp on and buzzer sounds	Security	Security	Security
Caution ringing	Yellow lamp on and buzzer sounds	45 km/h or less	35 km/h or less	25 km/h or less
Alarm ringing	Red lamp on and buzzer sounds	35 km/h or less	25 km/h or less	No running

In cases where rain alarms go off as a result of accumulated rainfall, operating speed on all sections is to be 25 km/h or less.

Moreover, in cases where lines are flooded and the rails are inundated to a certain depth, train operations shall be suspended depending on the type of rolling stock.

(Example) 25 mm or more : Electric railcar
50 mm or more : Electric and diesel engines
80 mm or more : Passenger cars and diesel cars
200 mm or more : Freight cars
250 mm or more : Steam locomotives

There are five types of rain alarm (A-model to E-model), and they sound off (with different ringing types) according to the set rainfall level.

Fig. 1 illustrates an example of a rain alarm installation.

Incidentally, hourly rainfall refers to the amount of rainfall in the past hour, whereas continuous rainfall refers to the amount of rain that falls from the start until the end of the rain. (Anything within 24 hours is seen as a rainfall series).

When a rain alarm goes off, the designated maintenance section chief (line maintenance, power, signaling and telecommunication section chiefs, etc.) shall patrol the problem site and contact the operation dispatching center depending on the type of alarm, and the dispatching center shall alert the train drivers and conductors to make sure that the train operation regulation is carried out.

Trains can be alerted either through train wireless, etc. or through station masters.

Regulations shall be released in the same manner when the hourly rainfall drops below the alarm line and after a certain amount of time has elapsed.

2. Operation Regulations for Strong Winds

In the case of strong winds, as in the case of heavy rain, wind alarms are installed in necessary areas and the operation regulations indicated in Table 2 shall be carried out when the alarms go off.

Table 2 Wind Alarm Displays and Operation Regulations, etc.

Wind Velocity	Alarm Type	Regulation Speed
Between 20 m/s and 25 m/s	Alarm ringing	25 km/h or less
Over 25 m/s	Stop ringing	Suspension of train operation.

The same regulations shall apply to cases where there is no wind gauge and it is thought that the wind velocity has reached the regulation value.

Moreover, station masters at stations that are installed with wind gauges shall, in cases where the wind velocity has reached 10 m/s, continue to make measurements.

Implementation of the operation regulations is basically the same as in the case of heavy rain, however, station masters shall be able to impose regulations on their own initiative and then contact the related areas.

3. Operation Regulations for Earthquake

Earthquake alarms operate in the manner shown in Table 3.

Table 3 Earthquake Alarm Alarms and Displays and Operation Regulations, etc.

Acceleration Rate	Alarm Type	Alarm Display	Regulation Speed
Between 40 gal and 80 gal (equivalent to level 4 on Japanese scale of seismic intensity)	Alarm ringing	Yellow light on and buzzer sounds	25 km/h or less
Over 80 gal (equivalent to level 5 on the Japanese scale of seismic intensity)	Stop ringing	Red light on and buzzer sounds	Suspension of train operation

In cases where an earthquake alarm goes off (receives a report), the transportation dispatching officer shall give commands in accordance with the above operation regulations.

Train drivers shall stop their trains and avoid risk areas in cases where they sense an earthquake and consider the train to be at risk, or in cases where have received a command to that effect.

Maintenance section chiefs shall immediately patrol the designated sections and report back to the dispatching officers on the necessity of the regulations, and so on.

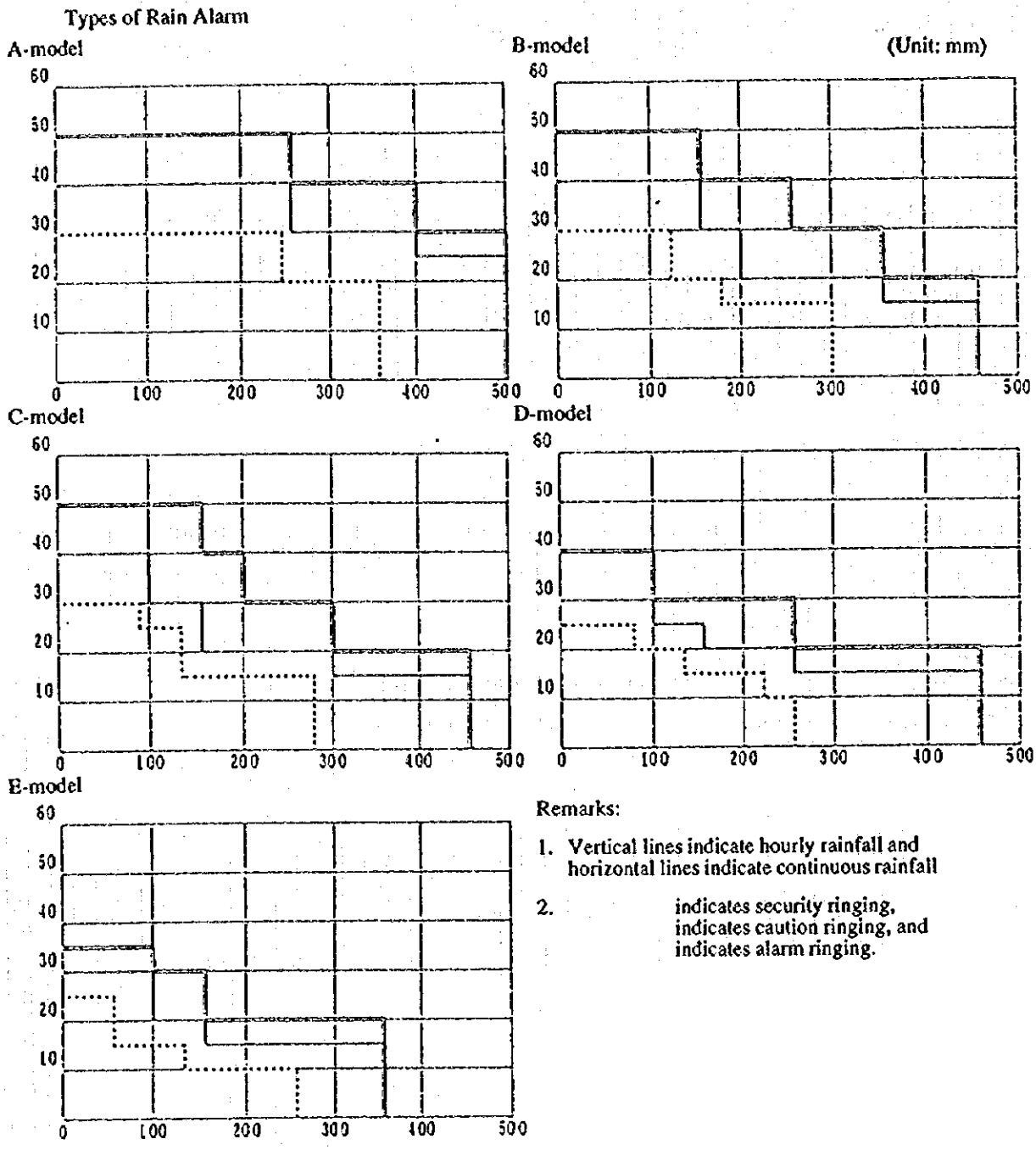


Fig. 1 Types of Rain Alarm and Settings

Appendix 9.3.4 Operating Performance of Locomotives and Running Resistance, etc.

1. Operating Performance of Main Locomotives

The running curves of locomotives and traction engines are indicated in Fig. 1.

2. Running Resistance, etc.

The running resistance for each type of locomotive is calculated through the following expressions.

(1) Running Resistance (rr)

DL : Acceleration	rr_E	=	$1.72 + 0.0084\ V + 0.0369\ V^2/W$	(kg/ton)
: Coasting	rr_e	=	$2.45 + 0.0500\ V + 0.0481\ V^2/W$	(kg/ton)
PC :	rr_p	=	$1.74 + 0.0069\ V + 0.000313\ V^2$	(kg/ton)
FC :	rr_f	=	$1.60 + 0.00077\ V^2$	(kg/ton)

However, V: Operation speed (km/h)
W: Locomotive or train weight (kg)

(2) Gradient Resistance (rg)

The acceleration and deceleration gradient correction (βr) on a gradient section (r‰) is obtained by the following expression.

$$\beta\gamma = \beta L \pm 0.033\,\gamma \quad \text{(km/h/sec)}$$

However, βL: Acceleration and deceleration (km/h/sec) on flat line.

(3) Curve Resistance

The curve resistance on a curve radius Rm is obtained by the following expression.

$$r_c = 800/R \quad \text{(kg/ton)}$$

3. Haulage Capacity and Train Formation, etc.

The haulage capacity and train formation, etc. are calculated by means of the following expression.

$$A = 0.7\,X\,(17 + 32 \times 0.85) + 0.3X \times 17$$

$$X = A/36$$

A	:	Haulage capacity (ton)	0.7	:	Loaded car ratio
X	:	Formation cars (cars)	0.85	:	Load factor
17	:	Car tare weight (ton)	0.3	:	Empty car ratio
32	:	Net weight (ton)			

According to the above expression, the net tonnage of a freight train with a haulage capacity of 800 tons will be:

X = 22 cars, Loaded cars = $22 \times 0.7 = 15$ cars. Therefore:

Net tonnage = $15 \times 32 \times 0.85 \fallingdotseq 410$ tons

Run curve (1)
D18E
400ton 9 Passenger cars
Accelerating Curve
Decelerating Curve
③ 3.5
② 3.0
6 ‰
10 ‰
18 ‰
23 ‰
km/h
(min)
km
0
1
2
3
4
5
6
7
8
9
10
20
30
40
50
60
70
80
1'10
2'20
3'30

Run curve (2)
D18E
600ton
Freight Train
Accelerating Curve
Decelerating Curve
0.0.75
L'
6 ‰
10 ‰
15 ‰
23 ‰
km/h
(min)
km

Run curve (3)
D12E-7 400ton 9 Passenger cars
Decelerating Curve
Accelerating Curve
β=1.0
β=1.5
6 ‰
10 ‰
16 ‰
km/h
(min)
km

Run curve (4)
D4H-M 400ton 9 Passenger cars
Accelerating Curve
Decelerating Curve
6 ‰
km/h
(min)
km

Appendix 9.3.5 Hauling Capacity and Train speed by Gradient

1. Passenger Trains (km/h)

Loco	T.W.	Gradient (‰)								Transport Capa.		
	ton	L	6	8	10	13	16	17	23	Tra.	For.	Par.
D18E	300	80	80	72	64	56	47	45	35	Exp.	7	420
	350	80	77	67	59	50	43	41	30	〃	8	S420
	390	80	72	62	55	47	39	37	27	〃	9	S400
	430	80	67	59	52	43	36	34	25	〃	10	S470
	480	80	62	55	48	39	32	30	22	〃	11	
	520	80	60	52	45	37	30	28	21	〃	12	
D 12 S	220	80	66	57	51	44	38	36	28	Loc.	4+1	320
	260	80	61	52	50	43	37	36	28	〃	5+1	400
	300	67	51	44	38	32	27	26	23	〃	6+1	480
W	300	80	72	68	63	54	47	45	36	Exp.	7	S290
	350	80	70	65	58	49	43	41	32	〃	8	S400
	390	80	67	61	53	46	40	38	30	〃	9	S450
	430	80	66	57	50	43	38	36	28	〃	10	S570
	480	80	63	53	47	41	35	33	26	〃	11	
	520	80	60	52	45	38	33	31	25	〃	12	
D13E S	220	80	80	78	72	65	57	54	44	Loc.	4+1	320
	260	80	78	64	57	48	41	39	31	〃	5+1	400
	300	80	66	60	52	43	37	35	27	〃	6+1	480
W	300	80	80	78	72	65	57	54	45	Exp.	7	420
	350	80	80	75	68	60	52	50	41	〃	8	S400
	390	80	78	72	65	56	49	47	38	〃	9	S450
	430	80	76	70	62	53	47	45	36	〃	10	S570
	480	80	73	65	58	50	44	42	32	〃	11	
	520	80	71	63	55	48	42	40	30	〃	12	
D11H S	220	80	63	56	48	40	37	36	28	Loc.	4+1	320
	260	80	58	50	45	38	34	33	25	〃	5+1	400
	300	79	53	46	40	35	30	29	20	〃	6+1	480

Note: Locomotive-S: Single Loco. -W: Double Loco. operation.
T.W. : Train Weight(ton)
For. : Train Formation. S400: Including sleeping cars.
4+1 : 4 Passenger cars and 1 Baggage car.

(Passenger Trains)

Loco	T.W.	Gradient (‰)								Transport Capa.		
	ton	L	6	8	10	13	16	17	23	Tra.	For.	Par.
D9E	220	80	62	55	49	42	37	36	27	Loc.	4+1	320
S	260	80	57	52	45	38	33	32	24	Exp.	5+1	400
	300	80	53	47	41	35	30	28	20	〃	6+1	480
W	260	80	78	71	63	55	48	47	39	〃	6	370s
	300	80	74	65	56	51	45	43	36	〃	7	420s
	350	80	69	60	53	47	42	40	32	〃	8	510s
	390	80	65	57	50	44	39	37	30	〃	9	560
	430	80	61	54	48	42	37	36	28	〃	10	720
	480	80	57	50	46	40	35	33	25	〃	11	
	520	80	55	48	44	38	33	31	23	〃	12	
D4H	130	50	47	43	37	30	-	-	-	Loc.	3	240
S	180	50	41	34	28	22	-	-	-	〃	4	320
	220	50	35	28	23	19	-	-	-	〃	5	400
	260	50	30	24	20	16	-	-	-	〃	6	480
W	260	50	48	44	37	28	-	-	-	Exp.	6	S370
	300	50	46	40	32	25	-	-	-	〃	7	
	350	50	42	34	27	22	-	-	-	〃	8	
	390	50	37	30	24	20	-	-	-	〃	9	
	430	50	35	27	23	19	-	-	-	〃	10	
D4H	130	70	55	48	34	27	-	-	-	Loc.	3	240
Imp.	180	70	35	32	26	20	-	-	-	〃	4	320
S	220	68	32	29	21	15	-	-	-	〃	5	400
W	300	70	42	37	30	24	-	-	-	〃	7	S420
	350	70	37	31	26	20	-	-	-	〃	8	
	390	70	33	28	21	15	-	-	-	〃	9	

Note: Imp. : Improved Locomotive.
370s : Only Seat cars

2. Freight Trains

Loco	T.W.	Gradient (‰)								Transport Capa.		
	ton	L	6	8	10	13	16	17	23	Tra.	For.	Par.
D18E	600	80	52	45	40	32	26	25	18	17	12	330
S	650	76	50	43	37	30	24	23	17	18	13	350
	700	75	47	40	35	27	23	21	-	19	14	380
	800	70	43	37	30	24	20	18	-	22	15	410
	900	67	40	32	27	21	18	17	-	25	18	490
	1000	65	37	30	25	19	-	-	-	28	20	540
	1200	60	31	25	20	-	-	-	-	33	24	650
D12E	300	78	51	45	38	32	27	26	22	8	6	160
S	330	72	50	44	37	32	27	25	20	輔 7	7	210
	340	72	50	44	37	32	27	25	20	9	7	190
	350	71	48	43	37	32	27	25	20	10	7	190
W	400	78	65	61	51	44	39	38	29	11	8	220
〃	450	77	60	54	48	41	36	34	27	13	9	240
〃	500	76	57	51	45	39	33	32	25	14	10	270
〃	550	75	55	47	43	36	31	30	23	15	11	300
〃	600	73	52	45	41	34	29	28	21	17	12	330
〃	650	72	50	44	39	32	27	26	20	18	13	350
〃	700	71	47	42	37	31	26	25	18	19	14	380
〃	750	70	45	40	35	29	24	23	17	21	15	410
〃	800	69	44	38	33	27	23	22	16	22	16	430
D13E	400	77	53	47	41	35	30	28	22	11	8	220
S	450	75	50	44	38	32	27	26	19	13	9	240
	500	70	47	41	36	30	25	24	17	14	10	270
	600	68	42	36	32	26	21	20	-	15	11	300
W	600	80	62	55	50	43	37	36	27	17	12	330
〃	700	79	57	51	45	38	33	31	24	19	14	380
〃	800	77	53	47	42	35	30	28	21	22	15	410
〃	900	75	50	44	38	32	27	25	18	25	18	490
D11H	300	74	50	45	39	35	31	29	21	8	6	160
S	400	68	43	38	34	29	23	22	-	11	8	220
W	500	79	57	50	43	38	34	33	25	14	10	270
〃	600	75	52	43	40	35	30	29	20	17	12	330
〃	700	72	46	41	37	32	27	25	15	19	14	380

(Freight Train)

Loco	T.W.	Gradient (‰)								Transport Capa.		
	ton	L	6	8	10	13	16	17	23	Tra.	For.	Par.
D9E	300	74	50	45	40	35	30	28	20	8	6	160
	350	71	47	41	36	31	26	24	16	10	7	190
W	500	79	54	48	43	38	33	32	24	14	10	270
〃	550	77	52	46	42	36	31	30	22	15	11	300
〃	600	74	49	44	40	34	29	26	20	17	12	330
D4H	300	50	45	38	32	25	-	-	-	8	6	160
W	350	50	42	32	25	20	-	-	-	10	7	190
	400	50	37	29	24	20	-	-	-	11	8	220

◎ Exclusive Freight Train

Gross ton	Net ton	No. of Cars
330	210	7
380	240	8
420	270	9
470	300	10
520	330	11
560	360	12
610	390	13
660	420	14
700	450	15
750	480	16
800	510	17
850	540	18
900	570	19
940	600	20

Appendix 9.3.6 (1) Number of persons passing through the section and train operation plan

O-D Total	Chart	Passenger 1 Lao Cai	2 P.Lu 1-2	P/S 3 Y.Bai 2-3	(2000) 4 T.Kien 3-4	Lao Cai - Cai Lan Line 5 V.Tri 4-5	6 B.Hong 5-6	to South 7 (V.Dien Y.Vien 6-V.D 6-7	to H.Phon (G.Lam) 7-G.La.	(Kanoi) G.L-Ha.	to South 8 Kep 7-8	(L.Son) 8-L.S.	9 C.Linh 8-9	10 Mao Khe 9-10	11 Ha Long 10-11	12 Cai Lan 11-12	
No.-sec	—		1247	1247	1756	1756	2511	100	2411	2813	413	2200	12	1111	38	1115	1115	1115	0
(A)	—		1281	1281	1926	1926	3033	101	2932	2844	438	2406	10	916	498	1000	1000	1000	0

Loop Line

Train Operation Plan		(2000) 1-2	Lao Cai Line 2-3	3-4	4-5	5-6	6-V.D	6-7	7-G.La.	G.L-Ha.	to South	Cai Lan Line 7-8	8-L.S.	8-9	9-10	10-11	11-12		
km		31.9	108.4	64.6	18.0	45.7	39.9	18.1	5.4	5.5		57.6		37.9	20.5	48.2	4.0		
No.of Train	Ex.:D4He	2	2	2	2	2		2	2	2	-	2	-	2	2	2			
	Ex.:D4HW	2	0	0	1	1		2	2	2	-	2	-	2	2	2			
	Lo.:D4H	1	3	4	4	4	1	4	4	3	-	3	01'ES	3	3	3			
	Total		5	6	7	7	1	8	8	7		7		7	7	7	0		
No.of Cars/ train	Exp.	9	9	9	9	9		9	9	9		4		4	4	4			
	Exp.			8	8	8		8	8	8									
	Local	5	5	5	5	5	5	5	5	5		5		5	5	5			
Nomi. Pass. Cap.	Exp.	480	480	480	480	480		480	480	480		480		480	480	480			
	Exp.			510	510	510		510	510	510									
	Local	320	320	320	320	320	320	320	320	320		320		320	320	320			
Transm. Cap.	Exp.	768	768	768	768	768	0	768	768	768		432	0	432	432	432	0		
	Exp.	-	-	408	408	816		816	816	816		0	0	0	0	0	0		
	Local	768	768	1024	1024	1792	256	1536	1536	1280		768	0	768	768	768	0		
(B)	Total	1536	1536	2200	2200	3376	256	3120	3120	2864		1200	0	1200	1200	1200	0		
(B)/(A)%		1.23	1.23	1.25	1.25	1.34	2.56	1.29	1.19	1.30	Lao Cai	1.08	0.00	1.08	1.08	1.08		Cai Lan	
		1.22	1.22	1.14	1.14	1.11	2.54	1.08	1.10	1.19	Total	1.31	0.00	1.10	1.10	1.10		Total	G.Total
Train (km)	Exp.	128	426	258	72	183	0	64	22	22	1174	346	0	227	123	289	0	1051	2225
	Exp.	0	0	129	36	183	0	64	22	22	456			0	0	0	0	0	456
	Local	191	638	517	144	640	80	193	66	55	2523	346	0	227	123	289	0	1051	3574
	Total	319	1064	904	252	1005	80	322	108	99	4154	691	0	455	246	578	0	2101	6255
Loco. (km)	Exp.	255	851	517	144	366	0	129	43	44	2349	346	0	227	123	289	0	1051	3399
	Exp.	0	0	258	72	366	0	129	43	44	912	0	0	0	0	0	0	0	912
	Local	191	638	517	144	640	80	193	66	55	2523	346	0	227	123	289	0	1051	3574
	Total	447	1490	1292	360	1371	80	451	151	143	5784	691	0	455	246	578	0	2101	7885
Car (km)	Exp.	1148	3830	2326	648	1645	0	580	194	198	10570	1382	0	910	492	1157	0	4202	14772
	Exp.	0	0	1034	288	1462	160	1224	410	396	4974	0	0	0	0	0	0	0	4974
	Local	957	3192	2584	720	3199	399	966	324	275	12816	1728	0	1137	615	1446	0	5253	17869
	Total	2105	7022	5943	1656	6307	559	2769	929	869	28159	3110	0	2047	1107	2603	0	9455	37615

Cai Lan to Kanoi

Ex.:8cars=350ton, 8cars=350t Local:5cars=220t

Cai Lan: Ex.:5-1cars:100ton Laos:

Appendix 9.3.6 (2) Number of cargo passing through the section and train operation plan

O-D Ch Chart	Cargo	F/S (2000) Lao Cai					to South		to K.Phon		to South	Cai Lan (2000)						
	1	2	3	4	5	6	7				8		9	10	11	12		
Total	Lao Cai	P.Lu	Y.Bai	T.Kien	V.Tri	B.Hong	(V.Dien	Y.Vien	(G.Lam)		(Hanoi)		Xep	(L.Son)	C.Linh	Mao Khe	Ha Long	Cai Lan	Lao C.L	Cai L.L.
		1-2	2-3	3-4	4-5	5-6	6-V.D	6-7	7-G.La	G.-H.Ph	G.L-Ha.		7-8	8-L.S.	8-9	9-10	10-11	11-12		
No.-sec. —		1184	1184	1202	1202	937	508	429	420	218	213	10	142	15	175	175	175	175		
(A) —		221	221	312	312	777	204	573	529	388	142	17	83	78	1491	1491	1491	1491	F.T.	F.T.
Get on (ton)	1184	0	80	0	581	0	142	0	0	25	125	0	0	0	0	0	0	1492	1046	481
Get off (ton)	221	0	152	0	1312	0	1176	0	0	390	174	0	0	0	0	0	0	175	310	143
							Via Loop Line											Apatite	98	
																		Coal :		60
Train Operation Plan																		Total	408	203
km	0	31.9	106.4	64.6	18.0	45.7	30.9	76.1	5.4		5.5		57.6		37.6	20.5	48.2	4.0		
		72%	72%	6%	6%	6%	6%	6%	6%		6%		6%		6%	6%	6%	6%		
No.of Di2E,S.V	F.T.	1	1	1	1	2	2	2	2		2		1		1	1	1	1		
Train Di2EW	Exc.T.	3	3	3	3	0	0													
Di2EW	Exc.T.															3				
	Total	4	4	4	4	2														
Net ton (ton)	F.T.	160	160	160	160	300	300	300	300		300		300		190	190	190	190		
	Exc.T.	420	420	420	420															
	Exc.T.															450				
N.of Loco.	F.T.	1	1	1	1	2	2	2	2		2		1		1	1	1	1		
	Exc.T.	2	2	2	2															
	Exc.T.															2				
No.of cars/train	F.T.	8	8	8	8	15	15	15	15		15		15		10	10	10	10		
	Exc.T.	14	14	12	14															
	Exc.T.															15				
Transport	F.T.	160	160	160	160	1200	600	600	600		300		300		190	190	190	190		
Capacity	Exc.T.	1260	1260	1260	1260	0	0	0	0		0		0		0	0	0	0		
	Exc.T.	0	0	0	0	0	0	0	0		0		0		0	1350	0	0		
(B)	Total	1420	1420	1420	1420	1200	600	600	600		300		300		190	1540	190	190		
(B)/(A)x	—	1.2	1.2	1.2	1.2	1.5	1.2	1.4	1.4		1.4	Lao Cai	2.1		1.1	8.8	1.1	1.1	Cai Lan	Total
	—	6.4	6.4	4.6	4.6	1.5	2.9	1.0	1.1		2.1	Total	3.6		0.1	1.0	0.1	0.1	Total	
Train km	F.T.	64	213	129	36	366	180	84	22		11	1064	115		76	41	96	8	347	1411
	Exc.T.	191	638	388	108	0	0	0	0		0	1325	0		0	0	0	0	0	1325
	Exc.T.	0	0	0	0	0	0	0	0		0	0	0		0	123	0	0	123	123
	Total	255	851	517	144	366	180	84	22		11	2389	115		76	164	96	8	470	2860
Loco. km	F.T.	64	213	129	36	731	319	129	43		22	1686	115		76	41	96	8	347	2033
	Exc.T.	383	1277	775	216	0	0	0	0		0	2651	0		0	0	0	0	0	2651
	Exc.T.	0	0	0	0	0	0	0	0		0	0	0		0	246	0	0	246	246
	Total	447	1490	904	252	731	319	129	43		22	4337	115		76	287	96	8	593	4930
Car km	F.T.	510	1702	1034	288	5484	2394	966	324		165	12867	1728		758	410	964	80	3472	16339
	Exc.T.	2680	8938	5426	1512	0	0	0	0		0	18556	0		0	0	0	0	0	18556
	Exc.T.	0	0	0	0	0	0	0	0		0	0	0		0	1845	0	0	1845	1845
	Total	3190	10640	6460	1800	5484	2394	966	324		165	31423	1728		758	2255	964	80	5317	36740
No.-sec.-T.C.	—	-236	-236	-218	-218	-263	-92	-171	-170		-87		-158		-15	-1365	-15	-15		
	—	-1199	-1199	-1108	-1108	-425	-398	-27	-71		-158		-217			-49				
Revision car-km		-558	-1860	-1044	-291	-890	-271	-52	-29		-36		-672							

O-D Ch Chart Cargo (2000) Apatite Includ Cai Lan

Total	1 Lao Cai	2 P.Lu 1-2	3 Y.Bai 2-3	4 T.Kien 3-4	5 V.Tri 4-5	6 S.Kong 5-6	to South (V.Dien 6-V.D	7 Y.Vien 6-7	(G.Lam) 7-G.La.G.-H.Ph	to H.Phon (Hanoi) G.L-Ha.	to South	8 Kep 7-8	(L.Son) 8-L.S.	9 C.Linh 8-9	10 Mao Khe 9-10	11 Ha Long 10-11	12 Cai Lan 11-12	
No.-sec —		1069	1069	1068	1068	282	99	183	182	59	123	0	1	0	1	1	1	0
(A) —		0	0	0	0	27	27	0	0	0	0	0	0	0	0	0	0	0
Get on (ton)	1069	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1069
Get off (ton)	0	0	1	0	813	0	0	0	0	0	123	0	0	0	0	1	0	0

Via.Loop Line

Train Operation Plan

km		0	31.9	106.4	64.6	18.0	45.7	39.9	16.1	5.4		5.5		57.6		37.9	20.5	48.2	4.0	
			12%	12%	6%	6%	6%	6%	6%	6%		6%		6%		6%	6%	6%	6%	
No.of Train	F.T.																			
	Exc.T.		5	5	5	5														
	Exc.T.																			
	Total		5	5	5	5	0	0	0	0	0	0								
Net ton	F.T.																			
	Exc.T.		420	420	420	420			360											
	Exc.T.																			
No.of Cars/ Train	F.T.																			
	Exc.T.		14	14	14	14														
	Exc.T.																			
Transport Capacity	F.T.		0	0	0	0	0	0	0	0		0		0		0	0	0		
	Exc.T.		1260	1260	1260	1260	0	0	0	0		0		0		0	0	0		
	Exc.T.		0	0	0	0	0	0	0	0		0		0		0	0	0		
(B)	Total		1260	1260	1260	1260	0	0	0	0		0		0		0	0	0		
(B)/(A)%			1.2	1.2	1.2	1.2		0.0	0.0			0.0		0.0		0.0	0.0	0.0		
								0.0												
Train km	F.T.		0	0	0	0	0	0	0	0		0		0		0	0	0		0
	Exc.T.		191	638	388	108	0	0	0	0		0		0		0	0	0		1325
	Exc.T.		0	0	0	0	0	0	0	0		0		0		0	0	0		0
	Total		191	638	388	108	0	0	0	0		0		0		0	0	0		1325
Car km	一般貨車		0	0	0	0	0	0	0	0		0		0		0	0	0		0
	車掌車		2680	8938	5426	1512	0	0	0	0		0		0		0	0	0		18556
	車掌車		0	0	0	0	0	0	0	0		0		0		0	0	0		0
	計		2680	8938	5426	1512	0	0	0	0		0		0		0	0	0		18556

Exc.T. :Gross:600ton Net:420ton:14cars

No. of Cars
143
(+4 days)
(30ton/car)
317
(-8 days:27ton/car)

Coal

O-D Chart Cargo (2000) Coal Includ Cai Lan

Total	1 Lao Cai	2 P.Lu 1-2	3 Y.Dai 2-3	4 T.Xien 3-4	5 V.Tri 4-5	6 D.Hong 5-6	to South (V.Dien 6-V.D	7 Y.Vien 6-7	(G.Lam) 7-G.La	G.-H.Ph	to H.Phon (Hanoi) G.L-Ha.	to South	8 Xep 7-8	(L.Son) 8-L.S	9 C.Linh 8-9	10 Mao Khe 9-10	11 Ha Long 10-11	12 Cai Lan 11-12	
No.-sec. —		0	0	0	0	0	0	0	19	0	19	1	14	0	14	14	14	0	
(A) —		39	39	78	78	113	0	113	85	17	68	0	910	28	1011	1011	1011	0	
Get on (ton)	0	0	10	0	7	0	19	0	0	14	68	0	0	0	0	1011	0	0	1011
Get off (ton)	39	0	49	0	42	0	882	0	0	146	0	0	0	0	0	14	0	0	

Via.Loop Line

Train Operation Plan

km	0	31.9	106.4	64.6	18.0	45.7	38.9	16.1	5.4	5.5	57.6	37.9	20.5	48.2	4.0	
		12%	12%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	6%	
No.of Train F.T.																
Exc.T.												3	3			
Exc.T.																
Total	0	0	0	0	0	0	0	0	0	0						
Net ton (ton) F.T.																
Exc.T.												420	420			
Exc.T.																
No.of cars/ Train F.T.																
Exc.T.												14	14	14		
Exc.T.																
Transpo F.T.	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Capacity Exc.T.	0	0	0	0	0	0	0	0	0	0	0	1260	1260	0		
Exc.T.	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
(D) Total	0	0	0	0	0	0	0	0	0	0	0	1260	1260	0		
(D)/(A)%	0.0	0.0	0.0	0.0	0.0					0.0	0.0	90.9	90.9	0.0		
	0.0	0.0	0.0	0.0						0.0	0.0	1.2	1.2	0.0		
Train km F.T.	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Exc.T.	0	0	0	0	0	0	0	0	0	0	0	227	123	0		350
Exc.T.	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Total	0	0	0	0	0	0	0	0	0	0	0	227	123	0		350
Car km F.T.	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Exc.T.	0	0	0	0	0	0	0	0	0	0	0	3184	1722	0		4906
Exc.T.	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Total	0	0	0	0	0	0	0	0	0	0	0	3184	1722	0		4906
												-3184				

No. of Cars
135
(+4 days)
(30ton/car)
299
(-8 days:27ton/car)

Train km
123

Car km
1722

Appendix 9.3.7 Train Over-running Accident Prevention Measures

With regard to this subject, description shall begin with the fundamental thinking in the JR train operation system.

1. Train Operation System and Safety Facilities

The train operation system, when divided into operation controls, is shown in the following table.

Operation Control	Control Content	Basic and Auxiliary Facilities		Modernization Facilities
Route control	Route setting	Interlocking devices		Automatic interlocking, ARC, PRC, CTC, etc.
Interval control	Coordination of intervals between trains and operating time intervals	Blocking equipment, Signaling equipment	# ATS	ATO
Drive control	Stop control, deceleration control, acceleration control, set position stop control, etc.	(Depending on driver handling)	ATC	
Operation surveillance control	Obstruction detection control, etc.	Various alarms		CTC, PRC, COMTRAC, etc.
Trains management control	Operation management control	Information communication equipment		

Note 1: The # sign indicates equipment to be installed as auxiliary equipment with regard to interval and drive control.

Note 2: ATO is based on ATC with automated acceleration control, etc.

Note 3: ARC and other abbreviations are as follows:

ATS: Automatic Train Stop
ATC: Automatic Train Control
ARC: Automatic Route Control
PRC: Programmed Route Control
CTC: Centralized Traffic Control
COMTRAC: Computer Aided Traffic Control

ATS is an auxiliary system used by blocking and signal drivers and does not require great skill for operation. However, there are cases where the ATC is used as a basic facility (on special sections such as commuter sections, etc.).

2. Train Overrunning Protection Measures

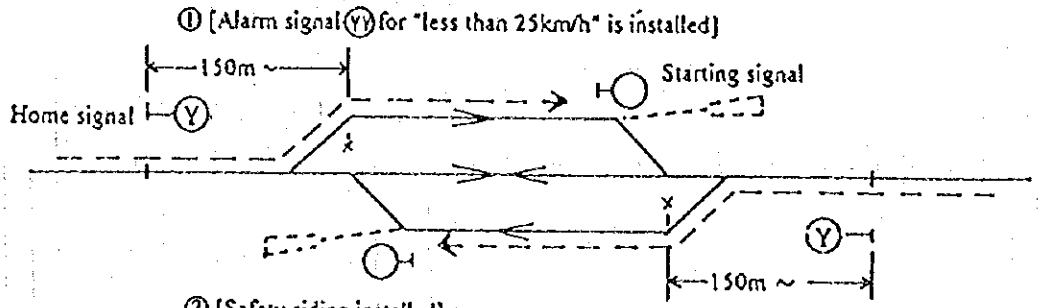
Leaving cases such as driver losing consciousness aside, if brake handling is mistaken due to poor weather conditions, etc., the overrunning of the stopping set position could hinder the operation of other trains. The following measures are adopted to prevent such an occurrence.

① With regard to stop signals, operate at low speed (25 km/h or less) and stop the train.

② Install safety sidings on the inner side of stop signals. (In this case, trains run at 45 km/h or less and stop on the outer side of the signals).

③ Provide an overrun allowance section of at least 150 m on the inner sides of stop signals. (The operation speed in this case will be the same as in " above).

Based on the above, the interlocking system shown in the diagram below is installed at a station to prevent the simultaneous entry or entry and exit of trains to and from a station. At the same time, either of the above-mentioned measures is adopted in areas where simultaneous entry is required.



Note: An overrun margin section of more than 150m is set up inside of the home signal for the case when the signal indicated stop.

Fig. 1 Facilities for Handling Simultaneous Train Entry, etc.

3. Routing of Interchange Station Planned for Construction on Hai Van Pass

Fig. 2 pass-by station to be constructed on Hai Van Pass.

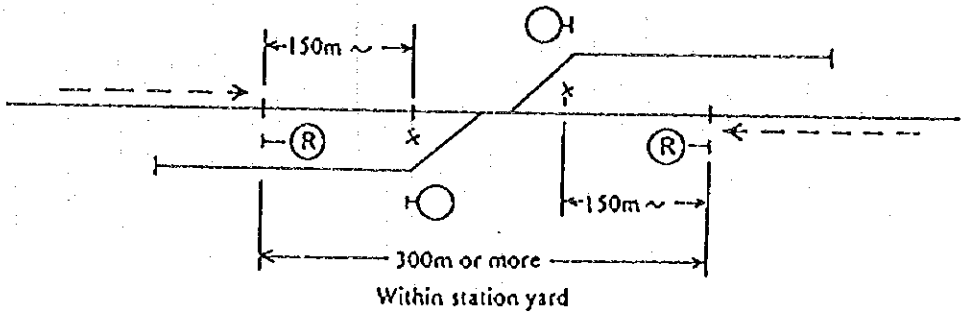


Fig. 2 Interchange Station to be Constructed on Hai Van Pass

In this case, it is considered that overrun accidents can be prevented through the following measures.

① Select facilities that do not allow simultaneous entry. (Add mutual locks to home signals).

② A 150 m overrun protection section is provided to handle cases where approaching trains have mutually overrun. (Separate signals by at least 300 m within the station yard).

③ Approaching train speed is basically low at 35 km/h or less.

Moreover, with regard to train pass-by at this station, the train schedule shall be planned to provide an allowance time of at least three minutes.

Appendix 9.3.8 ISO: Container

Container types		Height (H)		Width (W)		Length (L)	
		(mm)	(ft - in)	(mm)	(ft - in)	(mm)	(ft - in)
Standard	1A	2438	8 - 0	2438	8 - 0	12192	40 - 0
	1AA	2591	8 - 6				
	1B	2438	8 - 0			9125	30 - 0
	1C					6058	20 - 0
	1D					2991	9 - 9.75
	1E					1968	6 - 5.5
	1F					1460	4 - 9.5
	2A	2100	6 - 10.5	2300	7 - 6.5	2920	9 - 7
	2B			2100	6 - 10.5	2400	7 - 10.5
	2C			2300	7 - 6.5	1450	4 - 9
	3A	2400	7 - 10.5	2650	8 - 8.75	2100	6 - 10.5
	3B			1325	4 - 4.15		
	3C						
Non - standard	40ft	2743	9 - 0	2438	8 - 0	12192	40 - 0
	45ft	2896	9 - 6			13716	45 - 0
	48ft			2591	8 - 6	14630	48 - 0
	53ft					16154	53 - 0
		2946	9 - 8				
	20ft	2591	8 - 6	2438	8 - 0	6058	20 - 0

Appendix 9.4.1 Summary of High Speed Track Inspection Cars

Currently in JR, practical maximum speeds are 110 km/h on conventional lines and 210 km/h on Shinkansen lines. Figure 1 shows an example of those types and measurement device arrangement.

The track irregularity measurement positions and irregularity detection points are shown in Figure 2. They can be summarized as follows.

1) is an undulation irregularity detection point and ① - ① are measurement points (10 m chord).

2) is a line disorder detection point and ② - ② are measurement points (10 m chord).

3) is a water level irregularity detection point.

4) is a gage irregularity detection point.

5) is a kilometer detection point.

As well as the above, measurement of flatness and car oscillation acceleration (vertical and horizontal) is carried out.

The above data is fed into an operational amplifier and track irregularity is automatically printed out on a record chart. All data is then sent to the central processing unit and recorded on magnetic tape by sample. After the run, the measured data from the run can be reproduced as charts by processing done on the above ground unit.

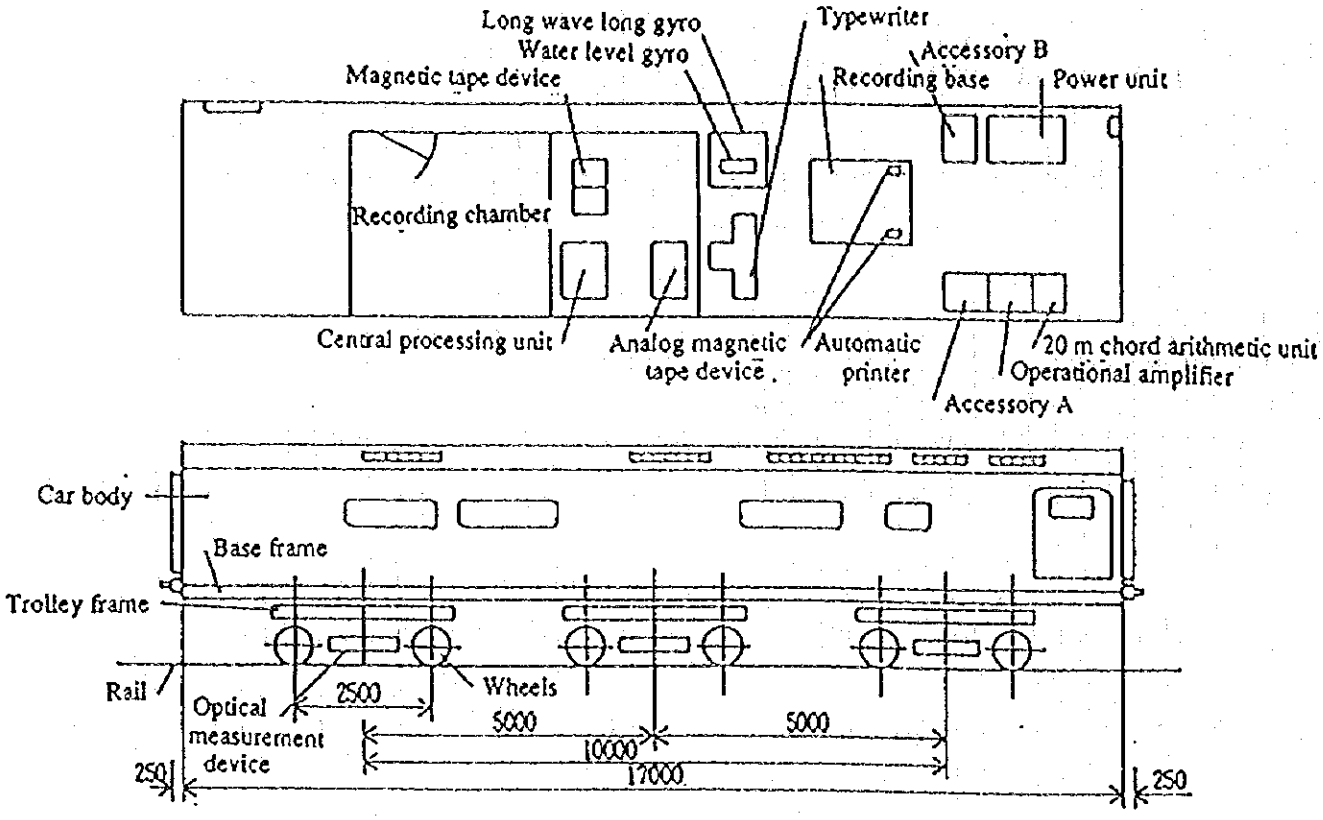

Long wave long gyro
Water level gyro
Typewriter
Accessory B
Magnetic tape device
Recording base
Power unit
Recording chamber
Central processing unit
Analog magnetic tape device
Automatic printer
20 m chord arithmetic unit
Operational amplifier
Accessory A
Car body
Base frame
Trolley frame
Rail
Optical measurement device
Wheels
2500
5000
5000
10000
17000
250
250

Fig. 1

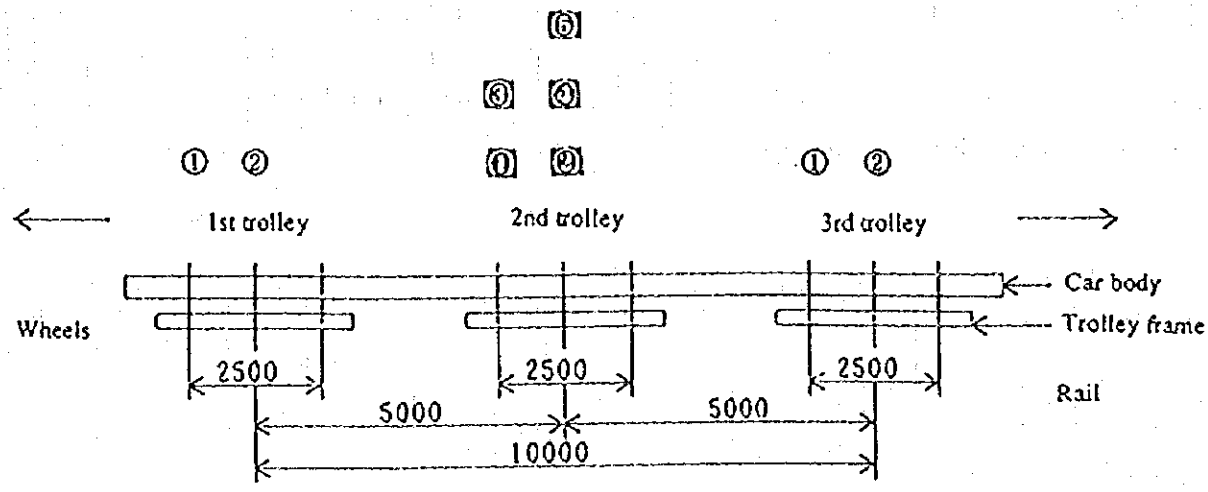

⑤
③
④
① ②
① ②
1st trolley
2nd trolley
3rd trolley
Car body
Trolley frame
Wheels
2500
2500
2500
Rail
5000
5000
10000

Fig. 2

Appendix 9.4.2 Summary of Ballast Making Facilities

The ballast making process and facilities are as shown in the flow chart. This can be summarized as follows. The solid lines indicate the process and facilities under consideration for this project.

Assuming that crushed stone are used for 24-26 mm ballast:

1. Put appropriately broken rocks into the rock hopper ①.

2. Separate rocks (to ③) and soil (to a) in the feeder ②.

3. Crush separated rocks from A in the initial crusher ③. Then carry the rocks to ④ by the conveyor belt.

4. Separate 63 mm or bigger rocks (to ⑤), 24-63 mm rocks (to c) and 24 mm and smaller rocks (to b) by the initial screen ④.

5. Put rocks of 63 mm or bigger through the secondary crusher ⑤ (with shaping function) and return to ④ by conveyor belt.

6. ⑥ is the dust collector.

7. ⑦ is a supplementary hopper for unshaped rocks.

8. ⑧ and beyond is possible for making rocks of 24 mm or smaller and crushed rocks for concrete etc., if a secondary crusher (with shaping function), screen, conveyor belt and dust collector are prepared.

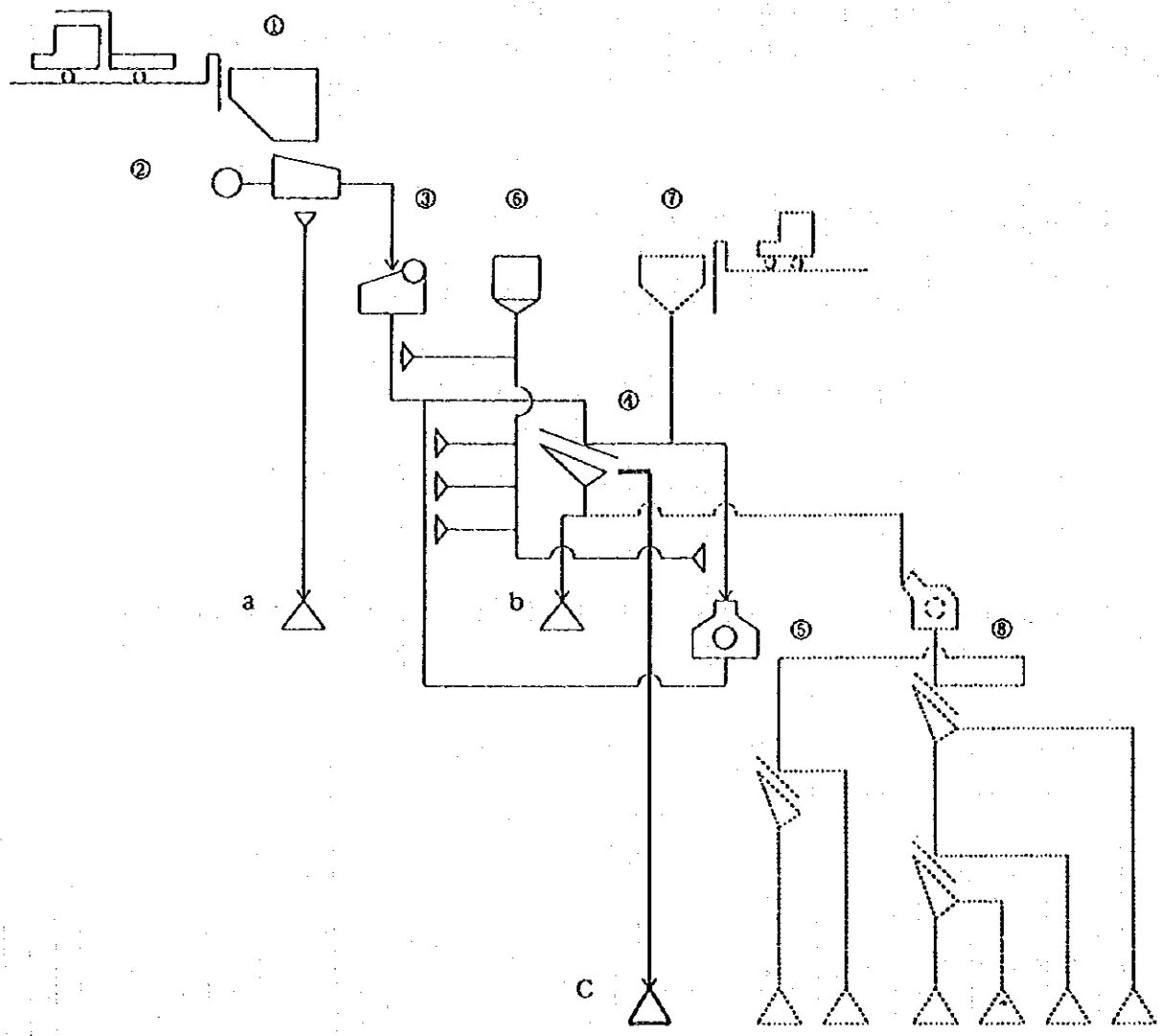
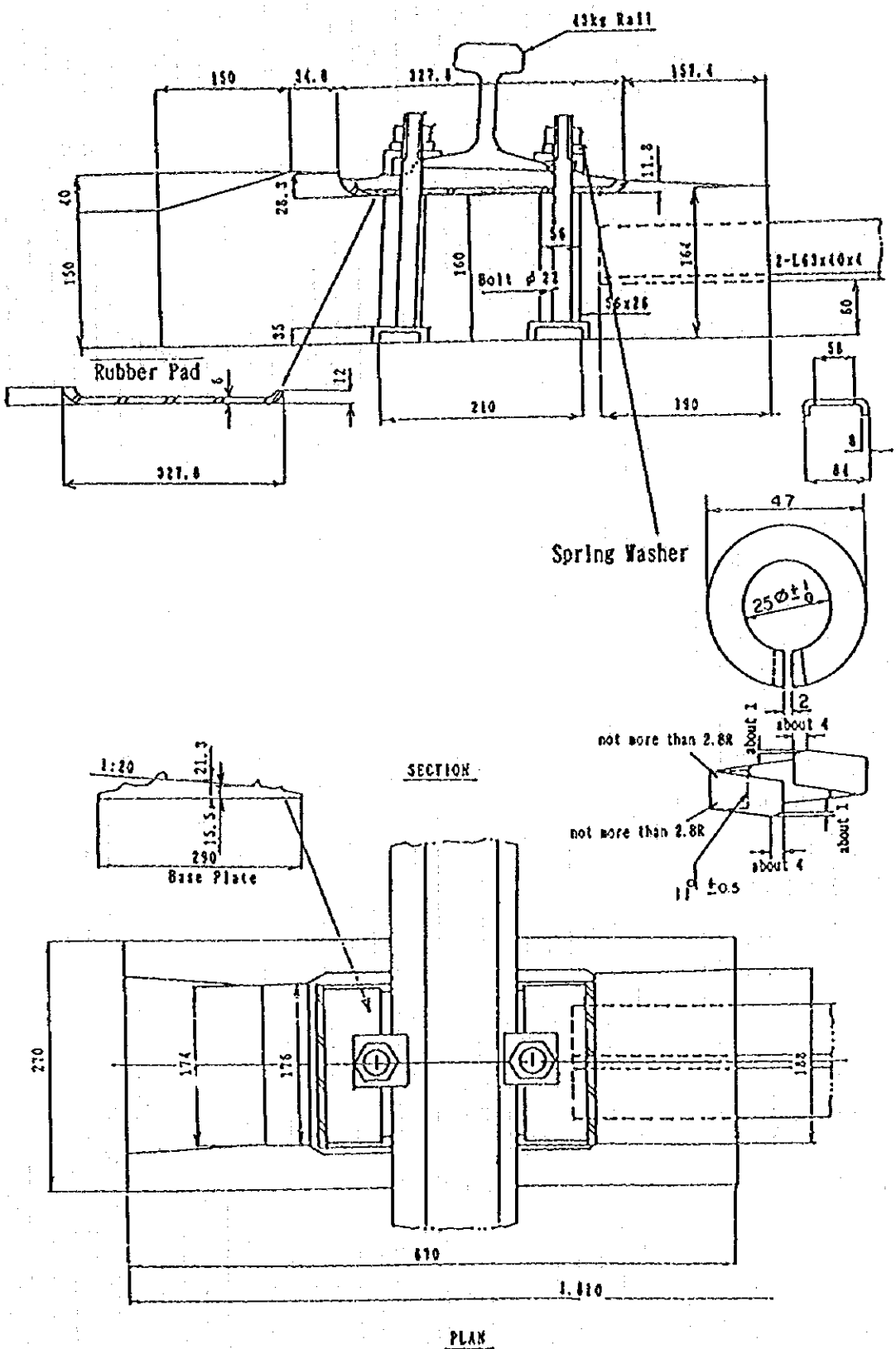
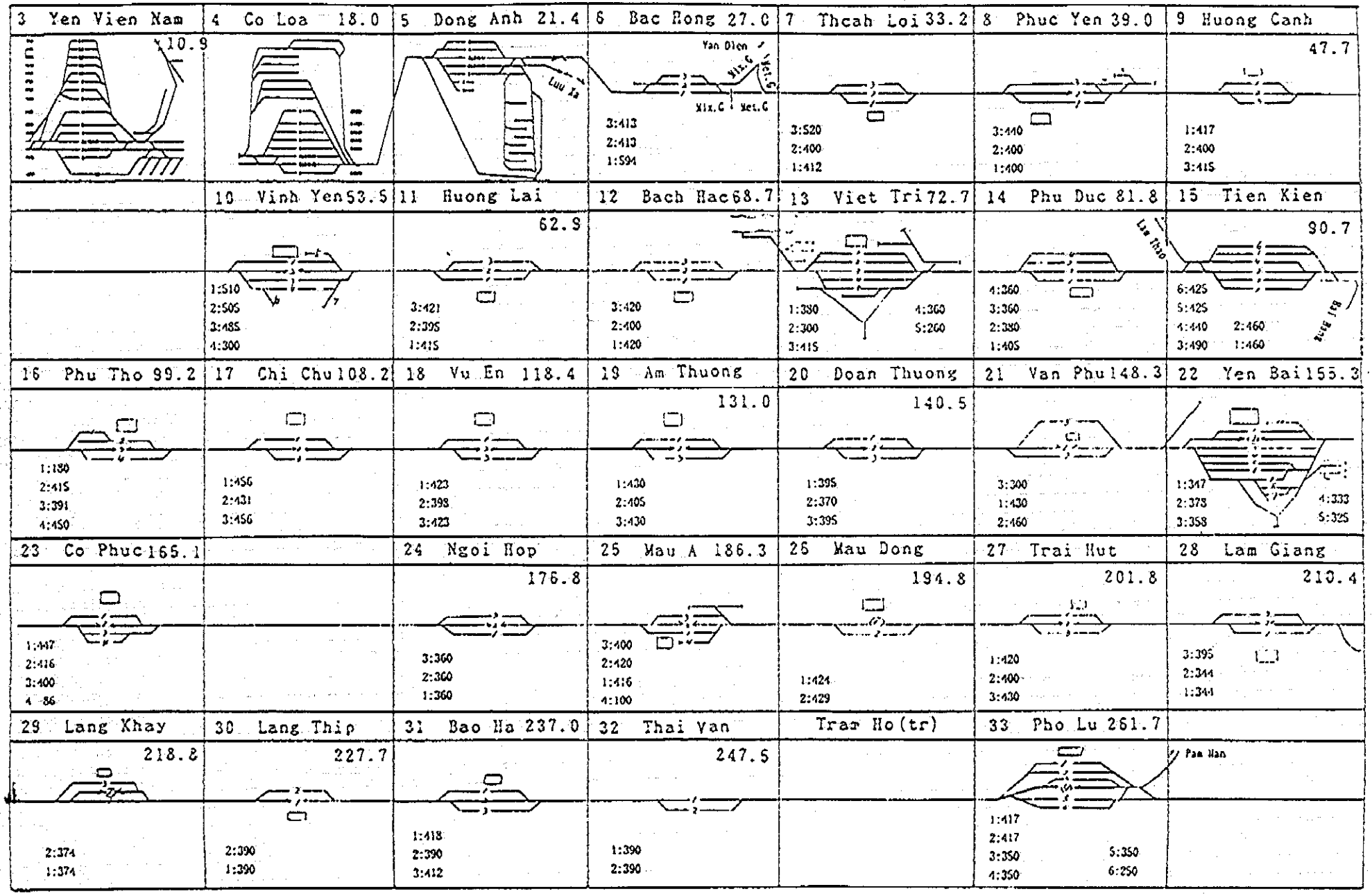


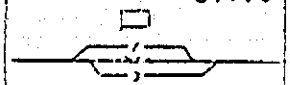
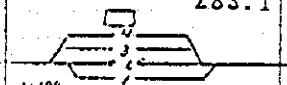
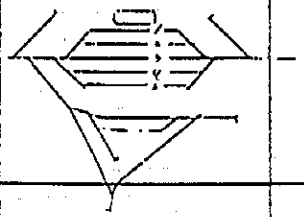
Fig. 1 Flow-Chart of Stone Crushing Facilities

Appendix 9.4.3 Improved Fasteners

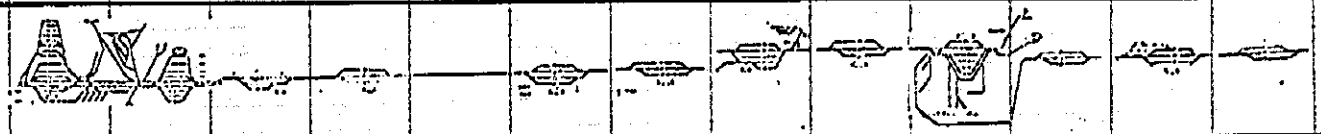


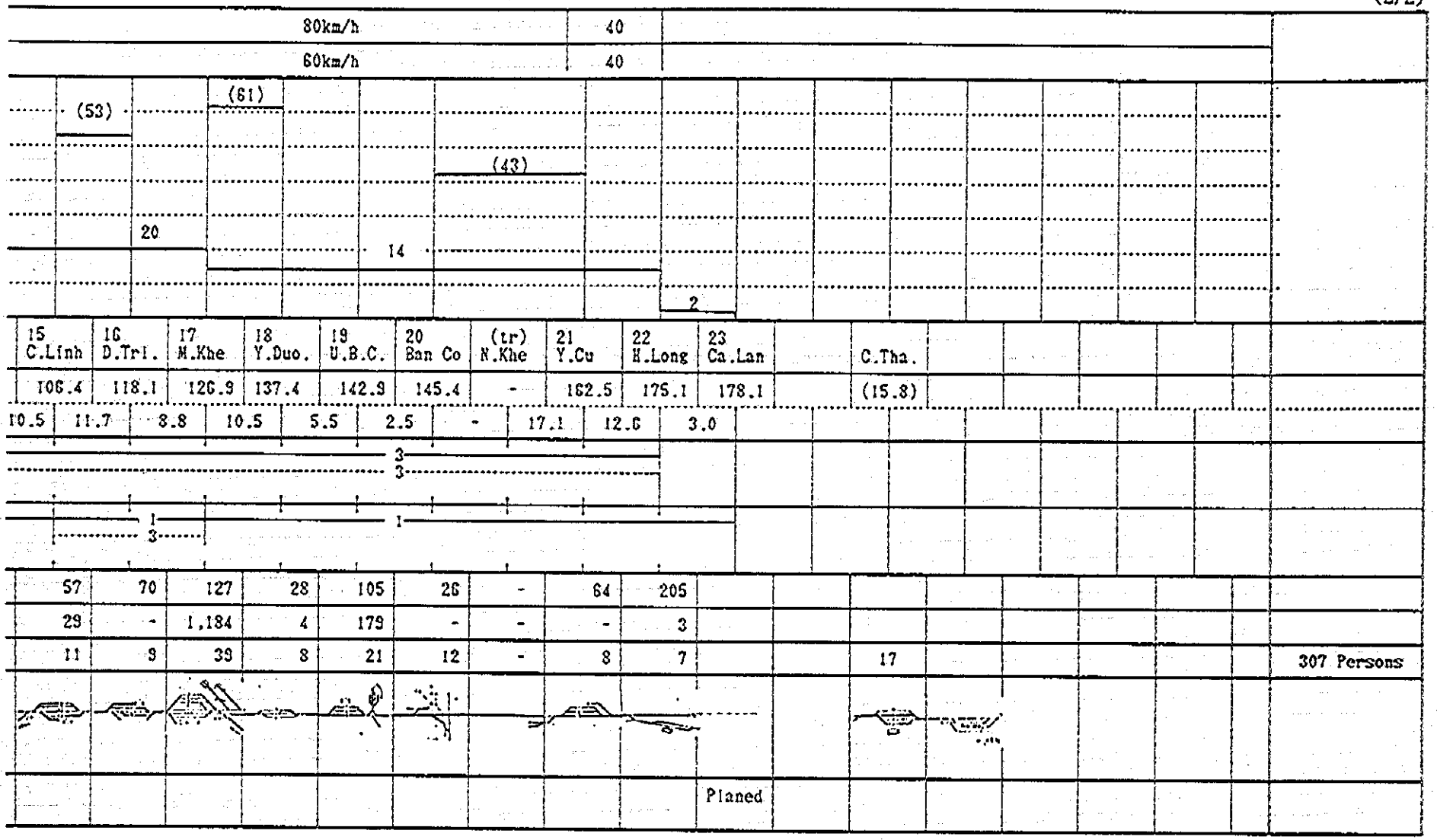
K3 TYPE FASTNER


3 Yen Vien Nam
10.9
4 Co Loa 18.0
5 Dong Anh 21.4
Luu Xa
6 Bac Hong 27.0
Yen Dien
Xix.C
Xix.C
Met.C
3:413
2:413
1:594
7 Thcah Loi 33.2
3:520
2:400
1:412
8 Phuc Yen 39.0
3:440
2:400
1:400
9 Huong Canh
47.7
1:417
2:400
3:415
10 Vinh Yen 53.5
11 Huong Lai
62.9
1:510
2:505
3:485
4:300
3:421
2:395
1:415
12 Bach Hac 68.7
3:420
2:400
1:420
13 Viet Tri 72.7
1:380
2:300
3:415
4:360
5:260
14 Phu Duc 81.8
Lua Thao
4:360
3:360
2:380
1:405
15 Tien Kien
90.7
Red R.
6:425
5:425
4:440
3:490
2:460
1:460
16 Phu Tho 99.2
1:180
2:415
3:391
4:450
17 Chi Chu 108.2
1:456
2:431
3:456
18 Vu En 118.4
1:423
2:398
3:423
19 Am Thuong
131.0
1:430
2:405
3:430
20 Doan Thuong
140.5
1:395
2:370
3:395
21 Van Phu 148.3
3:300
1:430
2:460
22 Yen Bai 155.3
1:347
2:378
3:358
4:333
5:325
23 Co Phuc 165.1
1:447
2:416
3:400
4:86
24 Ngoi Hop
176.8
3:360
2:360
1:360
25 Mau A 186.3
3:400
2:420
1:416
4:100
26 Mau Dong
194.8
1:424
2:429
27 Trai Hut
201.8
1:420
2:400
3:430
28 Lam Giang
210.4
3:395
2:344
1:341
29 Lang Khay
218.8
2:374
1:374
30 Lang Thip
227.7
2:390
1:390
31 Bao Ha 237.0
1:418
2:390
3:412
32 Thai Van
247.5
1:390
2:390
Trar Ho(tr)
33 Pho Lu 261.7
Pan Han
1:417
2:417
3:350
4:350
5:350
6:250

34 Thai Nien	35 Lang Giang		36 Lao Cai293.6			
277.3  1:380 2:355 3:380	283.1  4:400 3:400 2:425 1:425					
	Lam Thao	Bai Bang				
						

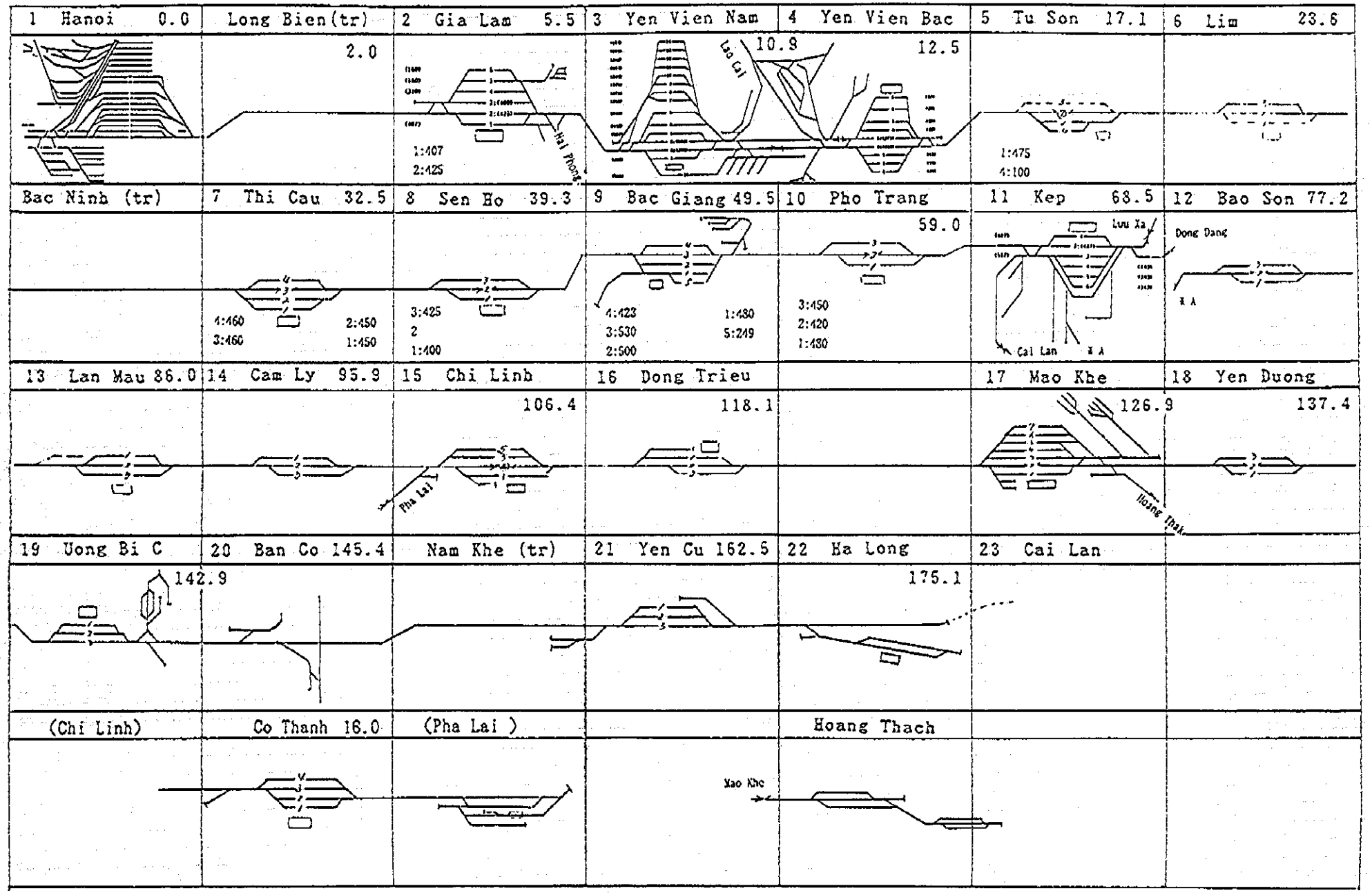
Appendix 13.3.1 Rough drawing of Track Layout and Capacity, etc. (Hanoi~Cai Lan)

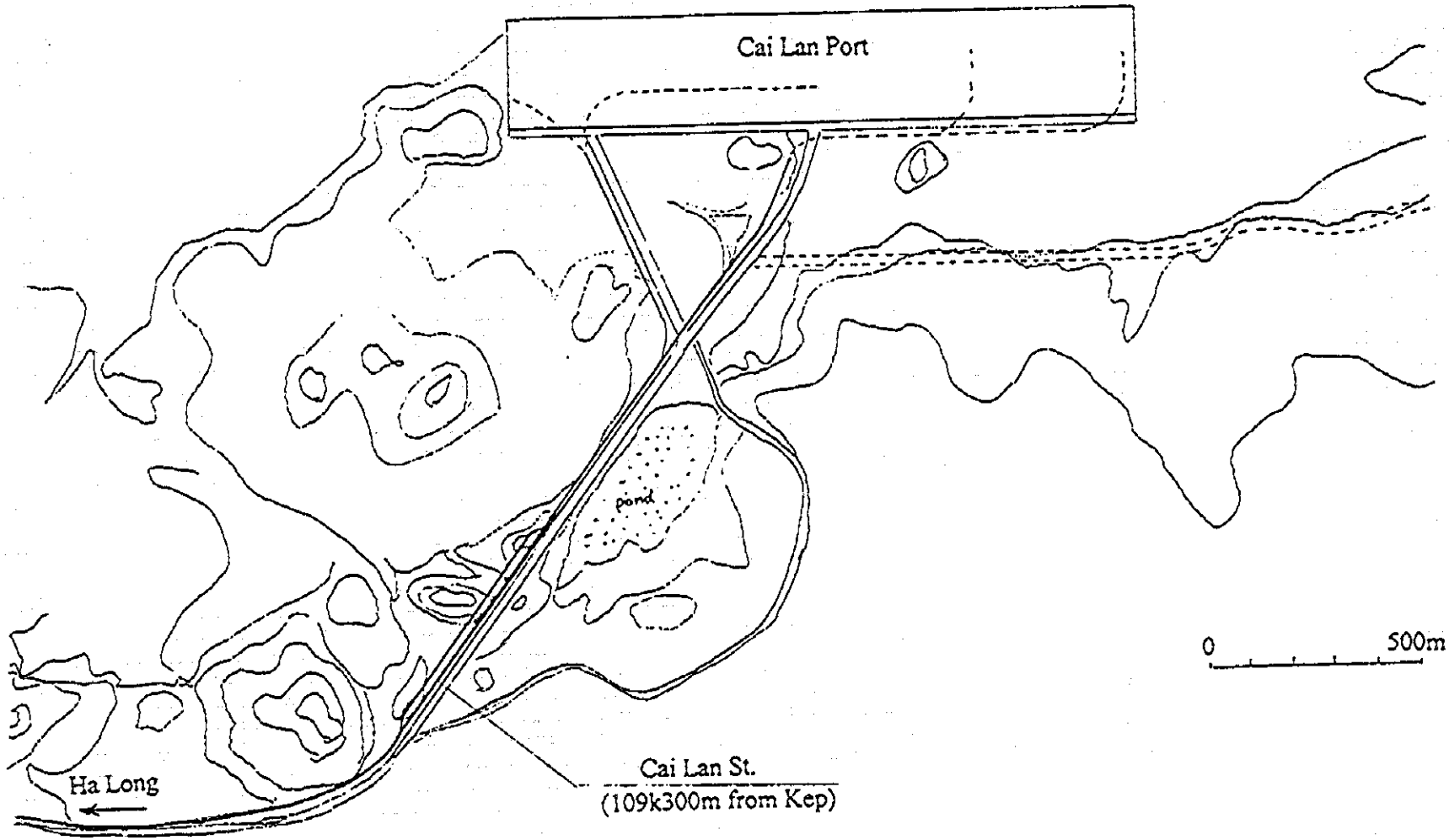
Max.Sp.2000		15km/h		40		80km/h				70km					30		80	
Max.Sp.1995		15	0.4km	40	1.4	50						60		8.7	30	9.4	60	
Track Capacity (2000)	60			(61)						(64)			(61)				(60)	
	50		(43)												(39)			
	40																	
No. of Trains (2000) (up& down)	30																	
	20					14									14			
	10		12															
Stasion		1 Hanoi	(tr) L.Bien	2 G.Lam	3 Y.Vien	4 Y.V.B.	5 T.Son	6 Lim	(tr) B.Ninh	7 T.Cau	8 S.Ho	9 B.Cia.	10 P.Tra.	11 Kep	12 B.Son	13 L.Mau	14 C.Ly	15 C.Linh
Distance(km)		0	2.0	5.5	10.9	12.5	17.1	23.6	-	32.5	39.3	49.5	59.0	68.5	77.2	86.0	95.9	106.4
Section (km)			2.0	3.5	5.4	1.6	4.6	6.5	-	8.9	6.8	10.2	9.5	9.5	8.7	8.8	9.9	10.5
Train Operation Plan (2000)	Exp. Loc.									3								
										3								
	F.T. E.T.									1								
Pass.(p/day)		-	-	-	-	-	54	32	130	39	33	348	76	242	33	142	102	-
Carg.(ton/d)		-	-	-	-	-	-	-	-	65	17	111	21	53	2	15	3	-
No.of Staff		-	-	-	-	-	16	9	8	17	15	38	9	42	6	11	6	11
Rough drawing of the Station		-	—	—														
Remarks																		


80km/h
40
60km/h
40
(53)
(61)
(43)
20
14
2
15 C.Linh
16 D.Tri.
17 M.Khe
18 Y.Duo.
19 U.B.C.
20 Ban Co
(tr) N.Khe
21 Y.Cu
22 H.Long
23 Ca.Lan
C.Tha.
106.4
118.1
126.9
137.4
142.9
145.4
-
162.5
175.1
178.1
(15.8)
10.5
11.7
8.8
10.5
5.5
2.5
-
17.1
12.6
3.0
3
3
1
1
3
57
70
127
28
105
26
-
64
205
29
-
1,184
4
179
-
-
-
3
11
9
39
8
21
12
-
8
7
17
307 Persons
Planed

Note: Appendices 13.3.2 to 13.3.8 are the same as Appendices of Chapter 9.

Appendix 13.4.1 Cai Lan Line (Hanoi~Cai Lan : 177.8 km) (Gia Lam ~ Cai Lan : 1435mm)





Appendix 14.2.1 Profile of Cai Lan Station

Appendix Table 16.1.1 Summary of Traffic Demadn by Mode

Year	Items	Alternative	Railway Volume			Road Transport Volume			Aviation Transport Volume			Inlandwater Transport Volume		
			with	without	with-w/o	with	without	with-w/o	with	without	with-w/o	with	without	with-w/o
1994	Passenger	Hanoi-HCM Line		2,392			12,998			925			0	
(million	pers.-km/year)	Hanoi-Lao Cai Line		332			930			0			0	
		Hanoi-Cai Lan Line		110			1,386			0			0	
	Cargo	Hanoi-HCM Line		1,189			5,266			0			459	
(million	ton-km/year)	Hanoi-Lao Cai Line		260			1,015			0			317	
		Hanoi-Cai Lan Line		50			1,286			0			823	
2000	Passenger	Hanoi-HCM Line	3,455	2,751	704	26,579	27,228	-649	1,541	1,593	-52	0	0	0
(million	pers.-km/year)	Hanoi-Lao Cai Line	409	331	78	1,461	1,545	-84	0	0	0	0	0	0
		Hanoi-Cai Lan Line	196	127	69	2,318	2,354	-36	0	0	0	0	0	0
	Cargo	Hanoi-HCM Line	2,135	1,378	757	9,131	9,890	-759	0	0	0	491	487	4
(million	ton-km/year)	Hanoi-Lao Cai Line	339	271	68	1,515	1,591	-76	0	0	0	381	372	9
		Hanoi-Cai Lan Line	64	48	16	2,021	2,049	-28	0	0	0	936	924	12
2005	Passenger	Hanoi-HCM Line	4,540	2,876	1,664	43,093	44,250	-1,157	2,156	2,557	-401	0	0	0
(million	pers.-km/year)	Hanoi-Lao Cai Line	522	363	159	2,632	2,805	-173	0	0	0	0	0	0
		Hanoi-Cai Lan Line	321	146	175	3,624	3,724	-100	0	0	0	0	0	0
0.85	Cargo	Hanoi-HCM Line	2,806	2,445	361	13,050	13,900	-850	0	0	0	516	512	4
(million	ton-km/year)	Hanoi-Lao Cai Line	392	307	85	2,208	2,307	-99	0	0	0	425	413	12
		Hanoi-Cai Lan Line	122	56	66	2,954	3,045	-91	0	0	0	1,030	1,006	24
2010	Passenger	Hanoi-HCM Line	6,054	2,644	3,410	70,075	70,273	-198	3,679	6,082	-2,403	0	0	0
(million	pers.-km/year)	Hanoi-Lao Cai Line	665	348	317	4,058	4,407	-349	0	0	0	0	0	0
		Hanoi-Cai Lan Line	444	160	284	5,625	5,820	-195	0	0	0	0	0	0
0.7	Cargo	Hanoi-HCM Line	3,282	2,802	480	19,287	21,246	-1,959	0	0	0	490	485	5
(million	ton-km/year)	Hanoi-Lao Cai Line	374	295	79	3,190	3,290	-100	0	0	0	433	416	17
		Hanoi-Cai Lan Line	177	52	125	4,356	4,548	-192	0	0	0	1,100	1,038	62

Appendix Table 16.1.2 Annual Working Hours

Year (days/year)	Work Days (days/week)	National Holiday	Working Hours (hr/day)	Working Hours (hr/year)
365	6	8	8	2,439

Note: formula = ROUND((365*(6/7)-8)*8,0) = 2,439

Time Value

Year	GDP per capita (US$)	Working Hours (hrs/year)	Working Force Ratio (%)	Time Value (US$/hr)
1994	258	2,439	0.5353	0.1976
2010	1,077	2,439	0.5353	0.8249

Appendix Table 16.1.3 Saving of Travle Time, Passengers

	Traffic Volume by Railway (mil. person-km/year)			Average Speed of Travel (km/h)			Saving of Travel Time (million hours)			Time Value	Saving of Time Value (million US$/year)		
	Railway Volume (with)	Railway Volume (without)	Traffic Converted from Road	Bus	Railway (with)	Railway (without)	Traffic Converted from Road	Residual	Total	Unit (US$/hr)	Traffic Converted from Road	Residual	Total
Year 2000													
Hanoi-HCM Line	3,455	2,751	704	38.44	55.80	48.06	5.70	7.94	13.64	0.1853	1.06	1.47	2.53
Hanoi-Lao Cai Line	409	331	78	30.00	33.00	30.00	0.24	1.00	1.24	0.1853	0.04	0.19	0.23
Hanoi-Cai Lan Line	196	127	69	38.44	42.00	23.00	0.15	2.50	2.65	0.1853	0.03	0.46	0.49
Year 2010													
Hanoi-HCM Line	6,054	2,644	3,410	38.44	72.08	48.06	41.40	18.33	59.73	0.5890	24.39	10.80	35.18
Hanoi-Lao Cai Line	665	348	317	30.00	37.00	30.00	2.00	2.19	4.19	0.5890	1.18	1.29	2.47
Hanoi-Cai Lan Line	444	160	284	38.44	42.00	23.00	0.63	3.15	3.77	0.5890	0.37	1.85	2.22

Note;
bus = 45 hours (Hanoi-HCMC) = 38.44 km/h
train = 24 hours (Hanoi-HCMC) = 72.08 km/h
train = 31 hours (Hanoi-HCMC) = 55.80 km/h
train = 36 hours (Hanoi-HCMC) = 48.06 km/h

Appendix Table 16.1.4 Saving of Trafel Time, Cargo

	Cargo Volume by Railway (mil. ton-km/year)			Average Speed of Cargo Travel (km/h)			Saving of Travel Time (million hours)			Cargo Value (million US$/year)	Time Value	Saving of Time Value (million US$/year)		
	Total Traffic Cargo (with)	Total Traffic Cargo (without)	Traffic Converted from Road	Road	Railway		Traffic Converted from Road	Residual	Total		Unit (%/hr)	Traffic Converted from Road	Residual	Total
					with	without								
Year 2000														
Hanoi-HCM Line	2,135	1,378	757	41.19	42.20	32.04	0.44	10.35	10.79	33.5	0.00288	0.04	1.00	1.04
Hanoi-Lao Cai Line	339	271	68	41.19	42.20	32.04	0.04	2.04	2.08	27	0.00288	0.00	0.16	0.16
Hanoi-Cai Lan Line	64	48	16	41.19	42.20	32.04	0.01	0.36	0.37	28.8	0.00288	0.00	0.03	0.03
										21.6				
Year 2010														
Hanoi-HCM Line	3,282	2,802	480	41.19	42.20	32.04	0.28	21.06	21.33	1,164.2	0.00288	0.9	70.6	71.53
Hanoi-Lao Cai Line	374	295	79	41.19	42.20	32.04	0.05	2.22	2.26	933.0	0.00288	0.1	6.0	6.08
Hanoi-Cai Lan Line	177	52	125	41.19	42.20	32.04	0.07	0.39	0.46	1,018.3	0.00288	0.2	1.1	1.36

Note;
truck = 42 hours (Hanoi-HCMC) = 41.19 km/h
train = 41 hours (Hanoi-HCMC) = 42.20 km/h
train = 54 hours (Hanoi-HCMC) = 32.04 km/h

time value = 25.2%/(365*24) = 0.00288%
cargo value = freight revenue x 20

Appendix Table 16.1.5 Saving of Road Transportation Cost

	Items	mil.veh-km with	mil.veh-km without	mil.veh-km w-w/o	mil. pcu-km	Saving in Passenger Vehicle
2000	Passenger Vehicle Related;					
	Hanoi - HCM Line	26,579	27,228	-649	0.0367	23.83
	Hanoi - Lao Cai Line	1,461	1,545	-84	0.0367	3.08
	Hanoi - Cai Lan Line	2,318	2,354	-36	0.0367	1.32
	Cargo Vehilce Related;					
	Hanoi - HCM Line	9,131	9,890	-759	0.0262	19.85
	Hanoi - Lao Cai Line	1,515	1,591	-76	0.0262	1.99
	Hanoi - Cai Lan Line	2,021	2,049	-28	0.0262	0.73
2005	Passenger Vehicle Related;					
	Hanoi - HCM Line	43,093	44,250	-1,157	0.0367	42.49
	Hanoi - Lao Cai Line	2,632	2,805	-173	0.0367	6.35
	Hanoi - Cai Lan Line	3,624	3,724	-100	0.0367	3.67
	Cargo Vehilce Related;					
	Hanoi - HCM Line	13,050	13,900	-850	0.0262	22.23
	Hanoi - Lao Cai Line	2,208	2,307	-99	0.0262	2.59
	Hanoi - Cai Lan Line	2,954	3,045	-91	0.0262	2.38
2010	Passenger Vehicle Related;					
	Hanoi - HCM Line	70,075	70,273	-198	0.0367	7.27
	Hanoi - Lao Cai Line	4,058	4,407	-349	0.0367	12.82
	Hanoi - Cai Lan Line	5,625	5,820	-195	0.0367	7.16
	Cargo Vehilce Related;					
	Hanoi - HCM Line	19,287	21,246	-1,959	0.0262	51.24
	Hanoi - Lao Cai Line	3,190	3,290	-100	0.0262	2.62
	Hanoi - Cai Lan Line	4,356	4,548	-192	0.0262	5.02

Appendix Table 16.1.6 Saving in Operation and Management Cost

	Hanoi-HCM Line	Hanoi-Lao Cai Line	Hanoi-Cai Lan Line
(million VN Dong)			
1994	183,000	35,200	14,157
2000	169,377	25,734	13,370
2005	141,866	20,077	14,493
2010	135,455	15,017	13,261
(Million US$)			
1994	16.64	3.20	1.29
2000	15.40	2.34	1.22
2005	12.90	1.83	1.32
2010	12.31	1.37	1.21

Source; JICA Study Team

Appendix Table 16.1.7 Economic Benefit at Specific Year

(unit; million US$)

Items	2000	2001	2005	2006	2010	Growth Rate (2000-2010) (%)
1. Saving in Travel Time ; Passenger						
Hanoi - HCM Line	2.53	3.29	9.43	12.28	35.18	30.112
Hanoi - Lao Cai Line	0.23	0.29	0.75	0.96	2.47	26.794
Hanoi - Cai Lan Line	0.49	0.57	1.04	1.21	2.22	16.310
2. Saving in Travel Time ; Cargo						
Hanoi - HCM Line	1.04	1.59	8.63	13.17	71.5	52.667
Hanoi - Lao Cai Line	0.16	0.23	0.99	1.42	6.1	43.873
Hanoi - Cai Lan Line	0.03	0.04	0.20	0.30	1.4	46.434
3. Saving in Road Transport Vehicles ; Passenger						
Hanoi - HCM Line	23.8	21.16	13.16	11.69	7.3	-11.194
Hanoi - Lao Cai Line	3.1	3.55	6.28	7.25	12.8	15.328
Hanoi - Cai Lan Line	1.3	1.56	3.07	3.64	7.2	18.422
4. Saving in Road Transport Vehicles ; Carogo						
Hanoi - HCM Line	19.9	21.82	31.89	35.06	51.2	9.947
Hanoi - Lao Cai Line	2.0	2.05	2.28	2.35	2.6	2.789
Hanoi - Cai Lan Line	0.7	0.89	1.91	2.32	5.0	21.266
5. Saving in O&M						
Hanoi - HCM Line	15.4	15.06	13.77	13.46	12.3	-2.215
Hanoi - Lao Cai Line	3.2	2.94	2.09	1.92	1.4	-8.134
Hanoi - Cai Lan Line	1.3	1.28	1.25	1.24	1.2	-0.636
Total						
Hanoi - HCM Line	62.7	62.9	76.9	85.7	177.5	10.978
Hanoi - Lao Cai Line	8.7	9.1	12.4	13.9	25.4	11.343
Hanoi - Cai Lan Line	3.9	4.3	7.5	8.7	17.0	15.960

Appendix Table 16.1.8 Benefit and Cost Flow (FS : Hanoi-Lao Cai Line)

(unit: million US$)

		Year	Economic Cost												Total Cost	Economic Benefit						Net Flow
			Bridges	Tunnel	Track Improvement		Roadbed Improve-ment	Eqip. for Track & Roadbed	Natural Disaster Protection	Signal	Communi-cation	Rolling Stocks (New)	Workshop & Depots	O & M Cost		Time Saving		Saving in Pass. Vehicle Capital	Saving in Cargo Vehicle Capital	Saving in O/M	Total Benefit	
					Rail	Others										Passenger	Cargo					
1		1995																				
2		1996	0.00	0.00	0.01	0.50	0.16	0.36	0.11	0.90	0.35	3.30	0.02		5.71						0.00	-5.71
3		1997	0.00	0.00	0.01	0.50	0.16	0.36	0.11	0.90	0.35	3.30	0.02		5.71						0.00	-5.71
4		1998	0.00	0.00	0.01	0.50	0.16	0.36	0.11	0.90	0.35	3.30	0.02		5.71						0.00	-5.71
5		1999	0.00	0.00	0.01	0.50	0.16	0.36	0.11	0.90	0.35	3.30	0.02		5.71						0.00	-5.71
6		2000	0.00	0.00	0.01	0.50	0.16	0.36	0.11	0.90	0.35	3.30	0.02		5.71						0.00	-5.71
7	1	2001												7.92	7.92	0.29	0.23	3.55	2.05	2.94	9.06	1.14
8	2	2002												8.31	8.31	0.42	0.47	4.29	2.11	2.74	10.03	1.72
9	3	2003												8.74	8.74	0.56	0.71	5.03	2.17	2.53	11.00	2.26
10	4	2004												9.16	9.16	0.69	0.94	5.77	2.23	2.33	11.96	2.80
11	5	2005										80.10		9.62	89.72	0.83	1.18	6.51	2.29	2.12	12.93	-76.79
12	6	2006												10.10	10.10	0.96	1.42	7.25	2.35	1.92	13.90	3.80
13	7	2007												10.59	10.59	1.34	2.59	8.64	2.41	1.79	16.77	6.18
14	8	2008												11.12	11.12	1.72	3.76	10.03	2.48	1.66	19.64	8.52
15	9	2009												11.66	11.66	2.09	4.93	11.41	2.54	1.53	22.50	10.84
16	10	2010												12.24	12.24	2.47	6.10	12.80	2.60	1.40	25.37	13.13
17	11	2011												12.85	12.85	2.64	6.53	13.70	2.78	1.50	27.15	14.29
18	12	2012												13.48	13.48	2.83	6.98	14.65	2.98	1.60	29.05	15.57
19	13	2013												14.14	14.14	3.03	7.47	15.68	3.19	1.72	31.08	16.94
20	14	2014												14.84	14.84	3.24	8.00	16.78	3.41	1.84	33.25	18.41
21	15	2015										110.7		15.59	126.29	3.46	8.56	17.95	3.65	1.96	35.58	-90.71
22	16	2016												16.35	16.35	3.71	9.15	19.21	3.90	2.10	38.07	21.72
23	17	2017												17.15	17.15	3.97	9.80	20.55	4.18	2.25	40.74	23.59
24	18	2018								4.48	1.75		0	18.00	24.23	4.24	10.48	21.99	4.47	2.41	43.59	19.36
25	19	2019												18.90	18.90	4.54	11.21	23.53	4.78	2.57	46.64	27.74
26	20	2020												19.84	19.84	4.86	12.00	25.18	5.11	2.75	49.91	30.07
27	21	2021												20.81	20.81	5.20	12.84	26.94	5.47	2.95	53.40	32.59
28	22	2022												21.85	21.85	5.56	13.74	28.83	5.86	3.15	57.14	35.29
29	23	2023						1.81				16.5		22.92	41.23	5.95	14.70	30.85	6.27	3.37	61.14	19.91
30	24	2024												24.06	24.06	6.37	15.73	33.01	6.70	3.61	65.42	41.36
31	25	2025										217.7		25.25	242.95	6.81	16.83	35.32	7.17	3.86	70.00	-172.95
32	26	2026												26.50	26.50	7.29	18.01	37.79	7.68	4.13	74.90	48.39
33	27	2027												27.81	27.81	7.80	19.27	40.43	8.21	4.42	80.14	52.33
34	28	2028												29.19	29.19	8.35	20.62	43.26	8.79	4.73	85.75	56.56
35	29	2029												30.62	30.62	8.93	22.06	46.29	9.40	5.06	91.75	61.13
36	30	2030				0.00			-1.30		-1.79	-0.70	-515.44	0.00	32.13	-487.10	9.56	23.61	49.53	10.06	5.42	98.17	585.27
Total			0.0	0.0	0.0	2.5	0.8	2.3	0.6	7.2	2.8	-73.9	0.1	521.7	464.1	119.7	289.9	636.7	137.3	82.4	1,266.0	801.9
																7.0%				ERR =		10.77%

Appendix Table 16.1.9 Benefit and Cost Flow (FS : Hanoi-Cai Lan Line) (Case 1)

(unit; million US$)

		Year	Economic Cost													Total Cost	Economic Benefit						Net Flow
			Bridges	Tunnel	Track Improvement		Roadbed Improvement	Eqip. for Track & Roadbed	Natural Disaster Protection	Signal	Communication	Rolling Stocks (New)	Workshop & Depots	Building	O & M Cost		Time Saving		Saving in Pass. Vehicle Capital	Saving in Cargo Vehicle Capital	Saving in O/M	Total Benefit	
					Rail	Others											Passenger	Cargo					
1		1995																					
2		1996	0.00	0.00	0.14	0.51	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.53						0.00	-1.53
3		1997	0.00	0.00	0.14	0.51	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.53						0.00	-1.53
4		1998	0.00	0.00	0.14	0.51	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.53						0.00	-1.53
5		1999	0.00	0.00	0.14	0.51	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.53						0.00	-1.53
6		2000	0.00	0.00	0.14	0.51	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.53						0.00	-1.53
7	1	2001													4.66	4.66	0.57	0.04	1.56	0.89	1.28	4.34	-0.32
8	2	2002													4.89	4.89	0.70	0.09	1.98	1.18	1.27	5.21	0.32
9	3	2003													5.14	5.14	0.83	0.14	2.39	1.46	1.26	6.09	0.95
10	4	2004													5.39	5.39	0.95	0.20	2.81	1.75	1.26	6.96	1.57
11	5	2005										62.10			5.66	67.76	1.08	0.25	3.22	2.03	1.25	7.84	-59.92
12	6	2006													5.94	5.94	1.21	0.30	3.64	2.32	1.24	8.71	2.77
13	7	2007													6.23	6.23	1.46	0.58	4.53	2.99	1.23	10.79	4.56
14	8	2008													6.54	6.54	1.72	0.85	5.42	3.66	1.22	12.87	6.33
15	9	2009													6.86	6.86	1.97	1.13	6.31	4.33	1.21	14.94	8.08
16	10	2010	0.00	0.00	2.39	13.74	0.00	1.34	0.00	0.00	0.00	42.70	0.00	0.00	7.20	67.37	2.22	1.40	7.20	5.00	1.20	17.02	-50.35
17	11	2011													7.56	7.56	2.38	1.50	7.70	5.35	1.28	18.21	10.65
18	12	2012													7.93	7.93	2.54	1.60	8.24	5.72	1.37	19.49	11.56
19	13	2013													8.32	8.32	2.72	1.72	8.82	6.13	1.47	20.85	12.53
20	14	2014													8.73	8.73	2.91	1.84	9.44	6.55	1.57	22.31	13.58
21	15	2015										52.50			9.17	61.67	3.11	1.96	10.10	7.01	1.68	23.87	-37.80
22	16	2016													9.62	9.62	3.33	2.10	10.81	7.50	1.80	25.54	15.92
23	17	2017													10.09	10.09	3.56	2.25	11.56	8.03	1.93	27.33	17.24
24	18	2018								2.04	0.03		0.00		10.59	12.66	3.81	2.41	12.37	8.59	2.06	29.24	16.58
25	19	2019													11.12	11.12	4.08	2.57	13.24	9.19	2.21	31.29	20.17
26	20	2020													11.67	11.67	4.37	2.75	14.16	9.84	2.36	33.48	21.81
27	21	2021													12.24	12.24	4.67	2.95	15.15	10.52	2.53	35.82	23.58
28	22	2022													12.85	12.85	5.00	3.15	16.22	11.26	2.70	38.33	25.48
29	23	2023						0.55							13.48	14.03	5.35	3.37	17.35	12.05	2.89	41.02	26.99
30	24	2024													14.15	14.15	5.72	3.61	18.57	12.89	3.09	43.89	29.74
31	25	2025										102.7			14.85	117.55	6.13	3.86	19.87	13.80	3.31	46.96	-70.59
32	26	2026													15.59	15.59	6.55	4.13	21.26	14.76	3.54	50.25	34.66
33	27	2027													16.36	16.36	7.01	4.42	22.74	15.79	3.79	53.76	37.40
34	28	2028													17.17	17.17	7.50	4.73	24.34	16.90	4.06	57.53	40.36
35	29	2029													18.01	18.01	8.03	5.06	26.04	18.08	4.34	61.55	43.54
36	30	2030			-1.69			-2.00		-0.65	-0.35	-111.70	0.00	-0.10	18.90	-97.60	8.59	5.42	27.86	19.35	4.64	65.86	163.47
Total			0.0	0.0	1.4	16.3	0.9	0.4	0.1	3.4	-0.3	148.7	0.0	0.2	306.9	478.1	110.1	66.4	354.9	244.9	65.1	841.4	363.2
																	7.0%				EIRR=		9.30%

Appendix Table 16.1.10 Benefit and Cost Flow (FS : Hanoi-Cai Lan Line)
(Case 2)

(unit: million US$)

		Year	Economic Cost													Total Cost	Economic Benefit						Net Flow
			Bridges	Tunnel	Track Improvement		Roadbed Improvement	Eqip. for Track & Roadbed	Natural Disaster Protection	Signal	Communication	Rolling Stocks (New)	Workshop & Depots	Building	O & M Cost		Time Saving		Saving in Pass. Vehicle Capital	Saving in Cargo Vehicle Capital	Saving in O/M	Total Benefit	
					Rail	Others											Passenger	Cargo					
1		1995																					
2		1996	0.00	0.00	0.14	0.51	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.53						0.00	-1.53
3		1997	0.00	0.00	0.14	0.51	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.53						0.00	-1.53
4		1998	0.00	0.00	0.14	0.51	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.53						0.00	-1.53
5		1999	0.00	0.00	0.14	0.51	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.53						0.00	-1.53
6		2000	0.00	0.00	0.14	0.51	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.53						0.00	-1.53
7	1	2001													4.66	4.66	0.57	0.04	1.56	0.89	1.28	4.34	-0.32
8	2	2002													4.89	4.89	0.70	0.09	1.98	1.18	1.27	5.21	0.32
9	3	2003													5.14	5.14	0.83	0.14	2.39	1.46	1.26	6.09	0.95
10	4	2004													5.39	5.39	0.95	0.20	2.81	1.76	1.26	6.96	1.57
11	5	2005										62.10			5.66	67.76	1.08	0.25	3.22	2.03	1.25	7.84	-59.92
12	6	2006													5.94	5.94	1.21	0.30	3.64	2.32	1.24	8.71	2.77
13	7	2007													6.23	6.23	1.46	0.56	4.53	2.99	1.23	10.79	4.56
14	8	2008													6.54	6.54	1.72	0.85	5.42	3.66	1.22	12.87	6.33
15	9	2009													6.86	6.86	1.97	1.13	6.31	4.33	1.21	14.94	8.08
16	10	2010	16.65	0.00	14.27	0.00	32.49	0.00	0.00	0.47	1.10	42.70	0.00	1.30	7.20	116.18	2.22	1.40	7.20	5.00	1.20	17.02	-99.16
17	11	2011													7.56	7.56	2.38	1.50	7.70	5.35	1.28	18.21	10.65
18	12	2012													7.93	7.93	2.54	1.60	8.24	5.72	1.37	19.49	11.56
19	13	2013													8.32	8.32	2.72	1.72	8.82	6.13	1.47	20.85	12.53
20	14	2014													8.73	8.73	2.91	1.84	9.44	6.55	1.57	22.31	13.58
21	15	2015										52.5			9.17	61.67	3.11	1.96	10.10	7.01	1.68	23.87	-37.80
22	16	2016													9.62	9.62	3.33	2.10	10.81	7.50	1.80	25.54	15.92
23	17	2017													10.09	10.09	3.56	2.25	11.56	8.03	1.93	27.33	17.24
24	18	2018								2.04	0.03			0	10.59	12.66	3.81	2.41	12.37	8.59	2.06	29.24	16.58
25	19	2019													11.12	11.12	4.08	2.57	13.24	9.19	2.21	31.29	20.17
26	20	2020													11.67	11.67	4.37	2.75	14.16	9.84	2.36	33.48	21.81
27	21	2021													12.24	12.24	4.67	2.95	15.15	10.52	2.53	35.82	23.58
28	22	2022													12.85	12.85	5.00	3.15	16.22	11.26	2.70	38.33	25.48
29	23	2023						0.55				0.4			13.48	14.43	5.35	3.37	17.35	12.05	2.89	41.02	26.59
30	24	2024													14.15	14.15	5.72	3.61	18.57	12.89	3.09	43.89	29.74
31	25	2025										102.7			14.85	117.55	6.13	3.86	19.87	13.80	3.31	46.96	-70.59
32	26	2026													15.59	15.59	6.55	4.13	21.26	14.76	3.54	50.25	34.66
33	27	2027													16.36	16.36	7.01	4.42	22.74	15.79	3.79	53.76	37.40
34	28	2028													17.17	17.17	7.50	4.73	24.34	16.90	4.06	57.53	40.36
35	29	2029													18.01	18.01	8.03	5.06	26.04	18.08	4.34	61.55	43.54
36	30	2030	-9.99		-6.18			-0.40		-0.82	-0.01	-111.99		-0.88	18.90	-111.37	8.59	5.42	27.86	19.35	4.64	65.86	177.23
Total			6.7	0.0	8.8	2.6	33.4	0.7	0.1	3.7	1.2	146.8	0.0	0.7	306.9	513.6	110.1	66.4	354.9	244.9	65.1		327.8
																					EIRR=		7.30%

Appendix Table 16.1.11 Benefit and Cost Flow (FS : Hanoi-Cai Lan Line) (Case 3)

(unit: million US$)

		Year	Economic Cost													Total Cost	Economic Benefit						Net Flow
			Bridges	Tunnel	Track Improvement		Roadbed Improvement	Equip. for Track & Roadbed	Natural Disaster Protection	Signal	Communication	Rolling Stocks (New)	Workshop & Depots	Building	O & M Cost		Time Saving		Saving in Pass. Vehicle Capital	Saving in Cargo Vehicle Capital	Saving in O/M	Total Benefit	
					Rail	Others											Passenger	Cargo					
1		1995																					
2		1996	0.00	0.00	1.54	2.84	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.80						0.00	-7.80
3		1997	0.00	0.00	1.54	2.84	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.80						0.00	-7.80
4		1998	0.00	0.00	1.54	2.84	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.80						0.00	-7.80
5		1999	0.00	0.00	1.54	2.84	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.80						0.00	-7.80
6		2000	0.00	0.00	1.54	2.84	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.80						0.00	-7.80
7	1	2001													4.66	4.66	0.57	0.04	1.56	0.69	1.28	4.34	-0.32
8	2	2002													4.89	4.89	0.70	0.09	1.98	1.18	1.27	5.21	0.32
9	3	2003													5.14	5.14	0.83	0.14	2.39	1.46	1.26	6.09	0.95
10	4	2004													5.39	5.39	0.95	0.20	2.81	1.75	1.26	6.96	1.57
11	5	2005										10.40			5.66	16.06	1.08	0.25	3.22	2.03	1.25	7.84	-8.22
12	6	2006													5.94	5.94	1.21	0.30	3.64	2.32	1.24	8.71	2.77
13	7	2007													6.23	6.23	1.46	0.58	4.53	2.99	1.23	10.79	4.56
14	8	2008													6.54	6.54	1.72	0.85	5.42	3.66	1.22	12.87	6.33
15	9	2009													6.86	6.86	1.97	1.13	6.31	4.33	1.21	14.94	8.08
16	10	2010										42.7			7.20	49.90	2.22	1.40	7.20	5.00	1.20	17.02	-32.88
17	11	2011													7.56	7.56	2.38	1.50	7.70	5.35	1.28	18.21	10.65
18	12	2012													7.93	7.93	2.54	1.60	8.24	5.72	1.37	19.49	11.56
19	13	2013													8.32	8.32	2.72	1.72	8.82	6.13	1.47	20.86	12.53
20	14	2014													8.73	8.73	2.91	1.84	9.44	6.55	1.57	22.31	13.58
21	15	2015										52.2			9.17	61.37	3.11	1.96	10.10	7.01	1.68	23.87	-37.50
22	16	2016													9.62	9.62	3.33	2.10	10.81	7.50	1.80	25.54	15.92
23	17	2017													10.09	10.09	3.56	2.25	11.56	8.03	1.93	27.33	17.24
24	18	2018								2.04	0.03		0		10.59	12.66	3.81	2.41	12.37	8.59	2.06	29.24	16.58
25	19	2019													11.12	11.12	4.08	2.57	13.24	9.19	2.21	31.29	20.17
26	20	2020													11.67	11.67	4.37	2.75	14.16	9.84	2.36	33.48	21.81
27	21	2021													12.24	12.24	4.67	2.95	15.15	10.52	2.53	35.82	23.58
28	22	2022													12.85	12.85	5.00	3.15	16.22	11.26	2.70	38.33	25.48
29	23	2023						1.89				11.8			13.48	27.17	5.35	3.37	17.35	12.05	2.89	41.02	13.85
30	24	2024													14.15	14.15	5.72	3.61	18.57	12.89	3.09	43.89	29.74
31	25	2025										102.7			14.85	117.55	6.13	3.86	19.87	13.80	3.31	46.96	-70.59
32	26	2026													15.59	15.59	6.55	4.13	21.26	14.76	3.54	50.25	34.66
33	27	2027													16.36	16.36	7.01	4.42	22.74	15.79	3.79	53.76	37.40
34	28	2028													17.17	17.17	7.50	4.73	24.34	16.90	4.06	57.53	40.36
35	29	2029													18.01	18.01	8.03	5.06	26.04	18.08	4.34	61.55	43.54
36	30	2030	0.00		-0.66			-1.36		-0.82	-0.01	-120.08	0.00	-0.10	18.90	-104.13	8.59	5.42	27.86	19.35	4.64	65.86	169.99
Total			0.0	0.0	7.0	14.2	0.9	2.4	0.1	3.3	0.1	111.5	0.0	0.2	306.9	446.7	110.1	66.4	354.9	244.9	65.1	841.4	394.7

EIRR= 9.43%

Appendix Table 16.1.12 Benefit and Cost Flow (FS : Hanoi-Cai Lan Line)
(Case 4)

(unit: million US$)

		Year	Economic Cost													Total Cost	Economic Benefit						Net Flow
			Bridges	Tunnel	Track Improvement		Roadbed Improvement	Eqpp. for Track & Roadbed	Natural Disaster Protection	Signal	Communication	Rolling Stocks (New)	Workshop & Depots	Building	O & M Cost		Time Saving		Saving in Pass. Vehicle Capital	Saving in Cargo Vehicle Capital	Saving in O/M	Total Benefit	
					Rail	Others											Passenger	Cargo					
1		1995																					
2		1996	0.00	0.00	1.54	2.84	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.80						0.00	-7.80
3		1997	0.00	0.00	1.54	2.84	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.80						0.00	-7.80
4		1998	0.00	0.00	1.54	2.84	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.80						0.00	-7.80
5		1999	0.00	0.00	1.54	2.84	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.80						0.00	-7.80
6		2000	0.00	0.00	1.54	2.84	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.80						0.00	-7.80
7	1	2001													4.66	4.66	0.57	0.04	1.56	0.89	1.28	4.34	-0.32
8	2	2002													4.89	4.89	0.70	0.09	1.98	1.18	1.27	5.21	0.32
9	3	2003													5.14	5.14	0.83	0.14	2.39	1.46	1.26	6.09	0.95
10	4	2004													5.39	5.39	0.95	0.20	2.81	1.75	1.26	6.98	1.57
11	5	2005										10.40			5.66	16.06	1.08	9.25	3.22	2.03	1.25	7.84	-8.22
12	6	2006													5.94	5.94	1.21	0.30	3.64	2.32	1.24	8.71	2.77
13	7	2007													6.23	6.23	1.46	0.58	4.53	2.90	1.23	10.79	4.56
14	8	2008													6.54	6.54	1.72	0.85	5.42	3.66	1.22	12.87	6.33
15	9	2009													6.86	6.86	1.97	1.13	6.31	4.33	1.21	14.94	8.08
16	10	2010	16.65	0	14.27	0	32.49	0	0	0.47	1.1	42.7	0	1.3	7.20	116.18	2.22	1.40	7.20	5.00	1.20	17.02	-99.16
17	11	2011													7.56	7.56	2.36	1.50	7.70	5.35	1.28	18.21	10.65
18	12	2012													7.93	7.93	2.54	1.60	8.24	5.72	1.37	19.49	11.56
19	13	2013													8.32	8.32	2.72	1.72	8.82	6.13	1.47	20.85	12.53
20	14	2014													8.73	8.73	2.91	1.84	9.44	6.55	1.57	22.31	13.58
21	15	2015										52.2			9.17	61.37	3.11	1.96	10.10	7.01	1.68	23.87	-37.50
22	16	2016													9.62	9.62	3.33	2.10	10.81	7.50	1.80	25.54	15.92
23	17	2017													10.09	10.09	3.56	2.25	11.56	8.03	1.93	27.33	17.24
24	18	2018								2.04	0.03		0		10.59	12.66	3.81	2.41	12.37	8.59	2.06	29.24	16.58
25	19	2019													11.12	11.12	4.08	2.57	13.24	9.19	2.21	31.29	20.17
26	20	2020													11.67	11.67	4.37	2.75	14.16	9.84	2.36	33.48	21.81
27	21	2021													12.24	12.24	4.67	2.95	15.15	10.52	2.53	35.82	23.58
28	22	2022													12.85	12.85	5.00	3.15	16.22	11.26	2.70	38.33	25.48
29	23	2023						1.89				11.8			13.48	27.17	5.35	3.37	17.35	12.05	2.89	41.02	13.85
30	24	2024													14.15	14.15	5.72	3.61	18.57	12.89	3.09	43.89	29.74
31	25	2025										102.7			14.85	117.55	6.13	3.86	19.87	13.80	3.31	46.96	-70.59
32	26	2026													15.59	15.59	6.55	4.13	21.26	14.76	3.54	50.25	34.66
33	27	2027													16.36	16.36	7.01	4.42	22.74	15.79	3.79	53.76	37.40
34	28	2028													17.17	17.17	7.50	4.73	24.34	16.90	4.06	57.53	40.36
35	29	2029													18.01	18.01	8.03	5.06	26.04	18.08	4.34	61.55	43.54
36	30	2030	-5.99		-1.88			-1.36		-1.01	-0.33	-120.08		-0.57	18.90	-112.32	8.59	5.42	27.86	19.35	4.64	65.86	178.18
Total			10.7	0.0	20.1	14.2	33.4	2.4	0.1	3.5	0.8	111.5	0.0	1.0	306.9	504.7	110.1	66.4	354.9	244.9	65.1		336.6

EIRR= 7.16%

Appendix Table 16.1.13 Benefit and Cost Flow (FS : Hanoi-Cai Lan Line) (Case 5)

(unit: million US$)

		Year	Economic Cost													Total Cost	Economic Benefit						Net Flow
			Bridges	Tunnel	Track Improvement		Roadbed Improvement	Eqip. for Track & Roadbed	Natural Disaster Protection	Signal	Communication	Rolling Stocks (New)	Workshop & Depots	Building	O & M Cost		Time Saving		Saving in Pass. Vehicle Capital	Saving in Cargo Vehicle Capital	Saving in O/M	Total Benefit	
					Rail	Others											Passenger	Cargo					
1		1995																					
2		1996	0.00	0.00	0.61	3.30	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.33						0.00	-7.33
3		1997	0.00	0.00	0.61	3.30	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.33						0.00	-7.33
4		1998	0.00	0.00	0.61	3.30	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.33						0.00	-7.33
5		1999	0.00	0.00	0.61	3.30	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.33						0.00	-7.33
6		2000	0.00	0.00	0.61	3.30	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.33						0.00	-7.33
7	1	2001													4.66	4.66	0.57	0.04	1.56	0.89	1.28	4.34	-0.32
8	2	2002													4.89	4.89	0.70	0.09	1.98	1.18	1.27	5.21	0.32
9	3	2003													5.14	5.14	0.83	0.14	2.39	1.46	1.26	6.09	0.95
10	4	2004													5.39	5.39	0.95	0.20	2.81	1.75	1.26	6.96	1.57
11	5	2005										10.40			5.66	16.06	1.08	0.25	3.22	2.03	1.25	7.84	-8.22
12	6	2006													5.94	5.94	1.21	0.30	3.64	2.32	1.24	8.71	2.77
13	7	2007													6.23	6.23	1.46	0.58	4.53	2.99	1.23	10.79	4.56
14	8	2008													6.54	6.54	1.72	0.85	5.42	3.68	1.22	12.87	6.33
15	9	2009													6.86	6.86	1.97	1.13	6.31	4.33	1.21	14.94	8.08
16	10	2010										42.7			7.20	49.90	2.22	1.40	7.20	5.00	1.20	17.02	-32.88
17	11	2011													7.56	7.56	2.38	1.50	7.70	5.35	1.28	18.21	10.65
18	12	2012													7.93	7.93	2.54	1.60	8.24	5.72	1.37	19.49	11.56
19	13	2013													8.32	8.32	2.72	1.72	8.82	6.13	1.47	20.85	12.53
20	14	2014													8.73	8.73	2.91	1.84	9.44	6.55	1.57	22.31	13.58
21	15	2015										52.2			9.17	61.37	3.11	1.96	10.10	7.01	1.68	23.87	-37.50
22	16	2016													9.62	9.62	3.33	2.10	10.81	7.50	1.80	25.54	15.92
23	17	2017													10.09	10.09	3.56	2.25	11.56	8.03	1.93	27.33	17.24
24	18	2018								2.05	0.03		0		10.59	12.67	3.81	2.41	12.37	8.59	2.06	29.24	16.57
25	19	2019													11.12	11.12	4.08	2.57	13.24	9.19	2.21	31.29	20.17
26	20	2020													11.67	11.67	4.37	2.75	14.16	9.84	2.36	33.48	21.81
27	21	2021													12.24	12.24	4.67	2.95	15.15	10.52	2.53	35.82	23.58
28	22	2022													12.85	12.85	5.00	3.15	16.22	11.26	2.70	38.33	25.48
29	23	2023						1.89				11.8			13.48	27.17	5.35	3.37	17.35	12.05	2.89	41.02	13.85
30	24	2024													14.15	14.15	5.72	3.61	18.57	12.89	3.09	43.89	29.74
31	25	2025										102.7			14.85	117.55	6.13	3.86	19.87	13.80	3.31	46.96	-70.59
32	26	2026													15.59	15.59	6.56	4.13	21.26	14.76	3.54	50.25	34.66
33	27	2027													16.36	16.36	7.01	4.42	22.74	15.79	3.79	53.76	37.40
34	28	2028													17.17	17.17	7.50	4.73	24.34	16.90	4.06	57.53	40.36
35	29	2029													18.01	18.01	8.03	5.06	26.04	18.08	4.34	61.55	43.54
36	30	2030	0.00		-0.26			-1.36		-0.82	-0.01	-120.08	0.00	-0.10	18.90	-103.73	8.59	5.42	27.86	19.35	4.64	65.86	169.59
Total			0.0	0.0	2.8	15.5	0.9	2.4	0.1	3.3	0.1	111.5	0.0	0.2	306.9	444.7	110.1	66.4	354.9	244.9	65.1		396.6
																					EIRR=		9.69%

Appendix Table 16.1.14 Benefit and Cost Flow (FS : Hanoi-Cai Lan Line)
(Case 6)

(unit: million US$)

		Year	Economic Cost													Total Cost	Economic Benefit						Net Flow
			Bridges	Tunnel	Track Improvement		Roadbed Improvement	Eqip. for Track & Roadbed	Natural Disaster Protection	Signal	Communication	Rolling Stocks (New)	Workshop & Depots	Building	O & M Cost		Time Saving		Saving in Pass. Vehicle Capital	Saving in Cargo Vehicle Capital	Saving in O/M	Total Benefit	
					Rail	Others											Passenger	Cargo					
1		1995																					
2		1996	3.33	0.00	3.46	3.30	6.68	0.38	0.03	0.50	0.16	2.36	0.00	0.32		20.53						0.00	-20.53
3		1997	3.33	0.00	3.46	3.30	6.68	0.38	0.03	0.50	0.16	2.36	0.00	0.32		20.53						0.00	-20.53
4		1998	3.33	0.00	3.46	3.30	6.68	0.38	0.03	0.50	0.16	2.36	0.00	0.32		20.53						0.00	-20.53
5		1999	3.33	0.00	3.46	3.30	6.68	0.38	0.03	0.50	0.16	2.36	0.00	0.32		20.53						0.00	-20.53
6		2000	3.33	0.00	3.46	3.30	6.68	0.38	0.03	0.50	0.16	2.36	0.00	0.32		20.53						0.00	-20.53
7	1	2001													4.66	4.66	0.57	0.04	1.56	0.89	1.28	4.34	-0.32
8	2	2002													4.89	4.89	0.70	0.09	1.98	1.18	1.27	5.21	0.32
9	3	2003													5.14	5.14	0.83	0.14	2.39	1.46	1.26	6.09	0.95
10	4	2004													5.39	5.39	0.95	0.20	2.81	1.75	1.26	6.96	1.57
11	5	2005										10.40			5.66	16.06	1.08	0.25	3.22	2.03	1.25	7.84	-8.22
12	6	2006													5.94	5.94	1.21	0.30	3.64	2.32	1.24	8.71	2.77
13	7	2007													6.23	6.23	1.46	0.58	4.53	2.99	1.23	10.79	4.56
14	8	2008													6.54	6.54	1.72	0.85	5.42	3.66	1.22	12.87	6.33
15	9	2009													6.86	6.86	1.97	1.13	6.31	4.33	1.21	14.94	8.08
16	10	2010										42.7			7.20	49.90	2.22	1.40	7.20	5.00	1.20	17.02	-32.88
17	11	2011													7.56	7.56	2.38	1.50	7.70	5.35	1.28	18.21	10.65
18	12	2012													7.93	7.93	2.54	1.60	8.24	5.72	1.37	19.49	11.56
19	13	2013													8.32	8.32	2.72	1.72	8.82	6.13	1.47	20.85	12.53
20	14	2014													8.73	8.73	2.91	1.84	9.44	6.55	1.57	22.31	13.58
21	15	2015										52.2			9.17	61.37	3.11	1.96	10.10	7.01	1.68	23.87	-37.50
22	16	2016													9.62	9.62	3.33	2.10	10.81	7.50	1.80	25.54	15.92
23	17	2017													10.09	10.09	3.56	2.25	11.56	8.03	1.93	27.33	17.24
24	18	2018								2.05	0.03		0		10.59	12.67	3.81	2.41	12.37	8.59	2.06	29.24	16.57
25	19	2019													11.12	11.12	4.08	2.57	13.24	9.19	2.21	31.29	20.17
26	20	2020													11.67	11.67	4.37	2.75	14.16	9.84	2.36	33.48	21.81
27	21	2021													12.24	12.24	4.67	2.95	15.15	10.52	2.53	35.82	23.58
28	22	2022													12.85	12.85	5.00	3.15	16.22	11.26	2.70	38.33	25.48
29	23	2023						1.89				11.8			13.48	27.17	5.35	3.37	17.35	12.05	2.89	41.02	13.85
30	24	2024													14.15	14.15	5.72	3.61	18.57	12.89	3.09	43.89	29.74
31	25	2025										102.7			14.85	117.55	6.13	3.86	19.87	13.80	3.31	46.96	-70.59
32	26	2026													15.59	15.59	6.55	4.13	21.26	14.76	3.54	50.25	34.66
33	27	2027													16.36	16.36	7.01	4.42	22.74	15.79	3.79	53.76	37.40
34	28	2028													17.17	17.17	7.50	4.73	24.34	16.90	4.06	57.53	40.36
35	29	2029													18.01	18.01	8.03	5.06	26.04	18.08	4.34	61.55	43.54
36	30	2030	0.00		-0.26			-1.36		-0.82	-0.01	-120.08	0.00	-0.10	18.90	-103.73	8.59	5.42	27.86	19.35	4.64	65.86	169.59
Total			18.7	0.0	17.1	16.5	33.4	2.4	0.1	3.8	0.8	111.5	0.0	1.5	306.9	510.7	110.1	66.4	354.9	244.9	65.1		330.7
																					EIRR=		5.42%

Appendix Table 16.1.15 Benefit and Cost Flow (FS : Hanoi-Cai Lan Line) (Case 7)

(unit: million US$)

		Year	Economic Cost													Total Cost	Economic Benefit						Net Flow
			Bridges	Tunnel	Track Improvement		Roadbed Improvement	Eqp. for Track & Roadbed	Natural Disaster Protection	Signal	Communication	Rolling Stocks (New)	Workshop & Depots	Building	O & M Cost		Time Saving		Saving in Pass. Vehicle Capital	Saving in Cargo Vehicle Capital	Saving in O/M	Total Benefit	
					Rail	Others											Passenger	Cargo					
1		1995																					
2		1996	0.00	0.00	0.61	3.30	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.33						0.00	-7.33
3		1997	0.00	0.00	0.61	3.30	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.33						0.00	-7.33
4		1998	0.00	0.00	0.61	3.30	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.33						0.00	-7.33
5		1999	0.00	0.00	0.61	3.30	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.33						0.00	-7.33
6		2000	0.00	0.00	0.61	3.30	0.18	0.38	0.03	0.41	0.01	2.36	0.00	0.06		7.33						0.00	-7.33
7	1	2001													4.66	4.66	0.57	0.04	1.56	0.89	1.28	4.34	-0.32
8	2	2002													4.89	4.89	0.70	0.09	1.96	1.18	1.27	5.21	0.32
9	3	2003													5.14	5.14	0.83	0.14	2.39	1.46	1.26	6.09	0.95
10	4	2004													5.39	5.39	0.95	0.20	2.81	1.75	1.26	6.96	1.57
11	5	2005										10.40			5.66	16.06	1.08	0.25	3.22	2.03	1.25	7.84	-8.22
12	6	2006													5.94	5.94	1.21	0.30	3.64	2.32	1.24	8.71	2.77
13	7	2007													6.23	6.23	1.46	0.58	4.53	2.99	1.23	10.79	4.56
14	8	2008													6.54	6.54	1.72	0.85	5.42	3.66	1.22	12.87	6.33
15	9	2009													6.86	6.86	1.97	1.13	6.31	4.33	1.21	14.94	8.08
16	10	2010	16.65	0	14.27	0	32.49	0	0	0.47	1.1	42.7	0	1.3	7.20	116.18	2.22	1.40	7.20	5.00	1.20	17.02	-99.16
17	11	2011													7.56	7.56	2.38	1.50	7.70	5.35	1.28	18.21	10.65
18	12	2012													7.93	7.93	2.54	1.60	8.24	5.72	1.37	19.49	11.56
19	13	2013													8.32	8.32	2.72	1.72	8.82	6.13	1.47	20.85	12.53
20	14	2014													8.73	8.73	2.91	1.84	9.44	6.55	1.57	22.31	13.58
21	15	2015										52.2			9.17	61.37	3.11	1.96	10.10	7.01	1.68	23.87	-37.50
22	16	2016													9.62	9.62	3.33	2.10	10.81	7.50	1.80	25.54	15.92
23	17	2017													10.09	10.09	3.56	2.25	11.56	8.03	1.93	27.33	17.24
24	18	2018								2.05	0.03		0		10.59	12.67	3.81	2.41	12.37	8.59	2.06	29.24	16.57
25	19	2019													11.12	11.12	4.08	2.57	13.24	9.19	2.21	31.29	20.17
26	20	2020													11.67	11.67	4.37	2.75	14.16	9.84	2.36	33.48	21.81
27	21	2021													12.24	12.24	4.67	2.95	15.15	10.52	2.53	35.82	23.58
28	22	2022													12.85	12.85	5.00	3.15	16.22	11.26	2.70	38.33	25.48
29	23	2023						1.89				11.8			13.48	27.17	5.35	3.37	17.35	12.05	2.89	41.02	13.85
30	24	2024													14.15	14.15	5.72	3.61	18.57	12.89	3.09	43.89	29.74
31	25	2025										102.7			14.85	117.55	6.13	3.86	19.87	13.80	3.31	46.96	-70.59
32	26	2026													15.59	15.59	6.55	4.13	21.26	14.76	3.54	50.25	34.66
33	27	2027													16.36	16.36	7.01	4.42	22.74	15.79	3.79	53.76	37.40
34	28	2028													17.17	17.17	7.50	4.73	24.34	16.90	4.06	57.53	40.36
35	29	2029													18.01	18.01	8.03	5.06	26.04	18.08	4.34	61.55	43.54
36	30	2030	-9.99		-6.36			-1.36		-0.82	-0.01	-120.08		-0.88	18.90	-120.62	8.59	5.42	27.86	19.35	4.64	65.86	186.48
Total			6.7	0.0	10.9	16.5	33.4	2.4	0.1	3.8	1.2	111.5	0.0	0.7	306.9	494.1	110.1	66.4	354.9	244.9	65.1		347.3
																					SRR=		7.40%

Appendix Table 16.1.16 Benefit and Cost Flow (FS : Hanoi-Cai Lan Line)
(Case without Gauge Conversion)

(unit: million US$)

		Year	Economic Cost													Total Cost	Economic Benefit						Net Flow
			Bridges	Tunnel	Track Improvement		Roadbed Improvement	Eqip. for Track & Roadbed	Natural Disaster Protection	Signal	Communication	Rolling Stocks (New)	Workshop & Depots	Building	O & M Cost		Time Saving		Saving in Pass. Vehicle Capital	Saving in Cargo Vehicle Capital	Saving in O/M	Total Benefit	
					Rail	Others											Passenger	Cargo					
1		1995																					
2		1996	0.00	0.00	0.14	0.50	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.52						0.00	-1.52
3		1997	0.00	0.00	0.14	0.50	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.52						0.00	-1.52
4		1998	0.00	0.00	0.14	0.50	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.52						0.00	-1.52
5		1999	0.00	0.00	0.14	0.50	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.52						0.00	-1.52
6		2000	0.00	0.00	0.14	0.50	0.19	0.11	0.03	0.41	0.01	0.08	0.00	0.06		1.52						0.00	-1.52
7	1	2001													4.66	4.66	0.57	0.04	1.56	0.89	1.28	4.34	-0.32
8	2	2002													4.89	4.89	0.70	0.09	1.98	1.18	1.27	5.21	0.32
9	3	2003													5.14	5.14	0.83	0.14	2.39	1.46	1.26	6.09	0.95
10	4	2004													5.39	5.39	0.95	0.20	2.81	1.75	1.26	6.96	1.57
11	5	2005										62.10			5.66	67.76	1.08	0.25	3.22	2.03	1.25	7.84	-59.92
12	6	2006													5.94	5.94	1.21	0.30	3.64	2.32	1.24	8.71	2.77
13	7	2007													6.23	6.23	1.46	0.58	4.53	2.99	1.23	10.79	4.56
14	8	2008													6.54	6.54	1.72	0.85	5.42	3.66	1.22	12.87	6.33
15	9	2009													6.86	6.86	1.97	1.13	6.31	4.33	1.21	14.94	8.08
16	10	2010													7.20	7.20	2.22	1.40	7.20	5.00	1.20	17.02	9.82
17	11	2011													7.20	7.20	2.38	1.50	7.70	5.35	1.28	18.21	11.01
18	12	2012													7.20	7.20	2.54	1.60	8.24	5.72	1.37	19.49	12.29
19	13	2013													7.20	7.20	2.72	1.72	8.82	6.13	1.47	20.85	13.65
20	14	2014													7.20	7.20	2.91	1.84	9.44	6.55	1.57	22.31	15.11
21	15	2015										85.80			7.20	93.00	3.11	1.96	10.10	7.01	1.68	23.87	-69.13
22	16	2016													7.20	7.20	3.33	2.10	10.81	7.50	1.80	25.54	18.34
23	17	2017													7.20	7.20	3.56	2.25	11.56	8.03	1.93	27.33	20.13
24	18	2018								2.04	0.03		0.00		7.20	9.27	3.81	2.41	12.37	8.59	2.06	29.24	19.97
25	19	2019													7.20	7.20	4.08	2.57	13.24	9.19	2.21	31.29	24.09
26	20	2020													7.20	7.20	4.37	2.75	14.18	9.84	2.36	33.48	26.28
27	21	2021													7.20	7.20	4.67	2.95	15.15	10.52	2.53	35.82	28.62
28	22	2022													7.20	7.20	5.00	3.15	16.22	11.26	2.70	38.33	31.13
29	23	2023						0.55				0.40			7.20	8.15	5.35	3.37	17.35	12.05	2.89	41.02	32.87
30	24	2024													7.20	7.20	5.72	3.61	18.57	12.89	3.09	43.89	36.69
31	25	2025										168.9			7.20	176.10	6.13	3.86	19.87	13.80	3.31	46.96	-129.14
32	26	2026													7.20	7.20	6.55	4.13	21.26	14.76	3.54	50.25	43.05
33	27	2027													7.20	7.20	7.01	4.42	22.74	15.79	3.79	53.76	46.56
34	28	2028													7.20	7.20	7.50	4.73	24.34	16.90	4.06	57.53	50.33
35	29	2029													7.20	7.20	8.03	5.06	26.04	18.08	4.34	61.55	54.35
36	30	2030			-0.06			-0.40		-0.82	-0.01	-169.73		-0.10	7.20	-163.92	8.59	5.42	27.86	19.35	4.64	65.86	229.78
Total			0.0	0.0	0.6	2.5	0.9	0.7	0.1	3.3	0.1	147.9	0.0	0.2	202.5	358.8	110.1	66.4	354.9	244.9	65.1	841.4	482.6
																	7.0%				EIRR=		12.49%

Appendix 16-2-1 Estimate of Accounts

Financial Analysis for the Hanoi-Lao Cai Line(Feasibility Studies up to 2000)

Estimate of Accounts	1994	0 1995	1 1996	2 1997	3 1998	4 1999	5 2000	6 2001	7 2002	8 2003	9 2004	10 2005	11 2006	12 2007	13 2008	14 2009	15 2010
Revenue	77,000	80,142	83,553	93,628	97,206	101,131	105,209	109,371	113,710	118,251	122,963	127,846	130,542	133,425	136,492	139,725	143,522
Passenger	36,000	37,278	38,749	46,611	48,253	49,969	51,739	54,330	57,049	59,896	62,889	66,029	69,314	72,762	76,394	80,191	84,553
Freight	41,000	42,864	44,804	46,817	48,953	51,162	53,470	55,041	56,661	58,355	60,074	61,817	61,228	60,663	60,098	59,534	58,969
Expense	90,000	98,369	100,887	103,800	106,469	109,379	112,436	117,289	122,357	127,651	133,148	138,847	148,172	147,745	152,576	157,622	163,302
Working Cost																	
Personnel	35,200	33,439	31,799	30,115	28,555	27,126	25,734	24,480	23,292	22,169	21,097	20,077	18,903	17,809	16,803	15,856	15,017
Non-Personnel	54,800	56,916	59,281	61,438	63,837	66,332	68,921	71,840	74,890	78,081	81,407	84,865	87,323	89,929	92,688	95,585	98,953
Sub Total	90,000	90,355	91,080	91,553	92,392	93,458	94,655	96,320	98,182	100,250	102,504	104,942	106,226	107,738	109,491	111,441	113,970
Depreciation																	
Carriage	0	0	1,452	2,904	4,356	5,808	7,260	10,032	12,804	15,576	18,348	21,120	23,892	26,664	29,436	32,208	34,980
Management	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sub Total	0	0	1,452	2,904	4,356	5,808	7,260	10,032	12,804	15,576	18,348	21,120	23,892	26,664	29,436	32,208	34,980
Infrastructure Rental	0	8,014	8,355	9,343	9,721	10,113	10,521	10,937	11,371	11,825	12,296	12,785	13,054	13,343	13,649	13,973	14,352
Profit	-13,000	-18,227	-17,334	-10,172	-9,263	-8,245	-7,227	-7,918	-8,647	-9,400	-10,185	-11,001	-12,630	-14,320	-16,084	-17,897	-19,780

(Unit : Million Dong)

Cash Flow Projection

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Cash In																	
Profit		-5,227	-4,334	2,628	3,737	4,752	5,773	5,082	4,353	3,600	2,815	1,999	370	-1,320	-3,084	-4,896	-6,780
Depreciation	0	0	1,452	2,904	4,356	5,808	7,260	10,032	12,804	15,576	18,348	21,120	23,892	26,664	29,436	32,208	34,980
Total	0	-5,227	-2,882	5,532	8,093	10,560	13,033	15,114	17,157	19,176	21,163	23,119	24,262	25,345	26,352	27,312	28,200
Cash Out (Investment)																	
Carriage	0	0	36,300	36,300	36,300	36,300	36,300	69,300	69,300	69,300	69,300	69,300	69,300	69,300	69,300	69,300	69,300
Management																	
Total	0	0	36,300	36,300	36,300	36,300	36,300	69,300	69,300	69,300	69,300	69,300	69,300	69,300	69,300	69,300	69,300
Surplus or Deficit	0	-5,227	-39,182	-30,768	-28,207	-25,740	-23,267	-54,186	-52,143	-50,124	-48,137	-46,181	-45,038	-43,956	-42,948	-41,988	-41,100
Cumulative Cash Flow	0	-5,227	-44,410	-75,177	-103,384	-129,124	-152,391	-206,577	-258,720	-308,844	-356,981	-403,162	-448,200	-492,156	-535,104	-577,092	-618,192

(Unit : Million Dong)

	FIRR	Residual Value (Carriage)	Residual Value (Management)
15 years later	0.23%	-627,660	0
25 years later	-0.01%	-277,860	0
35 years later	0.94%	-456,060	0

Appendix 16-2-1 (Continued)

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
147,426	151,436	155,555	159,786	164,132	168,596	173,182	177,893	182,732	187,702	192,807	198,052	203,439	208,972	214,656	220,495	226,492	232,653	238,981	245,481
86,853	89,215	91,642	94,135	96,695	99,325	102,027	104,802	107,652	110,581	113,588	116,678	119,852	123,112	126,460	129,900	133,433	137,063	140,791	144,620
60,573	62,221	63,913	65,651	67,437	69,271	71,156	73,091	75,079	77,121	79,219	81,374	83,587	85,861	88,196	90,595	93,059	95,590	98,190	100,861
166,280	169,327	172,444	175,635	178,900	182,240	185,659	189,157	192,737	196,401	200,149	203,985	207,911	211,928	216,039	220,245	224,550	228,955	233,463	238,076
15,358	15,707	16,063	16,428	16,801	17,182	17,572	17,971	18,379	18,796	19,223	19,659	20,105	20,562	21,028	21,506	21,994	22,493	23,004	23,526
101,199	103,496	105,846	108,249	110,706	113,219	115,789	118,417	121,105	123,854	126,666	129,541	132,482	135,489	138,565	141,710	144,927	148,217	151,581	155,022
116,557	119,203	121,909	124,676	127,506	130,401	133,361	136,388	139,484	142,650	145,889	149,200	152,587	156,051	159,593	163,216	166,921	170,710	174,585	178,548
34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980
14,743	15,144	15,555	15,979	16,412	16,860	17,318	17,789	18,273	18,770	19,281	19,805	20,344	20,897	21,466	22,049	22,649	23,265	23,898	24,548
-18,854	-17,891	-16,890	-15,849	-14,767	-13,644	-12,477	-11,265	-10,006	-8,699	-7,342	-5,934	-4,472	-2,956	-1,383	249	1,942	3,698	5,518	7,405

2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
-5,854	-4,891	-3,890	-2,849	-1,767	-644	523	1,735	2,994	4,301	5,658	7,066	8,528	10,044	11,617	13,249	14,942	16,698	18,518	20,405
34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980	34,980
29,126	30,089	31,090	32,131	33,213	34,336	35,503	36,715	37,974	39,281	40,638	42,046	43,508	45,024	46,597	48,229	49,922	51,678	53,498	55,385
0	0	0	0	0	0	0	0	0	0	36,300	36,300	36,300	36,300	36,300	69,300	69,300	69,300	69,300	69,300
0	0	0	0	0	0	0	0	0	0	36,300	36,300	36,300	36,300	36,300	69,300	69,300	69,300	69,300	69,300
29,126	30,089	31,090	32,131	33,213	34,336	35,503	36,715	37,974	39,281	4,338	5,746	7,208	8,724	10,297	-21,071	-19,378	-17,622	-15,802	-13,915
-589,066	-558,977	-527,886	-495,755	-462,543	-428,207	-392,703	-355,988	-318,014	-278,732	-274,394	-268,648	-261,440	-252,716	-242,419	-263,489	-282,867	-300,489	-316,291	-330,206

Appendix 16-2-2 Estimate of Accounts

Financial Analysis for the Hanoi-Cai Lan Line(Feasibility Studies up to 2000)

Estimate of Accounts	1,994	0 1,995	1 1,996	2 1,997	3 1,998	4 1,999	5 2,000	6 2,001	7 2,002	8 2,003	9 2,004	10 2,005	11 2,006	12 2,007	13 2,008	14 2,009	15 2,010
Revenue	0	0	0	0	0	0	51,209	57,047	63,519	70,745	78,829	87,856	94,030	100,651	107,751	115,341	123,469
Passenger	0	0	0	0	0	0	35,825	39,551	43,599	48,089	53,053	58,528	62,470	66,667	71,175	75,957	81,085
Freight	0	0	0	0	0	0	15,384	17,496	19,920	22,656	25,776	29,328	31,560	33,984	36,576	39,384	42,384
Expense	0	0	1,038	2,077	3,115	4,154	61,129	67,381	74,172	81,535	89,576	98,358	104,420	110,851	117,680	126,884	132,541
Working Cost																	
Personnel	0	0	0	0	0	0	13,370	13,574	13,793	14,019	14,252	14,493	14,230	13,962	13,742	13,494	13,261
Non-Personnel	0	0	0	0	0	0	37,446	41,590	46,195	51,289	56,969	63,287	67,675	72,372	77,411	82,784	88,541
Sub Total	0	0	0	0	0	0	50,816	55,164	59,988	65,308	71,221	77,780	81,905	86,334	91,153	96,278	101,802
Depreciation	0	0	1,038	2,077	3,115	4,154	5,192	6,512	7,832	9,152	10,472	11,792	13,112	14,432	15,752	17,072	18,392
Rental	0	0	0	0	0	0	5,121	5,705	6,352	7,075	7,883	8,786	9,403	10,065	10,775	11,534	12,347
Profit	0	0	-1,038	-2,077	-3,115	-4,154	-9,920	-10,334	-10,653	-10,790	-10,747	-10,502	-10,390	-10,200	-9,929	-9,543	-9,072

(Unit : Million Dong)

Cash Flow Projection

	1,994	1,995	1,996	1,997	1,998	1,999	2,000	2,001	2,002	2,003	2,004	2,005	2,006	2,007	2,008	2,009	2,010
Cash In																	
Profit		0	-1,038	-2,077	-3,115	-4,154	-9,920	-10,334	-10,653	-10,790	-10,747	-10,502	-10,390	-10,200	-9,929	-9,543	-9,072
Depreciation	0	0	1,038	2,077	3,115	4,154	5,192	6,512	7,832	9,152	10,472	11,792	13,112	14,432	15,752	17,072	18,392
Total	0	0	0	0	0	0	-4,728	-3,822	-2,821	-1,638	-275	1,290	2,722	4,232	5,823	7,529	9,320
Cash Out (Investment)	0	0	25,960	25,960	25,960	25,960	25,960	33,000	33,000	33,000	33,000	33,000	33,000	33,000	33,000	33,000	33,000
Surplus or Deficit	0	0	-25,960	-25,960	-25,960	-25,960	-30,688	-36,822	-35,821	-34,638	-33,275	-31,710	-30,278	-28,768	-27,177	-25,471	-23,680
Cumulative Cash Flow	0	0	-25,960	-51,920	-77,880	-103,840	-134,528	-171,350	-207,171	-241,808	-275,083	-306,793	-337,071	-365,839	-393,016	-418,487	-442,167

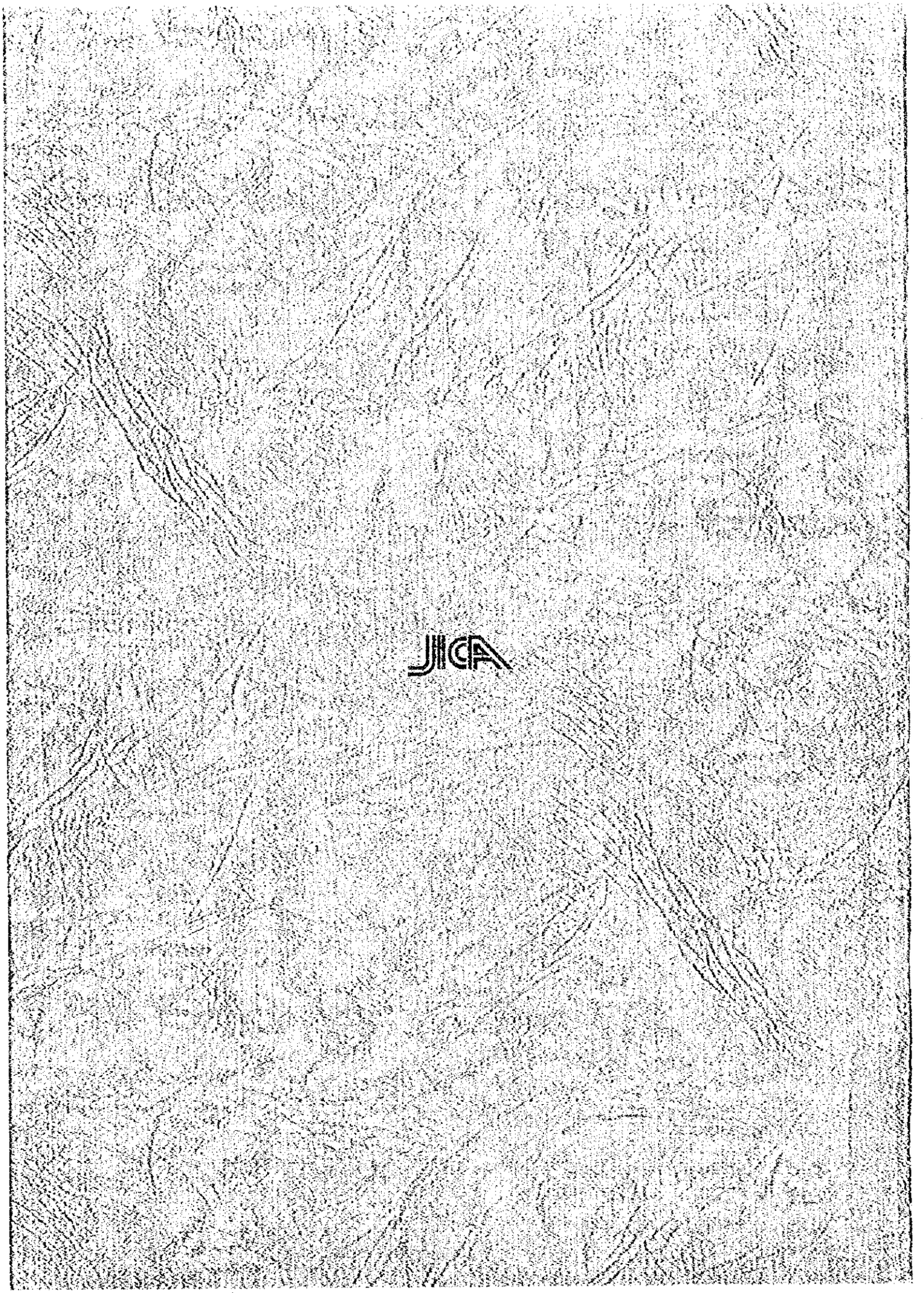
(Unit : Million Dong)

	FIRR	Residual Value (Investment)
15 years later	-4.77%	-319,704
25 years later	-1.31%	-135,784
35 years later	3.19%	-246,664

Appendix 16-2-2 (Continued)

16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
2,011	2,012	2,013	2,014	2,015	2,016	2,017	2,018	2,019	2,020	2,021	2,022	2,023	2,024	2,025	2,026	2,027	2,028	2,029	2,030
132,129	141,437	151,367	162,012	173,400	185,538	198,526	212,422	227,292	243,202	260,227	278,443	297,933	318,789	341,104	364,981	390,530	417,867	447,118	478,416
86,505	92,309	98,495	105,084	112,128	119,977	128,375	137,362	146,977	157,265	168,274	180,053	192,657	206,143	220,573	236,013	252,534	270,211	289,126	309,365
45,624	49,128	52,872	56,928	61,272	65,561	70,150	75,061	80,315	85,937	91,953	98,389	105,277	112,646	120,531	128,968	137,996	147,656	157,992	169,051
139,285	146,559	154,332	160,666	171,604	180,970	190,910	201,460	212,656	224,540	237,152	250,538	264,745	279,824	295,828	312,816	330,846	349,984	370,297	391,859
13,020	12,794	12,568	12,342	12,123	12,850	13,621	14,439	15,305	16,223	17,197	18,229	19,322	20,482	21,710	23,013	24,394	25,857	27,409	29,053
94,660	101,229	108,235	113,731	123,749	131,174	139,044	147,387	156,230	165,604	175,540	186,073	197,237	209,071	221,616	234,913	249,007	263,948	279,785	296,572
107,680	114,023	120,803	126,073	135,872	144,024	152,666	161,826	171,535	181,827	192,737	204,301	216,559	229,553	243,326	257,926	273,401	289,805	307,194	325,625
18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392
13,213	14,144	15,137	16,201	17,340	18,558	19,863	21,262	22,759	24,370	26,023	27,844	29,793	31,879	34,110	36,498	39,053	41,787	44,712	47,842
-7,156	-5,122	-2,965	1,346	1,796	4,568	7,615	10,962	14,636	18,663	23,075	27,905	33,189	38,965	45,276	52,166	59,684	67,883	76,820	86,557

2,011	2,012	2,013	2,014	2,015	2,016	2,017	2,018	2,019	2,020	2,021	2,022	2,023	2,024	2,025	2,026	2,027	2,028	2,029	2,030
-7,156	-5,122	-2,965	1,346	1,796	4,568	7,615	10,962	14,636	18,663	23,075	27,905	33,189	38,965	45,276	52,166	59,684	67,883	76,820	86,557
18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392	18,392
11,236	13,270	15,427	19,738	20,188	22,960	26,007	29,354	33,028	37,055	41,467	46,297	51,581	57,357	63,668	70,558	78,076	86,275	95,212	104,949
0	0	0	0	0	0	0	0	0	0	25,960	25,960	25,960	25,960	25,960	33,000	33,000	33,000	33,000	33,000
																46,970	46,970	46,970	
11,236	13,270	15,427	19,738	20,188	22,960	26,007	29,354	33,028	37,055	15,507	20,337	25,621	31,397	37,708	37,558	45,076	53,275	62,212	71,949
-630,931	-417,660	-402,233	-382,495	-362,307	-339,347	-313,340	-283,986	-250,958	-213,903	-198,396	-178,059	-152,438	-121,041	-83,334	-45,776	-700	52,575	114,787	186,737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