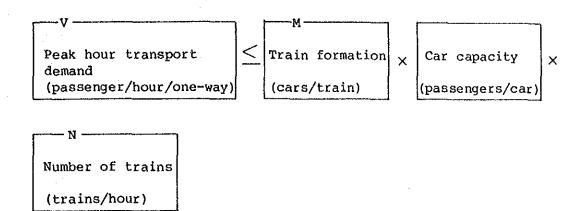
APPENDIX

Appendix 1-1. FORMATION OF A TRAIN (KINDS & NUMBER OF RAILCARS)

(1) Relation between transport demand and transport capacity

The transport capacity per hour is determined according to the following formula.



In the above formula M is in inverse proportion to N.

(2) Basis for studying train formation

It is desirable to shorten the train length and headway, because it makes the construction cost of stations cheaper and gives passengers frequent service.

Therefore, study was made in each case of 3, 4, and 5 cars in a train formation if the transport demand is satisfied or not under the following conditions when the headway is set to be 3 minutes or more (refer to Appendix 1-3).

	Nominal capacity of passengers	Max. No. of passengers	Ratio
4 cars	376 passengers	800 passengers	213 %
5 cars	474 passengers	1008 passengers	213 %
<u></u>			

Transport demand	1,900	1,993	2,000	year
in basic case	12,600	14,500	17,400	passengers

- a. In case of 3 cars train formation, there is some problem in transport capacity and also it cannot be in operation when a car in a unit is broken, so the train should have 2 units of MC + M, and M + Mc, at least.
- b. The following table shows the comparison of operating conditions of 4 cars and 5 cars trains in Basic Case.

	Year	1990	1993	2000
Transport de (one way)	mands in peak hour (passengers)	12,600	14,500	17,400
5 cars train	No. of trains Headway (minutes) No. of passengers	13 4.6 13,104	15 4.0 15,120	18 3.3 18,144
4 cars train	No. of trains Headway (minutes) No. of passengers transportable	16 3.8 12,800	18 3.3 14,400	22(20) 2.7(3.0) 17,600 (16,000)

At the initial stage, transport demand can be covered by 4 cars train, but in 1993 there is some problem in transport capacity and in 2000 it cannot cover the transport demand on condition that headway is 3 minutes or more.

Further, in case of 4 cars train, there is no "T" car in the train and so the train performance is somewhat higher than 5 cars train containing a T car, but the production cost per car of 5 cars train is cheaper than 4 cars train and it is more economical.

b. No. of cars

No. of cars required for the transportation is as shown on the following table and it is calculated with the formula shown on next page.

n¹		5				4
ŧ	(1990)	(1993)	(2000)	(1990)	(1993)	(2000)
to	4.6	4.0	3.3	3.8	3.3	2.7
1	70	80	100	70	80	100
2	75	90	105	76	84	104
3	75	90	110	76	88	108

$$N = \frac{\left(\frac{L}{V} + t_{o}\right) \times 2}{t}$$

$$n = \frac{N \times n^{i}}{(1-0.1)}$$

where,

N: No. of trains in peak hour

L: Operating kilometyerage (km)

V: Schedule speed (km/min)

t: Headway in rush hour (min)

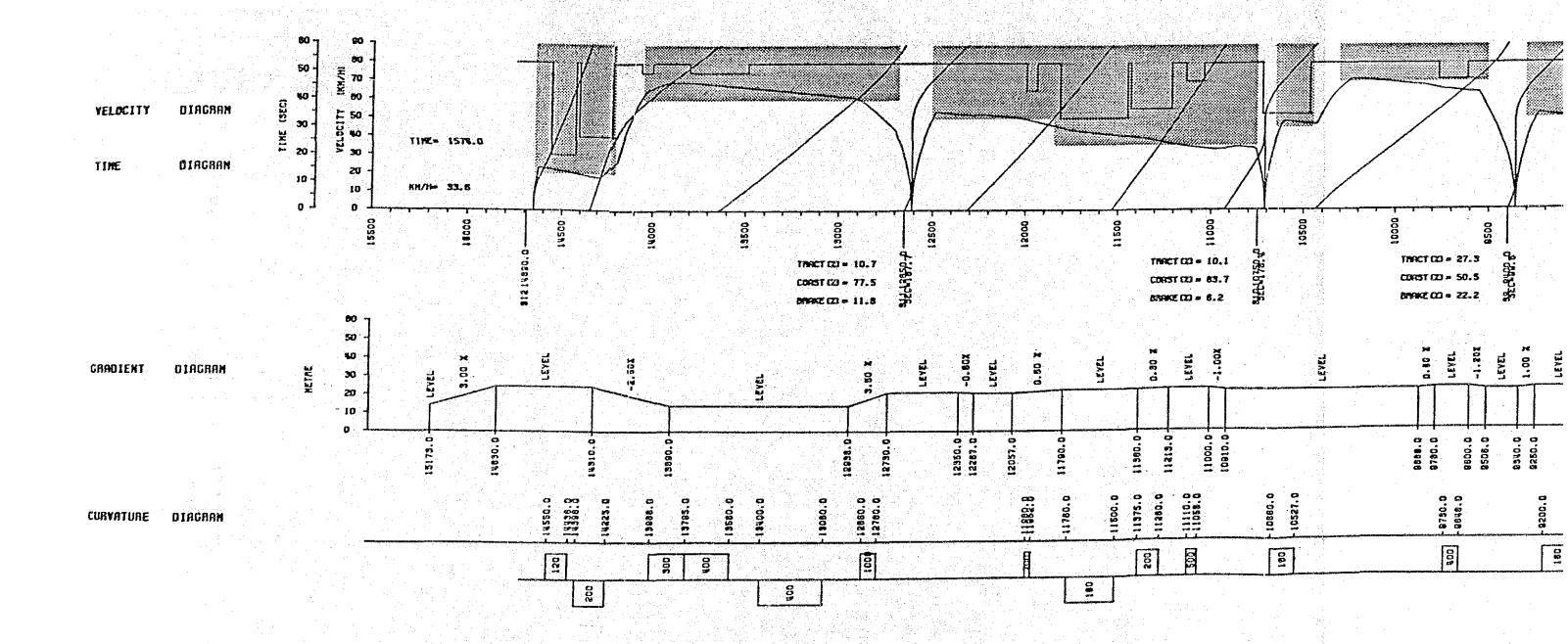
to: Time required for setting back at the terminal station (min)

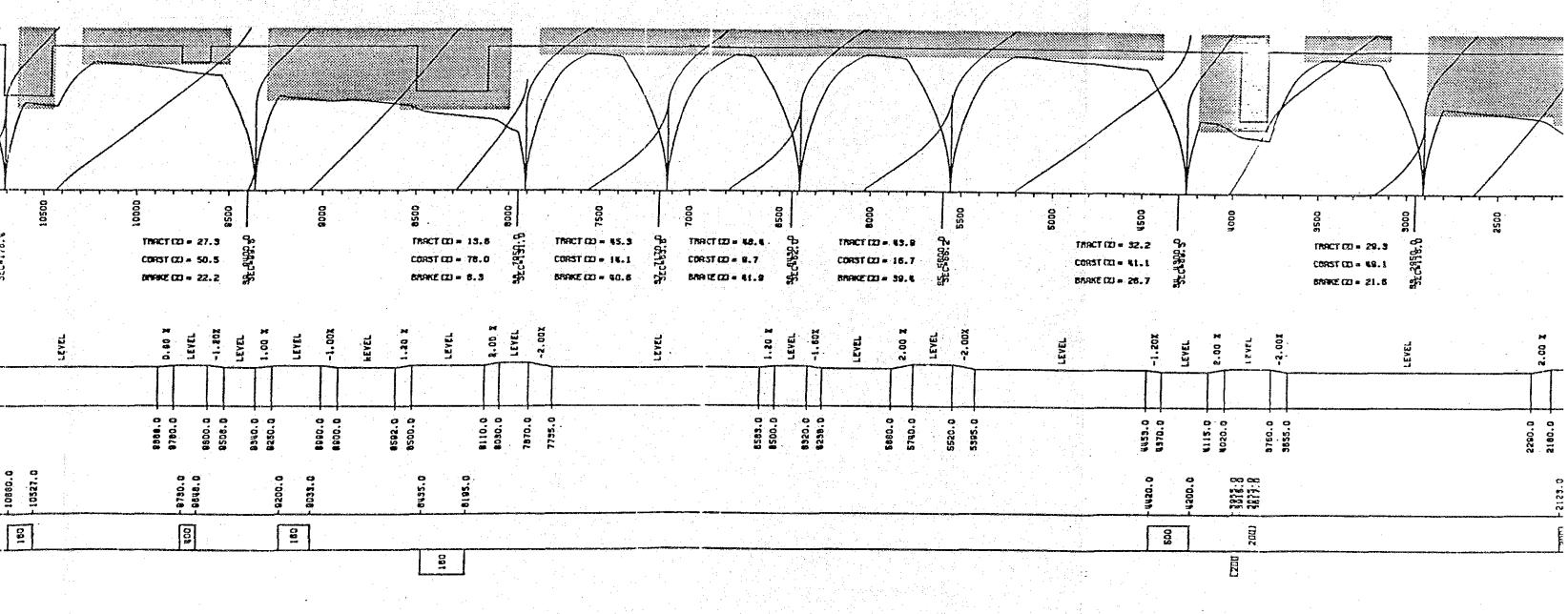
n': No. of cars in a train

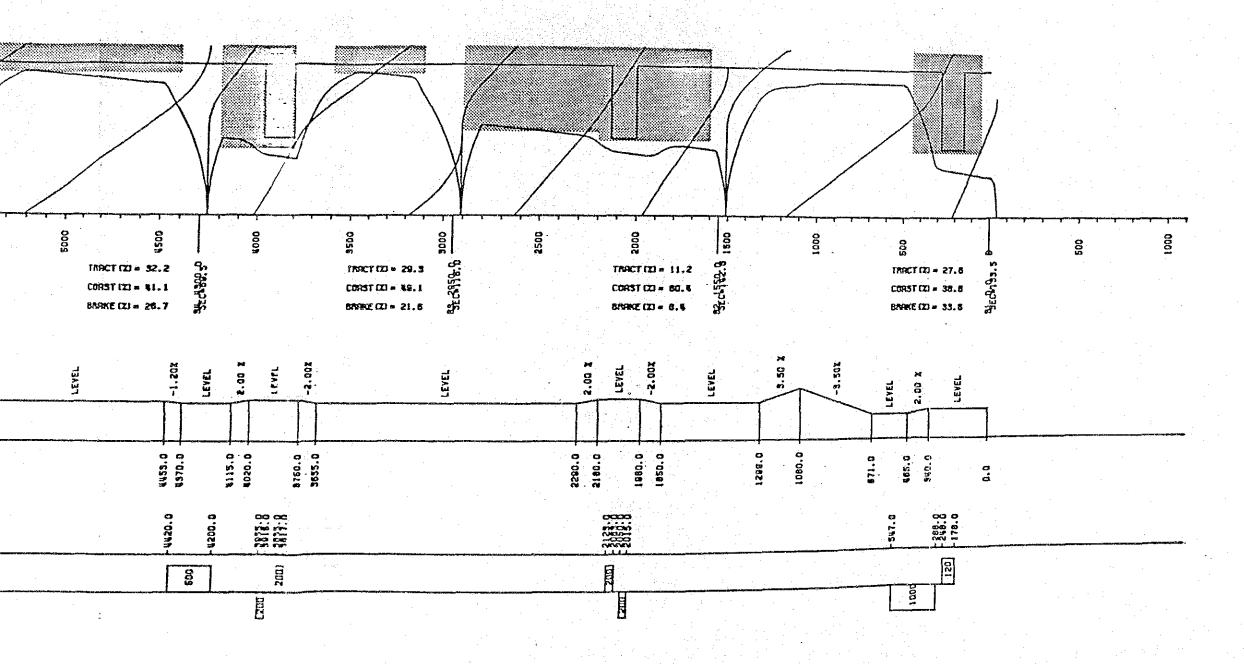
n: No. of cars required

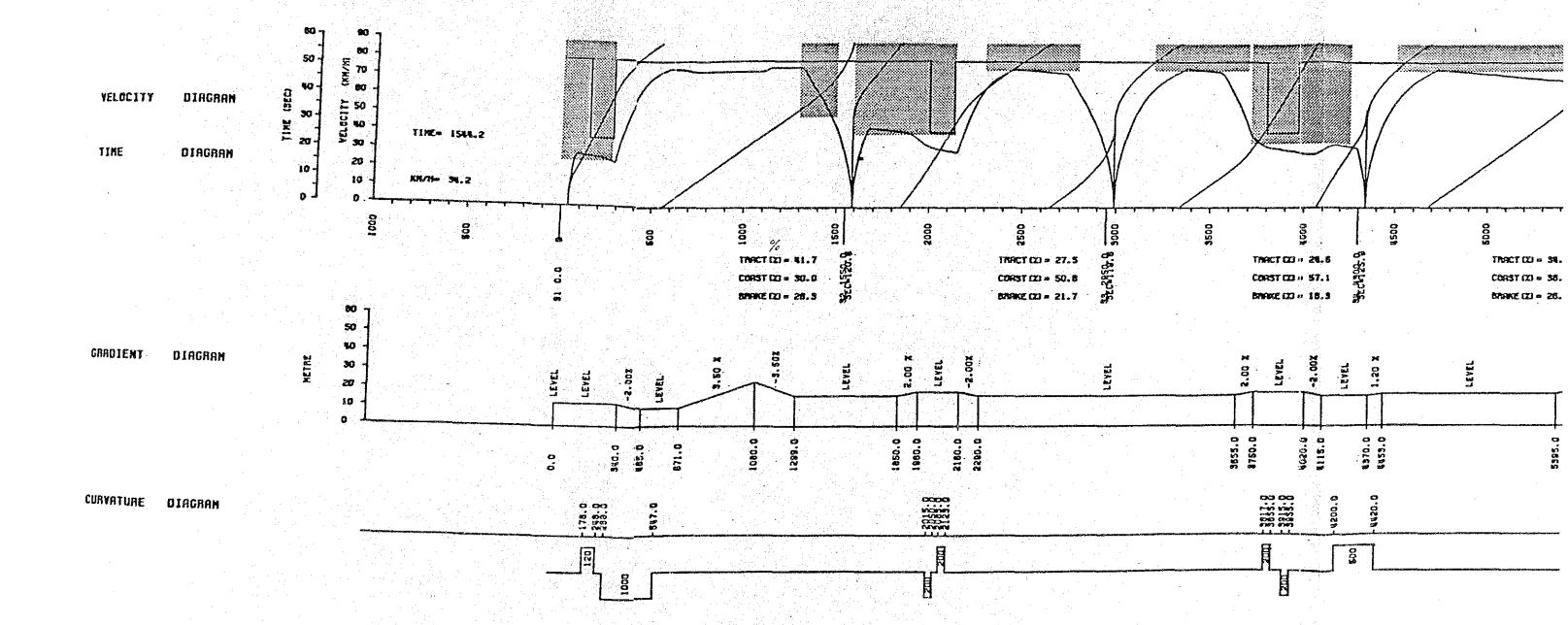
The table shows that there is no large difference in the number of cars between 4 cars formation and 5 cars formation.

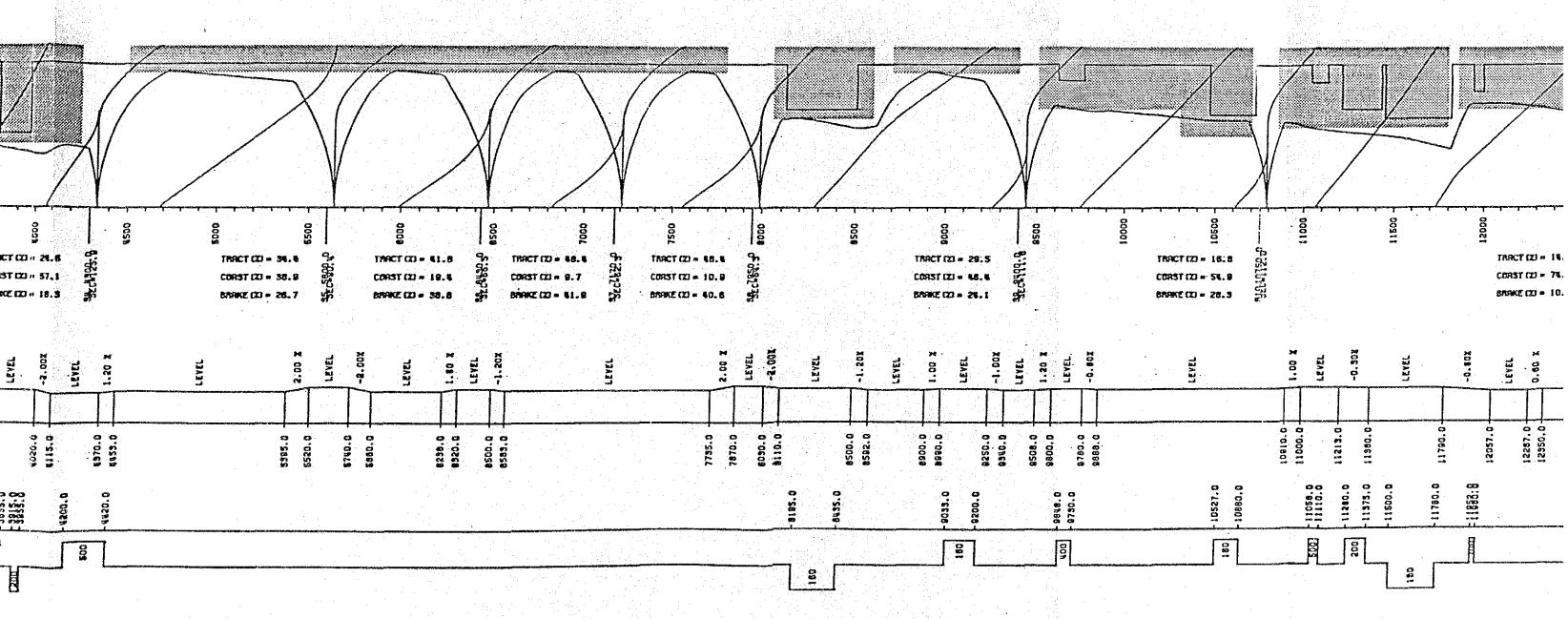
According to the above a, b and c, a train formation of 5 cars is most recommendable for this project.

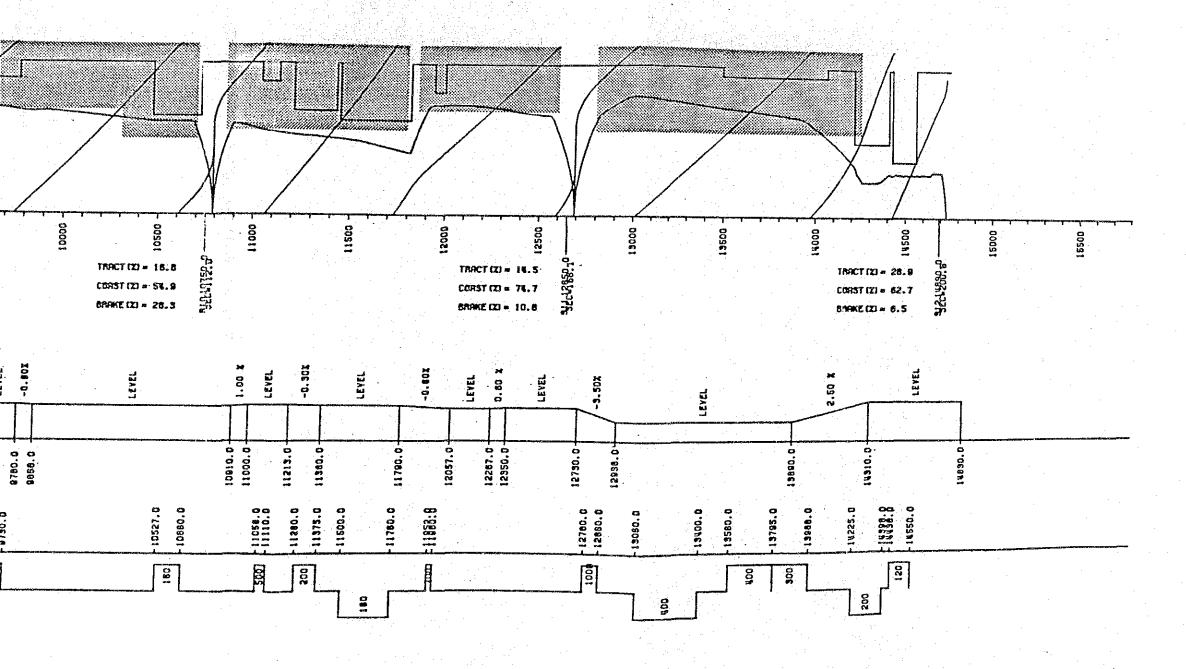












Appendix 1-3 MINIMUM HEADWAY

Minimum headway is derived from the minimum time required for shuttle operation at Terminal Terrestre, where the distance between the station and the scissors crossing is long (about 270m) and curve radius is small (R = 120m).

It is culculated by following expression:

$$T = t_1 + t_2 + t_3 + t_4 + t_5$$

IN the above expression,

- T: Minimum headway (sec)
- t1: The time required after an outgoing train has started until the rear part of the train goes out of the blocking section (until the rear part of the train passes the turnout)
- t2: The time required for route making, change of signal display and sinal confirmation & brake arrangement

 - Change of signal display: $t_{2-2} = 1$ sec
 - Signal confirmation & brake arrangement: $t_{2-3} = 3$ sec Therefore, $t_2 = 5 + 1 + 3 = 9$ sec
- t3: The time required for an incoming train running at its designed speed throughout the distance required for decelerating from the designed speed (speed at the train operation curve) to the speed indicated by signal display for control of distance spacing.
- t4: The time required for an incoming train running throughout the distance between the rear No. 1 block signal and the home signal
- t5: The time required after the front head of an incoming train has come in inward the yard signal until the train stops.

From the run-curve simulation,

$$t_1 = 60 \text{ sec } (L = 300\text{m}, v = 0 \text{ to 25 km/hr}, to = 18 \text{ sec},$$

thenceforth, $v = 25 \text{ km/hr constantly})$

$$t_5 = 75 \text{ sec } (1 = 460 \text{m (average } v = 22 \text{ km/hr)})$$

Calculation of t3:

Designed speed (from the run-curve) : v = 55 km/hr

Indicated speed : v = 45 km/hr

Deceleration : 4.0 km/hr/sec

$$t_3' = (55 - 45)/4.0 = 2.5 \text{ sec}$$

 $L = (55 + 45) \times 2.5/(2 \times 3.6) = 35 m = brake distance$

 $t_3 = 35 (55 \times 1/3.6) = 2 \text{ sec}$

From the above,

$$t_0 = 60 + 9 + 2 + 43 + 75 = 189 \text{ sec} = 3'09'' * 3' \text{ (minute)}$$

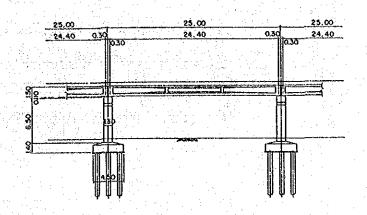
Appendix 1-4 EXAMPLE OF STRUCTURAL ANALYSIS (1)

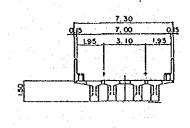
Prestressed Concrete Girder

(1) General View

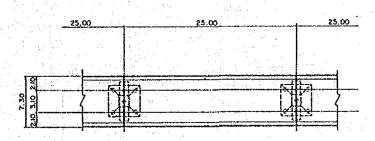
SIDE VIEW

CROSS SECTION

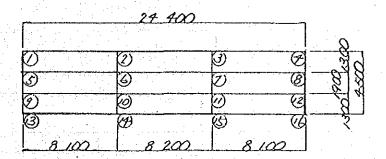




PLAN



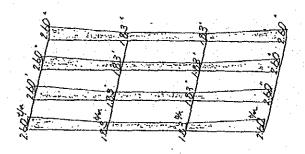
(2) Frame Diagram

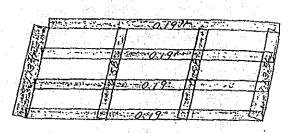


(3) Load Diagram

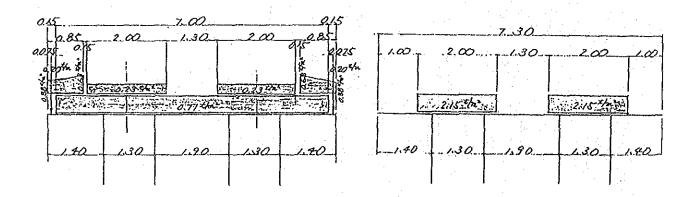
Case 1 Dead Load 1 (main beam)

Case 2 Dead Load 2 (cross beam)





Case 3 Dead Load 3 (ballast, track, others) Case 4 Train Load + Impact



(4) Load Combine

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2.		2		" (cross girder)
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DISTANCE HEMBER TORSION MOMENT SHEAR DISTANCE MEMBER TORSION MOMENT 0.000 34 (11) 0.0 0.0 -0.830E-03 0.000 34 (11) 0.0 0.0 1.400 (J1) 0.0 -0.001 -0.830E-03 1.400 (J1) 0.0 0.0 1.400 35 (11) 0.0 -0.001 0.880E-03 1.400 35 (11) -0.022 0.018 2.700 (J1) 0.0 0.0 0.880E-03 2.700 (J1) -0.022 -0.319 2.700 36 (11) 0.0 0.0 0.0 2.700 36 (11) 0.0 -0.308 4.500 (J1) 0.0 0.0 0.0 4.500 (J1) 0.022 -0.319 5.500 37 (11) 0.0 0.0 -0.880E-03 4.500 37 (11) 0.022 -0.319	0.0 -0.830E-03 7.300 (J) 0.0	0.0 0.0
DISTANCE HEMBER TORSION MOMENT SHEAR DISTANCE MEMBER TORSION MOMENT 0.000 34 (11) 0.0 0.0 -0.830E-03 0.000 34 (11) 0.0 0.0 1.400 (J1) 0.0 -0.001 -0.830E-03 1.400 (J1) 0.0 0.0 1.400 35 (11) 0.0 -0.001 0.880E-03 1.400 35 (11) -0.022 0.018 2.700 (J1) 0.0 0.0 0.880E-03 2.700 (J1) -0.022 -0.319 2.700 36 (11) 0.0 0.0 0.0 2.700 36 (11) 0.0 -0.308 4.500 (J1) 0.0 0.0 0.0 4.500 (J1) 0.022 -0.319 5.500 37 (11) 0.0 0.0 -0.880E-03 4.500 37 (11) 0.022 -0.319	NAKE OF GIRDER 1. C.4	والمحاصر بأسينك يفلس
0.000 34 (11 0.0 0.0 -0.830E-03 0.000 34 (11 0.0 0.0 0.0 1.400 (1) 0.0 0.0 0.0 1.400 (1) 0.0 0.0 0.0 0.0 1.400 (1) 0.0 0.0 0.0 0.0 1.400 35 (11 0.0 -0.001 0.880E-03 1.400 35 (11 -0.022 0.018 1.400 35 (11 0.0 0.0 0.0 0.880E-03 1.400 35 (11 -0.022 0.018 1.400 35 (11 0.0 0.0 0.0 0.880E-03 1.400 35 (11 0.0 0.0 0.0 0.880E-03 1.400 35 (11 0.0 0.0 0.0 0.0 0.880E-03 1.400 35 (11 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0	the state of the s	
1.400		
1.400 35 (1) 0.0 -0.001 0.880E-03 1.400 35 (1) -0.022 0.018 2.700 (J) 0.0 0.0 0.880E-03 2.700 (J) -0.022 -0.319 2.700 36 (I) 0.0 0.0 0.0 2.700 36 (I) 0.0 -0.308 4.500 (J) 0.0 0.0 0.0 4.600 (J) 9.0 -0.308 5.500 37 (I) 0.0 0.0 0.0 4.600 37 (I) 0.022 -0.319		
2.700 (J) 0.0 0.0 0.840E-03 2.700 (J) -0.022 -0.319 2.700 36 (I) 0.0 0.0 0.0 2.700 30 (I) 0.0 -0.308 4.500 (J) 0.0 0.0 0.0 4.600 (J) 0.0 -0.308 5.500 37 (I) 0.0 0.0 0.0 -0.880E-03 4.600 37 (I) 0.022 -0.319	그는 경우 가장 보는 사람들이 가장 하는 것이 되었다.	
2.700 36 (1) 0.0 0.0 0.0 2.700 30 (1) 0.0 -0.308 4.600 (J) 0.0 0.0 0.0 4.600 (J) 0.0 -0.308 5.500 37 (1) 0.0 0.0 -0.8808-03 4.600 37 (1) 0.022 -0.319		
4.600 (J1 0.0 0.0 0.0 4.600 (J1 9.0 -0.308 5.600 37 (T1 0.0 0.0 -0.880E-03 4.600 37 (T) 0.022 -0.319	0.0 0.840E-03 2.700 (J) -0.022	754 F 191 W
5.500 37 (I) 0.0 0.0 -0.880E-03 4.500 37 (I) 0.022 -0.319	U.O 0.O 2.700 36 [[] 0.0	
9-9-00 37 111 0-00	0.0 0.0 4.600 (1)1 9.0	
0.00 0.000-00 6.000 (11) 0.000 0.000	0.0 -0.8805-03 4.600 37 111 0.022	
5.900 4J) 0.0 -J.001 -0.880E-03 5.900 1J) 0.022 0.003	-u-001 -0.880E-03 5.900 (J) 0.022	0.018 -0.475
5.900 36 ([] 0.0 -0.001 U.830E-03 5.900 38 ([] 0.0 0.0	-0.001 0.830E-03 5.900 38 (1) 0.0	0.0
7.300 (3) 0.0 0.0 0.830E-03 7.300 (3) 0.0 0.0	0.0 0.830E-03 7.300 (J) 0.0	0.0

					CASE - 4				
NAME OF GIAL	DEA 1 G 2		erio de la compania del compania de la compania de la compania del compania de la compania del compania de la compania de la compania de la compania del la compania del compania de		NAME OF GI	ROER ; G 2	* - * - * - * - * - * - * - * - * - * -	, · ·	
DISTANCE	. NEMBEW	TORSION "	HONENT	SHEAR	DISTANCE	HEHBER	TORSION	HOHERT	SHE
	4 (11)	0.671	0+3	21+232	0.000	4 (1)	0.028	0.428	26.
0.000	***	0.671	52.255	17.07	3,050	***	0.028	62.27	19.
3.050		0.671	96.94	11.794	5100	***	0.028	112-67	11.
6.1.00			70 • 7 · " 12 • • 9 5 · · ·	0.015			0.028	143.277	8.
8.1'00	(7)	0.371	457 4 5		8.100	(J)		141.855	9·
8 T 00	5-644	0.0	124.281	5.73	8.100	5 400	0.0		7.
9 1 50	**** : 1 (7)	0.0	1244557 "	4.63	9.150	444	040	147-173	-0.
12.200		0.0	142.536	-0.242	15.500	***	0.0	163.966	
[5.230	***	0.0	128.099	-4-847	15,250	***	0.0	147.418	-7.
16.300	. 131	0.0	124.859	~5.73	16.300	(5)	0.0	143.096	9.
16.300	6 ***	-0.671	124.41	-9.912	16.300	& 	-0-028	145-051	.8-
18.300		-0.671	98.973	-12-355	19.300	46¥	-0.038	112.741	-12
21,350"		-0.671	52° 1'97	-17.526	21,350	684	-0.028	62.146	-20
24 14 00	[1]	-0.671	0.67	-51-535	24.400	(1)	~0.028	1.654	-20.
NAME OF GIRO	DER ; G 3				NAME OF GE	ROER G 3			
ESTANCE"	HEHBER	TORSION	HOHENT	SHEAR	DISTANCE	HEHBER	TORSTON	HONENT	SHE
		0.313	1.159	21.124	0.000	7-(1)	0.042		25.
3 .0 50	***************************************	0:313	53.329	16.772	3.050	***	0.042	61.634	19
6.100		0.313	90.073	11751	6.100		0.042	112-279	12
8.100	(1)	0.313	126.249	¥.375	8.100	133	0.042	143.493	- 9
8.100	8	0.0	1251446	5.947	8.100	8 ***	0.0	143.209	9
9.150		0.0	129.316	4,79	9.150	***	0.0	147 (553	6
12.200	00*	0.0	141.567	-0.286	15.500		0.0	163.162	- u .
15.250	***	Q+ O	129.557	-5.048	15.250	9**	0.0	147.632	- 7
16.300	(1)	0.0	126.429	-5.947	16.300	(J)	0.0	143.527	-8
16.300	9 ***	-0.313	125.277	-9,375	18.300	9 ***	-0.042	143.179	- 9
18.300	374	-0.313	98.13	-11.936	18.300		-0.042	112.298	-12
21.3.50	***	-0.313	53+231	-17.309	21,350 ;	. +94	-0.042	61.603	-20
24.400	(1)	-0.313	2-131	-21-124	24.400	(1)	-0.042	1.614	-25
					÷	RDER 1: "G"4"			
NAME OF GTRE	DER T G 4	المرابعة المستواد							• • • •
ESTANCE	HEHBER	TORSION	HONENT	SHEAR	DISTANCE	ME NO ER	TORSTON	HOMENT	SHE
						10 (1)		0.388	25
0.000	10 (1)	-0.313	1.561	21-124	0.000		-0.042		19.
0.000 3.050	10 (1)	-0.313 -0.313	53.304	21.124	3.050	***	-0.042	61-692	
		-0.313 -0.313 -0.313						61-692 112-266	
3.050	***		53.304	16-772	3.050	***	-0.042		12 9.
3.050 6.100	***	-0.313	53.304 98.079	16-772 11-51	3,050 6,100	***	-0+042 -0+042	112.266	1 2 9
3.050 6.100 8.100	***	-0.313 -0.313	53.304 98.079 126.249	16-772 11-51 9-375	3.050 6.100 8.100	*** *** (J)	-0.042 -0.042 -0.042	112.266	12 9. 8.
3.050 6.100 8.100 8.100	*** (J)	-0.313 -0.313	53.304 98.079 126.249 125.852	16-772 11-51 9-375 5-947	3,050 6,100 8,100 8,100	*** (J)	-0.042 -0.042 -0.042	112.266 143.493 142.286	1 2 9 8 6
3.050 6.100 8.100 8.100 9.150	(3)	-0.313 -0.313 0.0	53.304 98.079 126.249 127.852 129.403	16-772 11-51 9-375 5-947 4-79	3.050 6.100 8.100 8.100 9.150	624 (1) 444 444	-0.042 -0.042 -0.042 0.0	112.266 143.493 142.286 147.356	1 2 9 8 6
3.050 6.100 8.100 8.100 9.150	(J) (1 ++++	-0.313 -0.313 0.0 0.0	53.304 98.079 126.249 125.852 129.403 141.587	16-772 11-51 9-375 5-947 4-79	3.050 6.100 8.100 8.100 9.150	000 (J) (1 000 000	-0.042 -0.042 -0.042 0.0 0.0	112.266 143.493 142.286 147.356 163.162	8 8 6 -7
3.050 6.100 8.100 8.100 9.150 12.2200	10) 11 ***	-0.313 -0.313 0.0 0.0 0.0	53+305 98+079 126+249 12>+852 129+403 141+587 129+545	16-772 11-51 9-375 5-947 4-79 -0-266	3,050 6,100 8,100 8,100 9,150 12,200	\$1 *** (3) 21 ***	-0.042 -0.042 -0.042 0.0 0.0	112.266 143.493 142.286 147.356 163.162	8.6
3.050 6.100 8.100 8.100 9.150 12.2200 15.250	(1J)	-0.313 -0.313 0.0 0.0 0.0	53+304 98-079 126-249 12>+852 129-403 141-587 129-545 126-429	16-772 11-51 9-375 5-947 4-79 -0-266 -5-046	3.050 6.100 8.100 8.100 9.150 12.200 15.250 18.300	600 600 600 600 600 73 73 600	-0.042 -0.042 -0.042 0.0 0.0 0.0 0.0	112.266 143.493 142.286 147.356 163.162 147.661	12 9. 8. 6. -0. -7.
3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300	(J) (1 *** *** *** *** 1J) 12 ***	-0.313 -0.313 0.0 0.0 0.0 0.0 0.0	53.304 98.079 126.249 125.852 129.403 141.587 129.545 120.429 125.679 98.112	16-772 11-51 9-375 5-947 4-79 -0-266 -5-046 -5-947 -9-375 -11-936	3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300	17) +++ +++ +++ +++ +++ +++ +++ +	-0.042 -0.042 -0.042 0.0 0.0 0.0 0.0	112.266 143.493 142.286 147.356 163.162 147.661 143.527	12 9. 8. 6. -0. -7. -8. -9.
3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300 16.300	13) 12 *** *** *** *** *** *** *** *	-0.313 -0.313 0.0 0.0 0.0 0.0 0.0 0.313	53+304 98-079 126-249 129-852 129-403 141-587 129-545 129-545	16-772 11-51 9-375 5-947 4-79 -0-266 -5-046 -5-947 -9-375	3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300 16.300	000 (J) 21 000 000 1J) 12 000	-0.042 -0.042 -0.042 0.0 0.0 0.0 0.0 0.0	112.266 143.493 142.286 147.356 163.162 147.661 143.527 142.267	12 9 8 6 -0 -7 -8 -9 -12
3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300 16.300 21.350 24.400	10) 11 *** *** *** 11) 12 *** *** (U)	-0.313 -0.313 0.0 0.0 0.0 0.0 0.0 0.0 0.313 0.313	53.304 98.079 126.249 122.852 129.403 141.587 129.545 120.429 125.679 98.112 53.247	16-772 11-51 9-375 5-947 4-79 -0-266 -5-046 -5-947 -9-375 -11-936 -17-309	3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300 16.300 21.350 24.400	000 (3) (1) 000 000 000 (1) 1 (2) 000 000 (1) 2 (1) 000 000	-0.042 -0.042 -0.042 0.0 0.0 0.0 0.0 0.0 0.0 0.042 0.042	112.266 143.493 142.286 147.356 163.162 143.527 143.527 142.267	12 9 8 6 -0 -7 -8 -9 -12
3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300 18.300 21.350 24.400	10) 11 *** *** *** 11) 12 *** *** (U)	-0.313 -0.313 0.0 0.0 0.0 0.0 0.0 0.0 0.313 0.313	53.304 98.079 126.249 122.852 129.403 141.587 129.545 120.429 125.679 98.112 53.247	16-772 11-51 9-375 5-947 4-79 -0-266 -5-046 -5-947 -9-375 -11-936 -17-309	3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300 16.300 21.350 24.400	(1)	-0.042 -0.042 -0.042 0.0 0.0 0.0 0.0 0.0 0.0 0.042 0.042	112.266 143.493 142.286 147.356 163.162 143.527 143.527 142.267	12: 9. 8. 6. -0. -7: -8. -9. -12: -20.
3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300 18.300 21.350 24.400	13) 11 *** *** *** 13) 12 *** *** (d) DER ; G S HEHBER	-0.313 -0.313 0.0 0.0 0.0 0.0 0.0 0.313 0.313 0.313	53.304 98.079 126.249 129.403 141.587 129.545 120.429 125.679 98.112 53.247 2.131	16-772 11.51 9.375 5.947 4.79 -0.266 -5.046 -5.947 -9.375 -11.936 -17,309 -21.124	3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300 16.300 21.350 24.400	(J) 11 000 000 1J) 12 000 000 (J) RDER ; G 5	-0.042 -0.042 -0.042 0.0 0.0 0.0 0.0 0.0 0.042 0.042 0.042	112.266 143.493 142.286 147.356 163.162 147.661 143.527 142.267 112.338 61.568	126 8. 6. -0. -7. -8. -9. -12. -20. -25.
3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300 16.300 21.350 24.400 NAME OF GIRC	10) 11 *** *** *** 11) 12 *** *** (1) DER ; C 5 HEHBER 13 (1)	-0.313 -0.313 0.0 0.0 0.0 0.0 0.0 0.313 0.313 0.313 -0.313	53.304 98.079 126.249 129.403 141.587 129.545 120.429 125.679 98.112 53.247 2.131	16-772 11-51 9-375 5-947 4-79 -0-286 -5-046 -5-947 -9-375 -11-936 -17-309 -21-124	3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300 16.300 21.350 24.400 RAME OF GI	(J) 12 *** *** *** *** *** *** *** *	-0.042 -0.042 -0.042 0.0 0.0 0.0 0.0 0.0 0.042 0.042 0.042	112.266 143.493 142.286 147.356 163.162 147.661 143.527 142.267 112.338 61.568 1.614	126 9. 8. 6. -0. -7. -8. -9. -12. -20. -25.
3.050 6.100 6.100 8.100 8.100 12.200 12.200 15.250 16.300 16.300 21.350 24.400 NAME OF GIRD	13) 11 *** *** *** *** 13) 12 *** *** (3) DER ; G 5 HEHBER 13 (1)	-0.313 -0.313 0.0 0.0 0.0 0.0 0.0 0.313 0.313 0.313 -313 -313	53.306 98.079 126.249 122.852 129.403 141.587 129.545 120.429 125.679 98.112 53.247 2.131 MOKENT 0.314 52.254	16-772 11-51 9-375 5-947 4-79 -0-266 -5-046 -5-947 -9-375 -11-936 -17-309 -21-124 SHEAR 21-232	3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300 16.300 21.350 24.400 NAME OF GI	(J) 12 *** *** *** *** *** *** *** *	-0.042 -0.042 -0.042 -0.0 0.0 0.0 0.0 0.0 0.0 0.042 0.042 0.042 TORSION -0.028	112.266 143.493 142.286 147.356 163.162 147.661 143.527 142.267 112.338 61.568 1.614 MONENT	12. 9. 8. 60789122525.
3.050 6.100 8.100 8.100 12.200 12.200 15.250 16.300 16.300 21.350 24.400 NAME OF GIRO 1STANCE 0.000 3.050	131 11 *** *** *** *** *** *** (J) 12 *** *** (J) DER; G 5 *** *** *** *** *** *** ***	-0.313 -0.313 0.0 0.0 0.0 0.0 0.0 0.313 0.313 0.313 **TORSIDH** -0.671 -0.671	53.304 98.079 126.249 127.852 129.403 141.587 129.545 120.429 125.679 98.112 53.247 2.131 NOMENT 0.314 52.254 96.96	16-772 11-51 9-375 5-947 4-79 -0-266 -5-947 -9-375 -11-936 -17-309 -21-124 SHEAR 21-232 17-07 11-994	3.050 6.100 8.100 8.100 9.150 12.200 15.250 18.300 16.300 21.350 24.400 MAME OF GI DISTANCE 0.000 3.050	(J) 12 *** *** *** *** *** *** ***	-0.042 -0.042 -0.042 -0.0 0.0 0.0 0.0 0.0 0.042 0.042 0.042 TORSION -0.028	112.266 143.493 142.286 147.356 163.162 147.661 143.527 142.267 112.338 61.568 1.614	12 9 9 8 8 6 6 7 9 7 7 8 8 7 9 9 12 5 5 H 26 19 11
3.050 6.100 8.100 8.100 8.100 9.150 12:200 15:250 16:300 16:300 21:350 24:400 NAME OF GIRO 1STANCE 0.000 3.050 6:100	### ### ### ### ### ### ### ### ### ##	-0.313 -0.313 0.0 0.0 0.0 0.0 0.0 0.313 0.313 0.313 0.313 -0.671 -0.671 -0.671	53.304 98.079 126.249 129.852 129.403 141.587 129.545 120.429 125.679 98.112 53.247 2.131 HOMENT 0.314 52.254 96.94	16-772 11.51 9.375 5.947 4.79 -0.266 -5.046 -5.947 -9.375 -11.936 -17.309 -21.124 SHEAR 21.232 17.07 11.994 9.912	3.050 6.100 8.100 8.100 9.150 12.200 15.250 18.300 16.300 21.350 24.400 NAME OF GI DISTANCE 0.000 3.050 6.100	(J) 10 00 10 0	-0.042 -0.042 -0.042 -0.0 -0.0 -0.0 -0.0 -0.0 -0.042 -0.042 -0.028 -0.028 -0.028	112.266 143.493 142.286 147.356 163.162 147.661 143.527 142.267 112.338 61.568 1.614 MONENT 1.194 62.222 112.681	12. 9. 8. 60789122025
3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300 16.300 21.350 24.400 NAME OF GIRG 1STANCE 0.000 3.050 6.100 8.100	### (J) 11 *** *** *** 1J) 12 *** *** (J) DER ; G 5 HEHBER 13 (I) *** *** (J) 14 ***	-0.313 -0.313 0.0 0.0 0.0 0.0 0.0 0.313 0.313 0.313 **TORSION -0.671 -0.671 -0.671 0.00	53.304 98.079 126.249 125.852 129.403 141.587 129.545 120.429 125.679 98.112 53.247 2.131 HOHENT 0.314 52.254 96.96 124.98	16-772 11-51 9-375 5-947 4-79 -0-286 -5-046 -5-947 -9-375 -11-936 -17-309 -21-124 SHEAR 21-232 17-07 11-994 9-912 5-73	3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300 16.300 21.350 24.400 NAME OF GI DISTANCE 0.000 3.050 6.100 8.100	(J) 1000 000 000 000 000 000 000 000 000 0	-0.042 -0.042 -0.042 -0.00 0.0 0.0 0.0 0.0 0.0 0.042 0.042 0.042 0.042 T09510N -0.028 -0.028 -0.028	112.266 143.493 142.286 147.356 163.162 147.661 143.527 142.267 112.336 61.568 1.614 MONENT 1.194 62.222 112.681 143.277 142.631	12. 9. 8. 6078 -9 -12 -25 -25 -25
3.050 6.100 8.100 8.100 8.100 12.200 12.2200 15.250 16.300 16.300 21.350 24.400 NAME OF GIRU 1STANCE 0.000 3.050 6.100 8.100 8.100	### ### ### ### ### ### ### ### ### ##	-0.313 -0.313 0.0 0.0 0.0 0.0 0.0 0.313 0.313 0.313 0.313 -0.671 -0.671 -0.671 0.0	53.304 98.079 126.249 122.852 129.403 141.587 129.545 120.429 125.679 98.112 53.247 2.131 HONENT 0.314 52.254 96.95 124.98 124.290	16-772 11-51 9-375 5-947 4-79 -0-266 -5-947 -9-375 -11-936 -17-309 -21-124 SHEAR 21-232 17-07 11-994 9-912 5-73	3,050 6,100 8,100 8,100 9,150 12,200 15,250 16,300 16,300 21,350 24,400 MAKE OF GI DISTANCE 0,000 3,050 6,100 8,100 8,100	(J) 11 *** *** *** *** *** *** ***	-0.042 -0.042 -0.042 -0.00 -0.0 -0.0 -0.0 -0.0 -0.042 -0.042 -0.042 -0.028 -0.028 -0.028 -0.028	112.266 143.493 142.286 147.356 163.162 147.661 143.527 142.267 112.338 61.568 1.614 MONENT 1.194 62.222 112.681 143.277 142.631	120 9. 8. 6. -0. -7. -8. -29 -12. -25 -25 -25 19
3.050 6.100 8.100 8.100 9.150 12:200 15:250 16:300 16:300 21:350 24:400 NAME OF GIRG 1STANCE 0.000 3.050 6.100 8.100	### (J) 11 *** *** *** 1J) 12 *** *** (J) DER ; G 5 HEHBER 13 (I) *** *** (J) 14 ***	-0.313 -0.313 0.0 0.0 0.0 0.0 0.0 0.313 0.313 0.313 **TORSION -0.671 -0.671 -0.671 0.00	53.304 98.079 126.249 125.852 129.403 141.587 129.545 120.429 125.679 98.112 53.247 2.131 HONENT 0.314 52.254 96.96 124.98	16-772 11-51 9-375 5-947 4-79 -0-286 -5-046 -5-947 -9-375 -11-936 -17-309 -21-124 SHEAR 21-232 17-07 11-994 9-912 5-73	3.050 6.100 8.100 8.100 9.150 12.200 15.250 16.300 16.300 21.350 24.400 NAME OF GI DISTANCE 0.000 3.050 6.100 8.100	(J) 1000 000 000 000 000 000 000 000 000 0	-0.042 -0.042 -0.042 -0.00 0.0 0.0 0.0 0.0 0.0 0.042 0.042 0.042 0.042 T09510N -0.028 -0.028 -0.028	112.266 143.493 142.286 147.356 163.162 147.661 143.527 142.267 112.336 61.568 1.614 MONENT 1.194 62.222 112.681 143.277 142.631	12. 9. 8. 67891225252534444444444

									in the second
					16.300	 (J)	0.0	143.076	-9.009
16-300		0.0	124.859	-9:912	16.300	15 ***	850.0	142.417	~8,635
16.300	15 +++	0.671	96.973	-12.355	16.300		0.028	112.700	-12.424
18.300		176.0	52+198	-17.526	21.350	***	0.028	62.175	-20.54
51 •3 20		0,671	0.67	-21:232	24,400	(វិ)	0.028	1 . 654	-24.433
24.400	(41				- IFIDE TIE CI	ROER": G"I			
10-10-3HKN	RDER ; C			e de la composición del composición de la composición de la composición del composición de la composic	HANE OF OR		وجريسها والإنافات والمتعارفة	- produced	
ISTANCE	MEMBER	YOR STON	нонент	SHEAR	DISTANCE	HEHBER	TORSTON	HOHENT	SHEAR
0.000	18 (1)	-0.105	-0.176	-3.812	0.000	19 (1)	-0.004	-0.003	-0.255
1.400	(1)	-0.105	-4.123	-3.812	1,400	··· 191	-0.004	-0.531	-0.845
1 4 00	20 (1)	-0.126	-4.945	4:128	1,400	20 [1]	-0.054	-0.724	0.04
2.100	(1)	-0.726	0.304	4.728	2.700	(1)	-0.054	-0.682	0.04
2.700	51 (1)	0.0	-0.119	0.0	2.700	si iii	0.0	-0.644	0.0
4 .6 00		0.0	-0.119	0.0	4.500	(3)	0.0	-0.684	0.0
4.600	(11 55	0.726	0.304	-4.728	4,500	55 (1)	0.054	-0.682	-0.04 -0.04
5.900	(4)	0.726	-4.945	-4.728	5.900	เท่	0.053	-0.724	the transfer of
5.700	23 (1)	0.105	-4.123	3.012	5.700	23 [1]	0.004	-0.531	0.245
7.300		0.105	-0.17ь	3.812	7.300	(1]	0.004	-0.003	0+245
NAME OF GI	ROER"; C 2			iii. Taran ee	NAME OF GI	ROER ; C Z		enega ra n a sek	ji kata sa
			unuci.T	SHEAR	DISTANCE	HEHBER	TORSION	KOMENT	SHEAR
ISTAYCE	HEHBER	TORSION	Тизнон	:	0.000	24 (11		-0.541E-03	-0.489
0.000	24 (11)	-0.072	-0.015	-7.609 -7.609	1,400	(4)	-0.003	-1-171	-0.499
1.400	. (4)	-0.072	-8.919	-3.428	1.400	25 111	-0,01	-1.149	633.0-
2.700	25 (1)	-0.141	-8.372 -12.389	-3.428	2.700	(11	-0.01	-2.108	-0.863
2.760	Se (1)		-12.171	0.0	2.700	26 (1)	0.0	-2.082	0.0
4.600	111	0.0	-12-171	0.0	4.500	(2)	0.0	-2.082	0.0
4.600	27 (1)	0.141	-12.389	3.428	4.600	27 111	0.01	-2.108	0.863
5.900	(3)	0.141	-8.372	: 3.428	5.900	(1)	0.01	-1-149	0.963
5.900	28 (1)	0.072	-8.819	7.609	5.900	28 (1)	0.003	-1.171	0.439
7.100	(a)	0.072	-0.015	7.609	7.100	(a)	0.003	-0.541E-01	0.489
				· .		nneutrinie (* 1777)			
NAME. OL . Č I	RDEXTT: CT3				MARK DE CI	(AOE#C.)			
STAYCE	ненвея	TORSION	HOHENT	SHEAR	DISTANCE	HERBER	TORSLON	Тизнсн	SHEAR
0.000	29 (1)	0.072	-0.015	-7.609	0.000	29 (1)	0.003	-0.541E-03	-0.487
1.400	ं (अ	0.072	-8.819	-7.609	1.400	431	0.003	-1-171	-0.489
1.400	30 (1)	0-1-1	-3.372	-3.428	1.400	30 (1)	0.01	-1.149	-0.863
Z =7 00	(1)	0.141	-12.389	-3.428	2.709	(1)	0.01	-2-108	-0.863
2.700	и п	0.0	-12-171	0.0	2.700	31 111	0.0	-5.062	0.0
4-500	(13)	0.0	-12-171	0.0	4.600	មេរ	0.0	-2.092	0.0
4.600	32 (1)	-0-141	-12.389	3.428	4.600	32 (1)	-0.01	-5.108	0.863
5.900	(1)	-0-141	-8.372	3.428	5.900	(3)	-0.01	-1-159	0.863
5.900	33 (11)	-0.072	-8.819	7.609	5.900	33 (1)	-0.003	-1+171	0.459
7.300	(1)	-0.072	-0.015	7.609	7.300	(년)	-0.003	-0.541E-03	0.439
ANE OF GI	10ER " C 4			Acceptance of the control of	NAME OF G	IRDER C 4			
	.,= ., .,		HOMENT	tuere	BOVATE 10	HEHBER	TORSTON	изнент	SHEAR
STANCE	HEHBER	1025104	HOMENT	SHEAR	0.000	34 (11)	0.004	-0.003	-0.245
0.000	34 ([]	0.105	-0.176	-3.812	*** ** **	(1)	0-904	-0.531	-0.245
1.400	[J]	0.105	-4,123	-3.812	1,400	35 (1)	0.054	-0.724	0.04
1.400	35 (1)	0.726	-4.945	4.728	2,700	(1)	0.054	-0.612	0.0
2.700	(4)	0.724	-0.119	0.0	2,700	36 (1)	0.0	-0-684	0.0
2.700	36 (1)	0.0	-0.119	0.0	4.600	(1)	0.0	-0+684	0.0
4,600	(J)	0.0			4,600	37 (1)	-0.054	-0.692	-0.04
4.500	. 37 (1)	~0.726	0.304	-4,728 -4,728	5.900		-0,054	-0.724	-0.04
5,980		~8.726	-4.945	3.812	5.900	30 (1)	-0,004	-0.531	0.245
5.900	34 (1)	-0.105	-4-123	3.812	7,300	(1)	-0.004	-0.003	0.245
7.300	141	-0.105	-9.17 ₉	3101£	1,344		*****		
						*			

•	1 2 1 3	•		1 - 1	CASE - 6	· (1 + 5 +	3 7 4 3		
NAME OF GIRDE	A 1 G 2				NAME OF GI	ROER ; G 2		· · · · · · · · · · · · · · · · · · ·	
DISTANCE	HEHBER	TORSTON	HOMENT	SHEAR	DISYANCE	HEMBER	TORSION	HOHENT	\$HE
0.000	4 (1)	0.653	0.325	49.641	0.000	4 (1)	0.691	0.753	76.0
3 ,0 50	***	0.653	726.796	377411			0.68)	1897666	57.
6.100	***	0.653	221.943	25.152	6.100	***	0-651	334.613	37+
8.100	: (i)	0.453	272.004	18.84	8.100	(11)	0.651	415.283	27.
# 1 00 · · · ·		0.0	2717313	14.013		5.444	0:0	413-168	23.
9.1.50	160	0.0	283:171	10.791	9.150	A 444	0.0	430-344	16.
12.200	000	0.0	306.544	-0.242	12.200	444	0.0	470-51	-0.
15 2 50	***	0.0	283.312		15,250	***	0.0	430.79	-18-
16.300	1,11	0.0	271.889	-14.012	16.300	(3)	0.0	414.986	-23.
16.300	6 ***	-0.653	271.435	-18.04	16.300	6 6**	-0.681	413.436	-27
[8*300	***************************************	-0.653	221.916	-257513	10.300		-0.681	334.718	-37.
21.350	***	-0:653	126.336	-37.867	21,350	***	-0.531	188.494	-58.
24.400	(1))	-0.653	0.893		24.400	(3)	-0.691	2+547	-76.
									
NAME OF GIRDE	R; G3				NAME OF GI	RDER; G)			
STANCE I	HEHBER	TORSION	HOHENT	SHEAR	DISTANCE	HEHBER	TOR STON	тизнент	SHE
-0.000		0.302	1715	49.544		- 4 		27.439	75.
3.050	***	~0.302	127.462	37.125	3,050	***	0.344	189.096	56.
6.100	***	.0.305	223,103	24.68	6.100	***	0.344	335.383	37.
8.100	(J)	0.302	273.376	18-315	8.100		0.334	416.819	27.
9.1.00		0:0	- 272.519	14.229"			a.o	415+728	. 22.
1 1 1 1	0 ***		77283.971	10.951	9.150	***	0.0	431.524	17
12.200	666	0.0	305.637	~0.286	12.200	•••	0.0	468.9	-0.
15.2.50		0.0	284.212	-11-501	15.250		. 0.0	431-844	-10.
			273.502		16.300		0.8	417.029	-22
16.300	[J]	0.0 -0.302	272.353	=14.229 =18.315	16.300	9 980	-0.344	415.532	-27.
16.300	9 ***			-25.106	18.300	***	-0.344	335.458	-37.
18.300	***	-0.302	223.16		21.350	***	-0.344	185.966	-57
21.350	* 450 ************************************	-0.302	127.364	-37.662	24,400	(1)	-0.344	3.722	-75
24.400	133	-0.302	5.109	-49.544	23,700			in neris Trace	
NAME OF GIRDE	R ; G 4		·		HARE DE GI	ROER ; G 4			
					DISTANCE	HEHBER	TORSTON	HONENT	5#1
	NEMBER	TORSION	HOHENT	SHEAR	DISTANCE	10 (1)	-0.344	1.929	75
	10 (1)	-0.302	1.541	49.544	0.000		-0.344	159+128	
3.050	: :: : : : : : : : : : : : : : : : : :	-0.302	127 :436	37.125	3,050	***		•	37.
6.1 00	***	-0.302	223.109	24.68	6.100		-0.344	335+375	
8.1.00	131	-0.302	273.326	18,315	6.100	(1)	-0.344	416-819	27
0 41 00	11 ***	0:0	315.925	14+229	8.100	. , 11 ***	0.0	415.211	55
9 - 1 50		0.0	284.058	10.421	9.150	***	0.0	431+414	17.
12.200	***	0.0	305.637	-0.286	12.200	***	0.0	468.8	0.
15 -2 50	***	0.0	284.3	-11,207	35.250		0.6	431,86	-16
16.300		0.0	273.502	-14-229	16.300	(1)	0.0	417.029	-55
16.300	12 000	0.302	272.755	-18.315	16.300	12 ***	0.344	415.022	-27
18-300	***	0.302	223.142	-25-106	18.300	. ***	¢.344	335,49	-37
21 .3 50	***	0.302	127.379	-37.662	21.350	***	0.355	108.947	-57
24.400	(4)	0.302	2.109	-49.544	24,400		0.344	3,722	-15
NAME OF GIRDE		Tajihadi yazare	nation that so		NAME OF GI	RDER ; G 5			
الشيفة وأوأراته			* 10 m 12 m		**		****		
ISTANCE	MENBER	104 2 TOH	HOHERT	SHEAR	DISTANCE	HEHBER	TOUSION	HOHENT	SHI
0.000	លយ	-0.653	0.339	49.641	0.000	(3 (11)	-0-esi	1,534	76
3.0 50		-0.653	126.395	37.411	3.050		-0.661	168.617	57
4-100	444	-0.653	221.943	25.152	6.100		-0.69 L	334,624	37
					6.100	(3)	-0.681	415.283	. 27
8.100	1441	-0.653	272.006	18.84	800	• • •	• • • • • • • • • • • • • • • • • • • •	,,,,,	
	14 +44	-0.653	272.006	14.012	8.100	14 400	0.0	413,958	23

				•				**	
15.300	400	0.0	306.344	~0.242	12.200	***	0.0	470-51	-0.555
15.250	***	0.0	283.312	-11.008	15,250	***	0.0	430.765	-la.598
16.300	(1)	0.0	271.859	-14.012	16.300	្រា	0.0	414.986	-23.021
16.300	[5 ***	0.053	271.449	-15.64	18:300	15 ***	0.681	414.267	-27.475
18.300	***	0.653	221.916	-25,513	18,300	***	0.691	334.683	-17,437
21.350	***	0.653	126.339	-374867	21,350		0.691	[A8.5]4	-58,407
24.400	(1)	0.653	0.893	-49.641	24,400	(1)	0.681	2.546	-70.014
	· .					auda i er i dere ari			
"" NAME OF GI	INDER TO CELE				NAME OF GI	RUER': 'C''1''			
DISTANCE	HEHBER	NOTEPOT	HOMENT	SHEAR	DISTANCE	HENBER	TOR 510N	THENCH	SHEAR
0.000	19 (1)	-0.105	-0.176	-3.812	0.000	19 (1)	-0.109	-0.179	-4.05B
1.400	(3)	-0.105	-4.124	-3.812	1.400	401	-0-109	-4.455	~4.058
1.400	20 (1)	-0.703	-4.928	5-204	1.400	20.11)	-0-758	-5.652	5.244
2.700	(J)	-0.703	-0.014	3.735	2.100	(4)	-0.758	-0.696	3,775
2.700	51 (1)	0.0	-0.426	1.074	2.700	21 (11	0.0	-1-11	1.074
9.600	131	0.0	-0.428	-1+073	4.600	(3)	0+0	-1-11	-1.013
4.600	22 (1)	0.703	-0.014	-3.735	4.600	22 (1)	0.758	-0.696	-3,775
5.900	111	0.703	-4.928	-5.204	5.900	(J)	0,758	-5.652	~5.244
5.900	23 (1)	0.105	-4.124	3.612	5.900	23-(1)	0.109	-4.655	4.054
7.300	(J)	0.105	-0+176	3.812	7.300	(4)	0.109	-0.179	4.056
NAME OF GI	NDER " . " C . 2					ROER : C 2	en en ener en en En en en en		
OF CT INCE	DEVER 1	T00 5 10H	HOMENT	SHEAR	DISTANCE	HEMBER	T04510H	тизком	SHEAR
DISTANCE	REHBER	TORSION			0,000		-0,075	-0.015	-8.097
0.000	24 (1)	-0.072	-0.015	-7.608		24,(11	-0.075	-9.988	-6.097
1.400		-0.072	~8.818	-7.608	1.400	(1)			'
1.400	25 (1)	-0.137	-8,397	-2.781	1,400	25 (8)	-0,148	-9.538	-3.644 -4.398
2.700	(1)	-0.137	-12.055	-3,535	2.700	(3)	-0.148	-14.163	
2.760	26 [1]	0.0	-11.848	0.551	2.700	26 111	0.0	-13.93	0.551
4 ,6 00	(11	0.0	-11.848	-0.551	4.600	(1)	0.0	-13.93	-0.551
4 * 6 00	27 (1)	0.137	-12-055	3,535	4.600	27 ([]	0.148	-14-163	4.397
5.900	111	0+137	-8.389	2.781	5.900	[3]	0.148	-9.538	3,643
5.900	28 (1)	0.072	-8.818	7.608	\$.900	28 (11	0.075	-9.988	8.097
7.300	11.33	0.072	-0.015	7.508	7.300	131	0.015	-0.015	8.033
**************************************	ROER ; C 3				NAME OF GI	ADER : C 3			
	· · · · · · · · · · · · · · · · · · ·					* , *			
DISTMCE	MEMBER	TORSION	HOKEHT	SHEAR	33KAT210	HEHBER	TORSIUN	HUHENT	SHEAR
0.000	29 111	0.072	-0.015	-7.608	0.000	59 [1]	0.075	20.015	-4.097
1.400	131	250.0	-8.818	-1.608	1.400	(3)	0.075	~9.98¢	-8-077
1.400	30 (1)	0-137	-8.389	-2.7B1	1.400	30 (11	0,148	-9.538	-3.644
2.700	(1)	0.137	-12.055	-3.535	2.700	(4)	0.149	-14+163	-4.398
2.700	31 (1)	0.0	-11-646	0.551	2:700	31 (11	0:0	13·63	0.551
4.600	[1]	0.0	-11.848	-0.551	6,600		0.0	-13.93	-0.551
4.600	32 (1)	-0.133	-12.055	3,535	4.500	35 (1)	-0-148	-14-163	4 . 397
5.900	[1]	-0.137	-8.389	2.781	5,900	<u> </u>	-0.148	-9,538	3.643
5.900	33 (1)	-0.072	-8.818	7.608	5,900	33 (11)	-0-075	-9.988	8.097
7.300	(3)	-0.072	-0.015	806.7	7,300	(1)	-0.075	-0.015	8.097
NAME OF GI	anso	· 		*	NAME OF GI	2060 + 6.4	The More to	ر تالمستقر،	
NAME OF GI						, C 4			
DISTANCE	MEMBER	TORSION	HOHENT	SHEAR	PISTANCE	HENBER	1085104	тизнен	SHEAR
0.000	35 (1)	0.105	-0.176	-3.612	0.000	34"(1)	0-109	-0-179	-4.058
1.400	(7)	0.105	-4.125	-3.812	1,400	(1)	0-109	-4.655	-4,058
1.400	35 (1)	0.703	~4.928	5.204	1.400	35 (1)	0.758	-5.652	5.244
2.700	(1)	0.703	-0.014	3.735	2,700	(1)	0.758	-0.696	3.775
2 .7 00	36 (1)	0.0	-0.426	1.074	2.700	10 (1)	0.0	-1-11	1.074
4.600	LJI	0.0	-0.426	~1.073	4.600	(0)	0.0	-1.11	-1.073
4.500	37 (1)	-0.703	-0.014	-3,735	4,500	37 (1)	-0.758	-0.696	-3.775
5.900	ເມາ	-0.703	-4.928	-5.204	5,900	(4)	-0-758	-5.652	-5.244
	36 (1)	-0.105	-4-124	3.612	5.900	38 (1)	-0.109	-4.655	4,058
5.700	20 (11	0.103				and the second second			
7.300	(1)	-0.105	-0,170	3.812	7.300	(3)	-0.109	-0,179	4,059

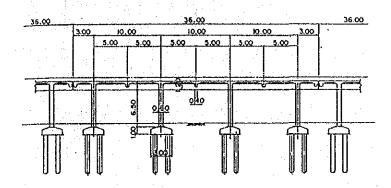
Appendix 1-4 KXAMPLE OF STRUCTURAL ANALYSIS (2)

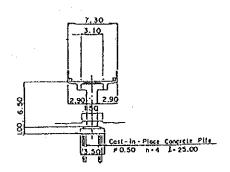
Reinforced Concrete Rigid Frame

(1) General View

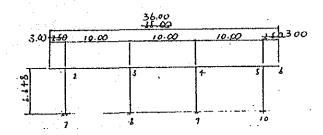
SIDE VIEW

CROSS SECTION



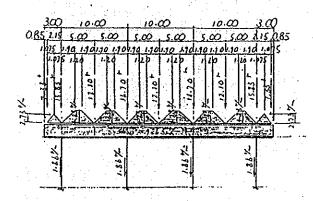


(2) Frame Diagram

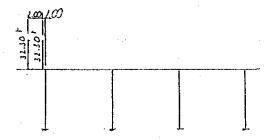


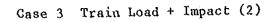
(3) Load Diagram

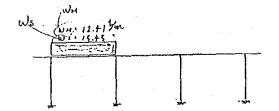
Case 1 Dead Load



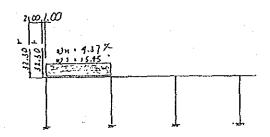
Case 2 Train Load + Impact (1)



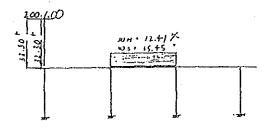




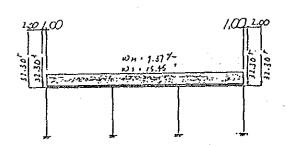
Case 5 Train Load + Impact (4)



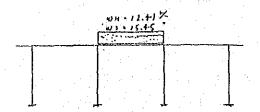
Case 7 Train Load + Impact (6)



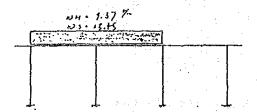
Case 9 Train Load + Impact (8)



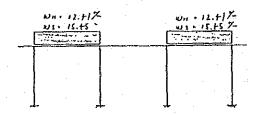
Case 4 Train Load + Impact (3)



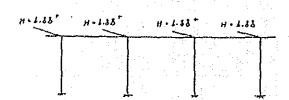
Case 6 Train Load + Impact (5)



Case 8 Train Load + Impact (7)



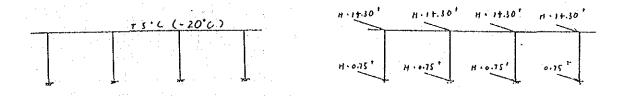
Case 10 Braking Load



Case 11 Temperature Change (+5°C)

Case 12 Temperature Change + Drying shrin.

Case 13 Effect of earthquake



(4) Load Combine

Case No	riquired over- design factor	load conhine	remarks
. 1			De
2		2	Tr+1 (1) 1111
3		3	" (2) T] TT
4		4	// (3) TITT
5		5	· (4) TTTT
6		6	~ (5) TTT
7		7	" (6) TTT
8		8	7 (7)
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14	1.000	1. + 2	D2+Tr+1
15		/ 1 3	"
16		1 + 4	"
17		1 + 5	*
/8	b	1 + 6	"
19	,	1 + 7	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
20	•	/ + 8	1,
21	"	1 + 9	"
22	1.15	1 + 9 + 10	Q+Tr+i+Br
23		1 . 9 - 10	
24	•	1 + 11	Det Te
25	,	1 + 12	"
26	1.50	1 + 13	Di+ E
27		1 - 13	"

(5) Analytical Data

•	LLYTICA IEHAER FORLE		а								
** C#16	l					OF CASE	2				HOVED
HEMBER	DISTANCE	нанент	\$4.2HZ	AXTAL	HONED	ЯЗВИЗР	0.000 OTZITYCE	743KDH 0.00	SHEAR -	0.0	YCYEKT
1 2	0.000	0.09 -23.56 -39.15	-0.00 -25.26 -31.36	0.00 0.00		1 2 9 1 + 2	2.200	-53.29	-31.30 -64.60 -54.60	0.0	
, нтх 5 Г . • 5	2.200 2.500 2.500	-49.01	-34.34 -34.34	0.00		H48	\$1500	-96.90	-94.90	0.0 2.60	
2 J	0.300 0.000	-59 - 83 -41 - 77	61.70 58.70	-2.44 -2.44 -2.44		244 3 	0.000 0.300 0.850	-54.59 -81.42 -15.60	10.58 10.58 10.58	2.60	
• 3	2.900 5.000	-11-12 - -68-70 - 90-87	-1.42	-2.44	,, ,	******	5.000 7.100	-53.91 -31.70 -9.48	10.58 10.58 10.58	5.60 5.60	
* 5 * 6 * 7	7.100 9.130 9.700	37.32 -73.13 -111.99	-39.30 -67.54 -13.64	-5.44 -5.44 -5.44			9.150 -9.700 10.000	12.21 18.02 21.20	10.58	\$**0 \$**0	
3 1 RAX	4.855	-134.54	~76.64	-2.44		X	0.0	15.99	10.54	2.60	
3 4	0.000	-131,77 -111,56 -76,71	64-17	-1.81 -1.81 -1.81	**	# 3###### * # 1 # 4# # 2 ##	0.300 - 0.850	14.35	-1.92 -1.92 -1.92	1.24	
+ 2 + 3 • 4	0.850 2.900 5.000	18.43	31.83	-1.01		* 5	2.900 5.000 1.100	10.44 6.42 2.40	-1.92	1.24	
• 5 • 6 • 7	7.100 9.150 9.700	18.43 -76.71 -111.46	-31.03 -60.07 -66.17	-1.01		- 6 6 7	9.150 9.700 10.000	-1.51 -2.59 -3.16	-1.92 -1.92	1.24 1.24 1.24	
HAE	10.000	-131.11 56.29	6.05	-1.61 -1.61		HAX 5>	0.0	15.99	~1.92 0.71	0.70	
4 9 9 1 9 2	0.000 0.300 0.850	-134.54 -111.99 -73.13	76.64 73.66 67.56	-2,44 -2,44		• 1		-4.59 -4.19 -2.73	0.71 0.71 0.71	0.10 0.10 0.10	
• 3 • 5	2.900 5.000	37.32 90.87 68.70	39,30 13,52 24,36	-2,44 -2,44 	•	5	5,000 7,100	-1.24 -0.25	0.71	0.70 0.70 0.70	
• 6	9.150	-11+12 -41,77 -59,83	-52.60 -58.70 -61.70	· · · - 2,44 · - 2,44 ·			10.000	2.32 2.32	0,71 0.71	0.70	4 14 1
HET 2 A	3.144	90.98	0.01 34.34	-2.44	•	NAX *	0.000	0.00	0.71	0.10	
5 6 0 1 1 2	0.000 0.300 0.650	-49.01 -39.15 -23.56	31.34 25.24	-0.00 -0.00 -0.00		• 1 • 2 • 5	0.300 0.350 2.500	0.00	-0.00 -0.00	-0.00	
44 E	2.500	0.00	34-34	-0.00		XAM:	0.000	0.00	-0.00	-0.00	
2 7 7 2 Max	0.000 4.648 9.0	10.52 -5.39 10.82	-2.44	-111.67 -124.24 -111.87		1 1 1 1	0.0	-12.31	2.60	-75.18 -15.19	
3 8 3 3	0.000 5.548 0.0	-2.17 1.39 -77.5-	6.63	-162.32 -114.84 -162.52	•	# 3 3 \$	0.000	5.21 -).79 5.21	-1.35 -1.35 -1.35	12.49	e.
4 4 9 4 HL1	600.0 824.4 0.0	2.11 -1.37 2.11	-0.63 -0.63	-162.52 -174.85 -162.52		4 9 7 4 HAK	0.000 6.648 6.648	-1.99 -1.99	-0.55 -0.55 -0.55	-2.63 -2.63	
5 LO LO 5	0.003 5.648 0.0	-10.82 5.39 -10.82	2.44	-111.87 -124.24 -111.87		5 10 10 5 HAX	0.000 6.648 6.648	2.32 -2.33 -2.33	-0.10 -9.10 -0.10	0.71	w ţ
			••••	••••						•	6 1. Y.
0 3451C M	EMBER FORCE 3	5				DD C25E	4				
Rže k 3K	OLSTANCE	HOMEN!	SHE 48	4xtaL	DEVOK THEMOK	HEHBER	324A1810	HONENT	SASAS	AXIAL	10346H
1 2	0.000	~0.00 G.Q0	0.00	-0.00		i 2 + 1	0.000	-0.00 U.00	0.00	0.07	* .
5 I MAX	2.200 2.500 2.500	0.00	0.00	-0.00 -0.00 -0.00		2 1 HAX	2.500 2.500 0.0	0.00	0.00	0.00	
2 1	0.000	-16-81	20.90 66.27	-3.65 -3.65		2)	0.000	3.50 1.75	-5.90 -5.90	0.11	
* 2	2.930	26.06 92.55 106.58	57.77 26.10 -6.35	-3.65 -3.65 -3.65	,	* 3	0.850 2.900 5.000	-1.43 -13.31 -25,49	-5.40	0.19	
• 5	5.000 7.100 9.150	65,89 -26.62	-39.79 -70,46	-3.65 -3.55		* 5 * 6	7,100	-37.65 -49,55	-5.60	0.79	
3 £ MAX	9,700 10,000 4,488	-60.31 -80.27 104.21	-35.96 -83.60 0.01	-3,68 -3,68 -3,68		3 5 WAX	9,700 10,000 10,000	-52,73 -54,47 -54,47	-5.10 -5.10	0-79 0-79 0-79	
3 4 # 1	0.000	-66.75 -64.31	5+13 8-13	-0.51 -0.51		3 4	0.000	-65.07 -47.02	77.25 72.61	-1.60 -1.60	
• ¿ • 3 • 5	0.850 2.900 5.000	-59.84 -43.18 -26.31	8.13 8.13 8.13	-0.51 -0.51 -0.51		• 3	2.900 5.000	-16.81 62.69 90.05	33.45	-1.60 -1.60	
* 5 * 6 * 7	7.100 9.150 9.700	7.63 -9.04	8.13 8.13 8.13	-0.51 -0.51 -0.51		* 5 * 6 * 7	9,700	62.69 -la.61 -47.02	-32.45 -64,12 -72.61	-1,60 -1,60 -1,60	•
43 MAX	0.00	14.54 -46.75	5.13	-0.51 -0.51		4~~ 3	10.000	-65.07 90.05	-77.25	-1.60)
4 5 + 1 + 2	0.000 0.300 3.850	13.60 13.13	-1-58 -1-58 -1-58	-0.61 -0.61 -0.61		4 5 * 1 • 2	0.000 0.300 0.850	-54.47 -52.73 -49.55	5.80 5.40 5.80	0.79	
ø 3 ø 4	2.900 5.000	9.02	-1.58 -1.58 -1.58	-0.61 -0.61 -0.61		+ 3 + 4 + 5	2.900	-37.65 -25.49 -13.31	3.80	0.79	
* 5 * 6 * 7	7.100 3.150 9.700	2.36 -0.86 -1.73	-1.55 -1.58	-0.61 -0.61		9 / 9 7 5 4	9.150	1.76	5.40	0.79	
5 4 HAX	0.00	11.69	-1.54 -1.58	-0.61		нех	0.000	-54.47	5.40	0.79	
5 b • 1 • 2	0.000 0.300 0.450	0.00 0.00 0.00	0.00	0.00 0.00		5 6 4 1 4 2	0.300	-0.00 -0.00 -0.00	0.00	0.00	
5 5	2.500	0,00	0.00	0.00		6 5 MAX	2.500	-0.00	0.00		
2 7 7 2 HAX	0.000 6.644 0.0	16.81 -7.63 16.81	-3.66 -3.66	-55.70 -55.70 -55.70		1 5 1 1	6.646 0.0	-3.50 1.75 -3.50	0.19 0.79 0.79	5,80 5,80 5,80	
3 0 3 3 HAX	0.000	-13.52 7.51 -13.52).lo 3.16 3.16	-76.53 -76.53 -76.53		5 6 E 8 XAK	0.00	10.60	-2,39 -2,39 -2,39	-67.85 -67.45 -67.45	
3 3 HAX 5 9 9 5	0.00	7.51 -13.52 0.94 0.21	3,16 3,16 -0,10 -0,10	-76.53 -76.53 9.71 9.71	· ·	. 4 3	6.648	~5. 30 10.69 -10.63 5. 30	-2,19 -2,19 2,19 2,19	-67.45 -67.45 -67.45	
3 3 HAX 5 9	0.0 0.0 0.00	7.51 -13.52 0.94	3.16	-76.53 -76.53	· · ·	8 3 XAX 4 9 2 4	0.0 0.0 0.00 0.648 0.0	-5. 10 10.60 -10.63	-2,39 -2,39 2,39	-67.45 -67.45	

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	* BASIC H	EHOER FORCS	\$		•							
	+o C125	•				CANON	** 5456	b				
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	1 - 2 0 1 0 2 2 - 1 H1X	1.650 2.200 2.500 2.500	0.00 -53.29 -77.52 -96.90 -96.90	-32.30 -37.30 -64.60 -64.60	0.0 0.0 0.0 0.0		1 2 + 1 + 2 2 1 HAX	1.550 2.200 2.500	-0.00 -0.00 -0.00	-0.00 -0.00 -0.00 -0.00	0.0	
	23 • 1 • 2 • 3 • 4 • 5 • 6	0.300 0.300 0.850 2.900 5.000	-91.23 -81.91 +53.93 13.96 48.73 40.27 -7.89 -27.51 -39.41	83,04 78,40 69,90 39,23 5,79 -26,66 -58,33 -66,83 -71,46 0.01	-0.18		2 3 • 1 • 2 • 3 • 4 • 5 • 6 • 7 7 2	7.100 9.150 9.100 10.000	-10.05 0.31 10.59 59.82 61.23 21.32 -57.51 -35.15 -101.74 65.72	60.08 63.45 54.95 23.28 -9.17 -41.61 *73.29 *81.78 -86.42	-2.18 -2.13 -2.13 -2.13 -2.15 -2.19 -2.19 -2.19	
	3 4 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	0.000 0.300 0.850 2.950 5.000 7.100 9.150 9.100	-34.41 -33.14 -30.82 -22.16 -13.30 -4.43 6.55 7.62	4,22 4,22 4,22 4,22 4,22 4,22 4,22 4,22	0.85 0.85 0.86 0.05 0.85 0.85		3 4 • 2 • 3 • 6 • 5 • 6 • 7 4 3 • 4A	0.850 2.900 5.000 7.100 9.150	-99.53 -84.06 -51.69 14.71 -40.51 -6.91 -20.35 -33.15	83, 19 13, 75 10, 26 34, 50 6, 14 -25, 31 -57, 98 -66, 56 -71, 11	-1.60 -1.60 -1.60 -1.60 -1.60 -1.60 -1.60	
• .	4 15 1	0.000	5.47 5.33	-0.43 -0.43	0.24 0.24 0.24 0.24 0.24		4 5 • 2 • 3 • 4 • 5 • 6 • 7 5 4	0.000 0.300 0.850 2.900 5.000 7.100 9.150 9.700	-30.66 -29.91 -28.15 -21.63 -14.94 -6.26 -1.71 0.02 0.97	3.13 3.14 3.16 3.18 3.18 3.18 3.18	0.13 0.13 0.13 0.13 0.13 0.13 0.13 0.13	
	5 6 0 1 0 2 6 5 Mix	0.000 0.100 0.850 2.500	0.00	0.00	-0.00 -0.00 -0.00 -0.00		5 6 * 1 • 2 6 5 ****	0.000	-0.00 -0.00 -0.00 -0.00 -0.00	0.00 0.00 0.00 0.00 0.00	0.02 0.00 0.00 0.00 0.00	
	4 5 5 5	0.000	0.38 -0.80 -0.80	-0.18	-117-24 -117-24 -117-25	•	\$\$ \$ xan	0.000 4.6.1 0.0	10.05 -4.44 10.05	-2.18 -2.18 -2.16	83.16- 84.16- 14.16-	
	5 3 HAX 6 9	0.000 6.646 0.0	-5.00 1.69 -5.00	1.04 1.04 1.04	-45.29 -45.29 -45.29	:	3 8 5 3 8 4 9	0.000 6.648 0.0 0.030 6.648	-2.20 1.68 -2.20 -7.30 4.21	0.58 0.58 0.58 1.73 1.73	-109.01 -109.01 -109.01 -43.93 -43.40	
	7 4 7 5	0.030	-1.13 2.35 6.65 -0.7)	-0.62 -0.62 -0.24	-0.48 -0.48		дах 5 10 10 5	0.00	-7.33 U.47 0.04	-0.13 -0.13	-43.10 3.11 3.13	
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	464368 1 3	DISTANCE	+0.00	5H_4R -32.30	3.0	THINGH	MeH4ER [2	0.000	17/3HCH 00.00	9,90	0.0	
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-	+ 7 3 2 ИАХ	0.300 0.650 2.900 5.000 7.100 9.150 9.700 10.000	-81,10 -79,65 -71,03 -62,23 -57,19 -47,14 -37,34 -34,71 -33,28 -81,10		3.39 3.39 3.39 3.39		2 3 * 1 3 2 4 3 5 6 6 7 7 2 HAX		-19-02 -2-19 25-19 25-19 -4-92 112-28 -4-91 -14-36 -47-19 -66-07 113-20	72.48 67.55 57.35 27.68 -4.77 -37.21 -63.98 -77.38 -82.02 n.01	-4,29 -4,29 -4,29 -4,29 -4,29 -4,29 -4,29 -4,29	
	7.0	0.000 0.300 0.850 2.900 5.000 7.100 9.150 9.700 10.000	-2.45 73.13 96.47	75.13 10.10 62.20 30.53 -1.92 -34.36 -65.03 -14.53 -79.17 0.01	-0.35 -0.36 -0.35	•	3 4 + 1 + 2 + 3 + 4 + 5 + 6 + 7 4 3 HAX	1.100 9.150 9.700	-52.22 -52.22 -52.22 -52.22 -52.22 -52.22 -52.22 -52.22 -52.22 -52.22	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	-1.02 -1.02 -1.02 -1.02 -1.02 -1.02 -1.02 -1.03 -1.02	
	4 5 • 1 • 2 • 4 • 5 • 6	0.000 0.303 0.850	-59.27 -57.12 -53.74 -60.39 -20.73 -13.05 0.28 3.85 5.61	8.51 6.51 6.51 6.51	1.49 1.49 1.49 1.49 1.49 1.49 1.49		• 5 • 6 • 1		-66.67 -47.19 -14.36 74.91 112.25 94.92 -25.19 -2.39 -19.02	67.02 77.38 65.88 37.21 4.77 -27.68 -57.35 -67.35 -12.48 0.00	-4.29 -4.29 -4.29 -4.29 -4.29 -4.29 -4.29 -4.29	
	5-+ 5 0 1 0 2	0.000 0.300 0.850 2.500	-0.00 -0.00 -0.00	-0.00 -0.00 -0.00 -0.00	-0.00 -0.00 -0.00 -0.00			0.000 0.300 0.850 2.500	0.00 0.00 0.00 0.00	0.0	-0.00 -0.00 -0.00 -0.00	
	2 7 7 2	0.00	-0.00 -15.30 6.70 -15.80	-0.00 3.39 3.39	-0.00 -69.38 -69.35		15 57 KAK	0.000 6.648 0.0	19.02	-4,29 -4,29 -4,29	457.29 -57.29 -51.25	
	3 A	0.000	[5.8] -9.09	-3.76 -3.76	-55.35 -55.35		8 8 6 8 XAN	0.000	-14.45 7.23 -14.45	3,26 3,26 3,26	-66.42 -66.42 -65.42	
	4 4	0.202 0.202	13.81 -4.96 3.33	-3.74 1.65 1.95	-33.35 -70.47 -70.47		4 9 9 4 HAX	0.000 6.548	14.45 -7.23 14.45	-3,26 -3,20 -3,26	-66.32 16.40 16.60	
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CASE **MEYAGER 1 2	0157AMCE 0.000 1.050 2.200 2.200 2.500 0.000 0.450 2.900 5.000 0.150 0.000 0.450 2.900 0.150 0.000 0.150 0.000 0.150 0.	MOMENT 0.00 0.00 0.00 0.00 0.00 0.04 0.15 0.5.65 0.23 0.23 0.23 0.23 0.23 0.23 0.23 0.23	-0.00 -0.00	-0.00 -0.00 -0.00 -0.00 -1.00	MONEO	TEMBER 1	0 STANCE 0.300 1.450 2.200 2.500 0.300 0.350 0.350 2.900 7.100 0.350 2.900 0.000 0.300 0.000	0.00 -	-2.00 -2.00 -3.61 -3.61 -3.61 -3.61 -3.61 -3.61 -3.61 -3.62 -3.67	0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0			
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*** CV2E--1-00* ** CASE** 13 SHEAR AXIAL MEMBER DISTANCE SHEAR 10- 2 0.000 0.00 1 1.010 -0.00 2 2.200 -0.00 2-1 2.500 -0.00 MAX 2.500 -0.00 2-- 3 0.000 44.65 -0.00 -0.00 -0.00 -0.00 0.000 0.100 0.350 2.900 5.000 7.100 9.150 4.700 -7.69 -7.69 -7.69 -7.69 -7.69 -7.69 -7.69 -7.69 -7.69 -7.69 44.65 42.40 36.28 22.92 7.19 -8.54 -23.90 -26.02 30.27 3-n 4 1 0 2 0 3 0 4 4 0 3 18.35 17.25 15.23 7.71 0.0 -7.71 -15.23 -17.25 -3.67 -3.67 -3.57 -3.57 -3.67 0.000 0.100 0.650 2.900 5.000 7.100 9.150 9.200 10.000 . -3.67 0.00

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3-- 4 25 0.2

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• 1 20 0.300 -159.18

• 2 20 0.550 -67.49

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• 5 20 7.100 103.63

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• 6 20 9.150 13.63

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OO SHEARING F. MAXIMUM			HOVED	HENSER CA DISTANCE		. <i>९५</i> ೯ ೩३	4X 1 4 E	ој уок Тијеси
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2 1 21 2.500	-35.53 -55.39	0.00		2 1 14 2.509	-10.12	-98.94 34-14	-1.52	
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0 7 27 94700 °	-40.98 -37.60 -62.81 -41.67 -75.61 -43.67	-1.21 -1.21 -1.21	•	4 7 14 9.700 4 7 14 9.700	-161-06	-140.70	-2.17 -2.17	. *
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+ 2 20 04850 + 3 20 24900	-87.49 136.42 112.23 76.51	-5.73 -6.73		0 2 26 0.450 	-32.82 30.58 55.79	40.03 21.20	-1.33 -1.33	N.
0 4 19 5.000 0 5 27 7.100 0 6 27 9.150	64.14 20.03 61.08 -11.14 18.10 -30.37	-0.75 -1.92 -1.92		+ 5 21 7.100 + 6 21 9.150	76+66	-58.69 -113.61	-1.78	
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** PICK UP TABLE ! !!				•			;i.	
HUNIXAN THENCH	HOMENT SHEAR	AXIAL	GSVOH TRAKOR	** MOHENT MINIMUM ***********************************	40XEXT	SHE 18	AXISE	15 VON
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	-62.81 -41.67 -35.61 -43.67			• 7 21 9.700 4 3 21 10.000		1.45 (-1.31	
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+ 5 20 7-100 + 6 21 9-150	163.63 -52.04 18.10 -30.37 0.42 -34.14	-6.73 -1.92 -1.92		• 5 26 7.100 • 6 22 9.150 • 7 22 9.700	-74.34	-104.27	-1.11 -1.10	
	-10.12 -36.14	-1.92		5 4 21 10,000	•	医复数静脉	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	ŧ.,
4	- 12.67 22.69	-0.00 -0.00 -0.00		5 6 21 0.0 • 1 21 0.300 • 2 21 0.350	-116.67	95.94	-0.00 -0.00 -0.00	
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5 6 27 0.0 • 1 27 0.300 • 2 27 0.850 6 5 21 2.500 2 7 27 0.0 7 2 26 6.648	-15.71 16.52 0.00 32.30 36.78 -10.46 28.03 7.61	-0.00 -79.58 -77.83		7-~ 2 27 6.648		• •		
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5 6 27 0.0 • 1 27 0.300 • 2 27 0.850 6 5 21 2.500 2 7 27 0.0 7 2 26 6.648 3 3 20 6.658 4 9 27 0.0 9 4 26 6.658 5 10 27 0.0	-15.71 16.32 0.00 32.30 36.78 -10.86 28.03 7.61 30.57 -9.41 33.58 10.25 34.20 -10.25 32.02 9.41	-0.400 -79.58 -77.83 -105.50 -117.14 -110.89		3 8 26 0.0 8 3 27 6.548	-34.25 -32.02 -30.37 -33.4d	10.25 -9.41 -10.25	-110.39 -114.04 -104.90	

Appendix 1-5 POWER SUPPLY SYSTEM OF EMELEC

1. Power supply system of EMELEC

Power supply network of the EMELEC in Guayaquil is shown in Appendix 1-1 "LINEAS DE TRANSMISION 69kV PLANO GENERAL", substation short-circuit capacities in Table A-1; and the capacities are enough for operation of the MRT.

Table A-1 SHORT-CIRCUIT CAPACITY OF EMELEC SUBSTATIONS

Substation	Minimum current [kA]	Minimum capacity [MVA]
Pascuales	3.99	477
Germania	3.82	457
Cridesa	3.13	374
Sauce	3.03	362
Alborada	2.59	310
Terminal Terrestre	2.26	270
Mapasingue	2.62	313
FISA	2.68	320
Ceibos	2.53	302

Source: Data supplied by EMELEC

2. Substation capacity & interval

Rectifier capacity and interval between the MRT substations are determined by train operation Condition, rolling stock performance, transportation demand and track condition; they are calculated as below.

1) Calculation conditions

(1) Route length : 14.7 km, 12 stations

(2) Operation speed : 30 km/h (scheduled)

80 km/h (maximum)

(3) Operation headway : 2.5 minutes

(4) Power consumption: 60 kwh/1000ton-km (traction)

30 kwh/car (HVAC & auxiliary)

(5) Train weight : 230 ton/train

2) Calculation

Interval of train operations is:

$$\frac{30 \text{ km/h}}{60/2.5} = 1.25 \text{ km}$$

Number of operated trains is:

14.7 km/1.25 km = 11.76 trains, one way

Number of both way train-kilometers per hour is: 11.76 trains X 2 ways X 30 km/h = 705.6 trains-km/h

. Required traction power is:

705.6 train-km/h X 230 tons/train X 60 kwh/1,000ton-km = 9,737 kwh

Required power for HVAC & auxiliary equipment is:

30 kwh/car X 5 cars X 11.76 trains X 2 ways = 3,528 kwh

Total power demand is: 9,737 kwh + 3,528 kwh = 13,265 kwh

Power demand per unit length is: 13,265/14.7 km = 902 kw/km

3) Rectifier Capacity & Coverage

MRT substations are required to supply power of 902 kw/km for train operations; if a substation provides 2000 kw rectifier, the substation is capable of power supply to cover about 2.2 km of both north bound and south bound tracks in one direction. Therefore, each end substation is provided with one set of 2000 kw rectifier, and the others with two sets; then, standard interval between substations is about 4 km.

Capacities of rectifiers are rated at 1000 kw, 1500kw, 2000 kw, 3000 kw, 4000 kw and so on; 2000 kw rectifier is generally adopted as a standard for an urban transportation system.

Feeding circuit length of 4 km is most appropriate to clear requirements of voltage drop and fault protection; if the interval is longer, the conductor size of the feeder will become unusually larger.

3. Catenary system

1) Types of catenary systems

Suitable catenary system is generally selected in consideration of train speed, current collection capacity, maintainability and economy. Systems are broadly classified in:

- a. direct suspension system,
- b. simple catenary system,
- c. stitched catenary system, and
- d. compound catenary system.

Table A-2 shows the features of each catenary system. The maximum speeds as shown are in case of one pantograph passing; The speed performance will lower when multipantograph passing, since the frequency of contact loss and the amount of uplift will increase due to the multiple vibration caused by successively passing pantographs.

2) Comparison of catenary systems

a. Direct suspension system

Direct suspension system is classified in two types; one directly supports the contact wire, and the other suspends the contact wire through short rods or wires to improve the system performance. This system can be adopted most economically for sections where the maximum train speed is 60 km/h (80 km/h for one pantograph passing).

Table A-2 CATENARY SYSTEMS

					
Maximum	speed (km/h)	80	120	150	200
	Wire tension (ton)		5	2	m
· (mm ²)	Contact	GT 110	GT 110	GT 110	GT 110
Standard wire type (mm2)	Catenary Auxiliary catenary	l uil	ní1	ni.1	Cu 100
Standar	Catenary	ni I	96 3¢	06 2¢	St 135
	Typical construction				
	Type	Direct suspension system	Simple catenary system	Stitched catenary system	Compound catenary system
		₽	7	m	4

Speed performance is based on one-pantograph passing

Galvanized steel wire St: Cu: GT:

Hard-drawn copper wire Hard drawn grooved contact wire

b. Simple catenary system

This system is generally used for sections where the maximum train speed is 120 km/h.

c. Stitched catenary system

Stitched wire is added to the simple catenary system to improve system performance.

d. Compound catenary system

This is another modification of the simple catenary system, in which auxiliary wire is provided to improve overall performance.

Both stitched and compound catenary systems have excellent speed performance; However, they require relatively high construction costs.

3) Selection of Catenary System

Simple catenary system will be employed since train speed is planned at 80 km/h.

Direct suspension system may be adopted in limited sections, e.g., low speed sections. However, the installation of two types of catenary systems on a short route of 14.7 km will make the following demerits, and the economical characteristic of direct suspension will be lost.

- a. Complication and variation of maintenance
- b. Variety of maintenance parts
- c. Complication of trolly wires and their suspension equipment at track transfer sections in the car depot.

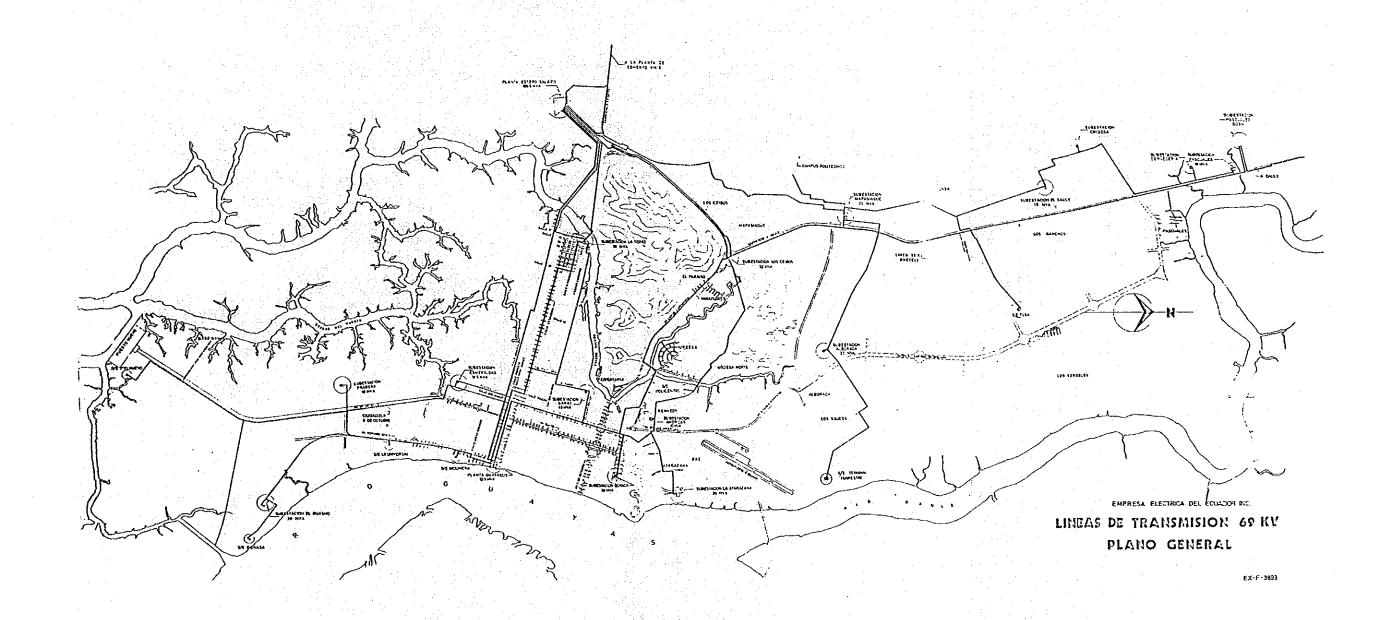
4. Calculation of fixed monthly charge of power supply

Electric power to the MRT system will be supplied from EMELEC: and its charge is shown in tariff as attached herewith.

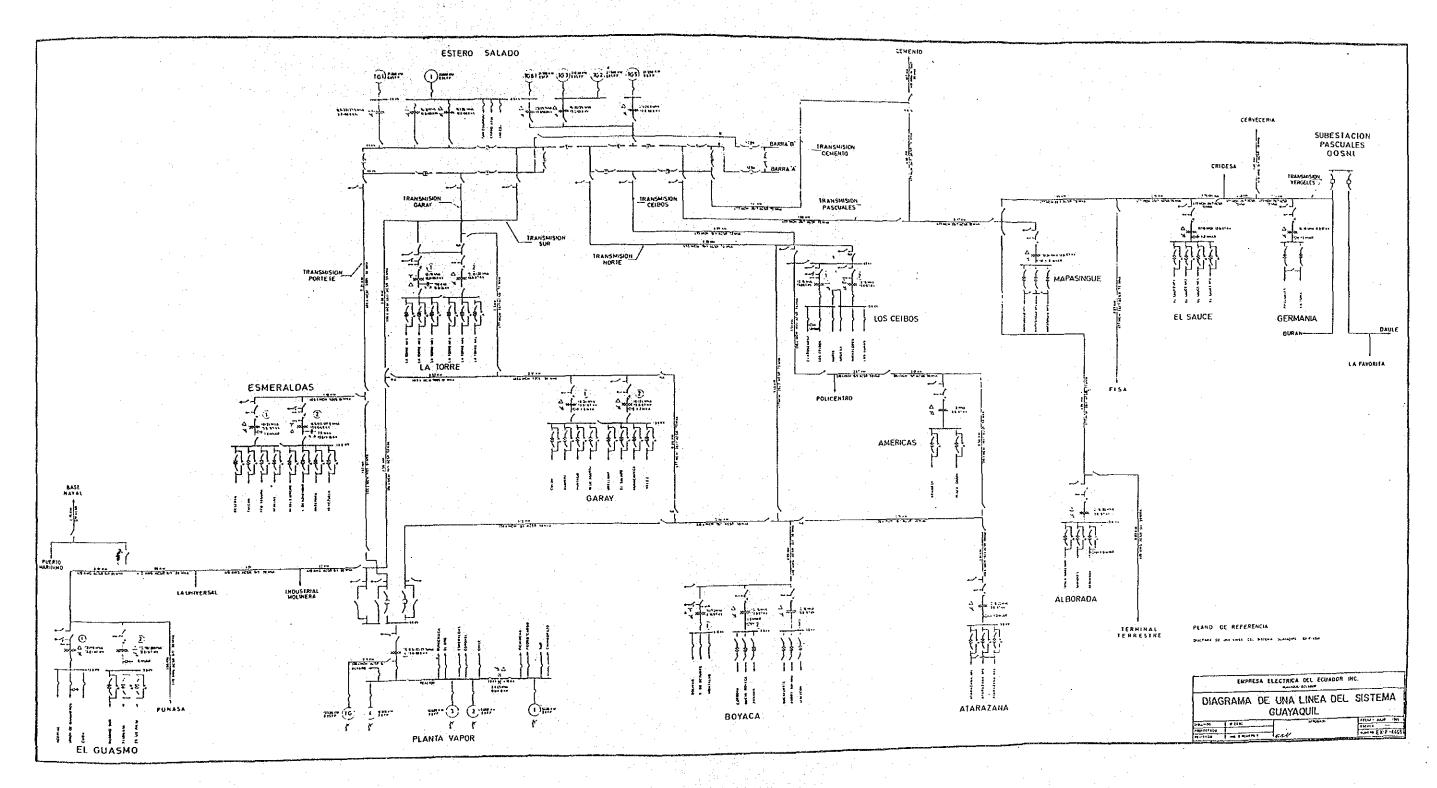
Management organization will be classified into official entities, this reason is described in our reports and Supplementary Vol 4 section entitled as Management Plan. Tarifa E-0 in the tariff, therefore, will be applicable; the fixed monthly charges at each case and year are calculated as shown in Table A-3. And rate of electricity per kwh is 3.5544 sucres.

table	-a Monti	ILY CHARGE OF	PUROLECT	
	<u> </u>	Number of	Payable	Fixed
Case description	Year	rectifiers	demand	charge
case description		[Sets]	[MM]	[8/.1000]
Basic Case	1990	5	24.4	1963
D4010 0403				
	1993	6	28.9	2325
	1996	6	28.9	2325
	2000-	8	37.9	3049
Case A-1,B-1,D-1	1990	3	15.2	1223
400 11 2,2 2,2	1993	6	28.9	2325
ase A-2	1990	3	15.2	1223
asc n z	1993	3	15,2	1223
ase C-1	1990	2	10.7	861
ase u t	1993	6	28.9	2325
		ž		
lase C-2	1990	2	10.7	861
1486 0-2	1993	3	15.2	1223
	1,,,,			
	1990			
ngo F F C	to	3	15.2	1223
ise E, F, G	1			
	2000			
			1.0	1000
ase E	2010	3	15.2	1223
se F, G	2010	4	19.7	1592

Appendix 1-6 GENERAL PLAN OF 69 KV TRANSMISSION LINE IN GUAYAQUIL



Appendix 1-7 DIAGRAM OF ELECTRIC POWER SUPPLY SYSTEM IN GUAYAQUIL



Appendix 1-8 MAJOR MACHINES, MECHANICAL FACILITIES & INSTRUMENTS

ı T'E M	Q'ty
Machinery	
Work Shop	
-(Carbody Shop)	
Underfloor equipment setting/removing machine 1 ton	1
Underfloor equipment setting/removing machine 1.5 ton	1
Arc welder	1
Carbody stand	24
Upright drilling machine	1
Double wheel grinder	1.
Surface plate	1
-(Bogie Shop)	
Double wheel grinder	1
Coil spring tester	1.
Bogie frame washer	1
Hydraulic press 10 ton	1
Magnaflux flaw detector	1
Arc welder	1
Bogie frame support stand	6 set
-(Wheel set Shop)	
Wheel axle lathe	1
Ultra-sonic flaw detector	1
Gear box flushing equipment	1
Wheel fitting press 200 ton	1
Jib crane 1.5 ton	2
Axle box fitting/removing equipment	2
-(Rotating machine shop)	
Parts washer	1.
Traction motor tester (no load test)	1
Rotating machine coil characteristic tester	1
Static inverter tester	1
Air compressor tester	1
Commutator lathe	1
Electric drying oven	1
Withstans voltage tester	1
Stand for traction motor frame and armature	10 set
Oil bath for bearing and pinion	1

	. *		*	
		en de la companya de La companya de la co		
				The Bull Hotel The Bull Hotel The Bull Hotel
	ITEM			Q'ty
-(Mechanical parts shop)	,			
Upright drilling machine				4
Double wheel grinder				3
Buffing machine				1
Magnalux flaw detector				1
Lathe center distance 1,000 mm				1
Universal milling machine	•			1
Circular shearing machine	•			1
		•		1
Pipe bender				
Pipe threader				
TIG welder				1
Shearing machine thickness 6 m				1
Folding machine thickness 6 m	an			1
Cutting disc grinder	1	•		
Oxyacetylene welder				1
Gas cutting machine				<u>.</u>
Universal tool grinder				. .
Band sawing machine				
Surface plate			· · · · · · · · · · · · · · · · · · ·	<u>.</u>
Parts washer		A Company		1
Air blow dust collector				1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Air brake valve tester				1
Bench drill	-			1
Air compressor for testing				1
-(Electrical parts shop)				
Double wheel grinder				1
Buffing machine				and a 1 or
Soft-blasting parts cleaner				1
Electric belt sander		•		. 1
Parts washer	* .			1
Electro pneumatic valve tester				
Jumper coupler tester				1
Battery charging dis-charging	tester		na di salah s Salah salah sa	• 1
Circut breaker tester				4 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
Withstand voltage tester				1
Public address tester				1

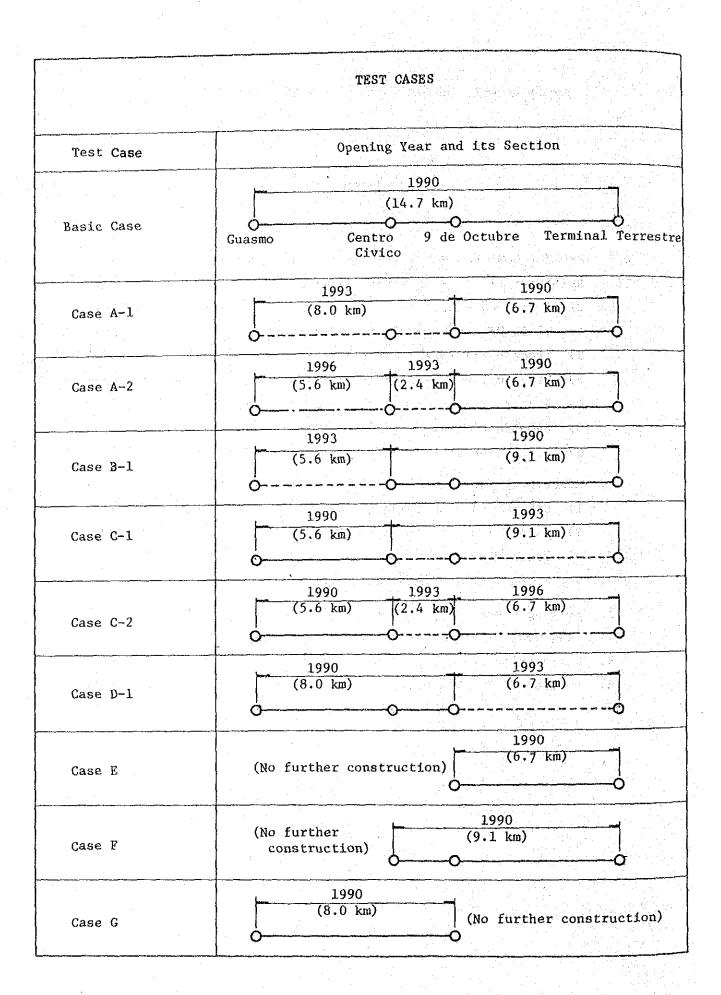
ITEM	Q¹ty
Speedmeter tester	1
Brake receiver tester	1
Line breaker tester	1
Low voltage large current generator	1
High voltage small current generator	1
Pantograph tester	1
Car Depot -(Inspection shed)	
Upright drilling machine	.1
Double head grinder	1
Parts air blowing cleaner	1
Air compressor	1
-(Temporary inspection shop)	
Lifting jack 40 ton	l set
Arc welder	1
Upright drilling machine	1
Parts air blasting booth	:1
-(Wheel tread re-profiling shed)	٠.
Under-floor type wheel tread reprofiling machine	1
- (Turnout & Electrical maintenance shop)	
Hydraulic press 100 ton	1
Metal band saw	1
Arc welder	2
Upright drilling machine	1
Double wheel grinder	1
Oxy-acetylene welder	1
Overhead travelling crane	
Overhead travelling crane for carbody shop 15/3 ton	2
for bogie shop 5 ton	2
for mechanical/electrical parts shop 1.5 ton	2
for mechanical/electrical parts shop 1 ton	.1
for temporary inspection shop 3 ton	1

:	ITEM		Q'ty
1 111 aguinmont	4 4		
Auxiliary equipment			1
Shunting locomotive			2
Motor car			5
Wagon	*		1
Fork lift 1 ton			1
Fork lift 1.5 ton			2
Battery car 1 ton platform			
Airconditioning Facilities			
Airconditioning facility f			4
,	or signal cabin		1
Utility service facilities			NE LA COLLEGE
Compressed air pipe line			1
Effluent treatment facilit	у	and the second of the second o	1
Diesel oil supply plant			<u> </u>
Measuring instrument			
DC volt meter			8
DC ammeter			9-1
Frequency indicator	: •		1
Power factor meter			
Current transformer for me	eter		. .2
Shunt	•		. 1
Wheatstone bridge			1.
Double bridge			· : 1:
Slide rheostat			2
Slide transformer			1.
Insulation resistance test	ter		1
Tachometer			1 4 1 1
Tester			
Surface thermometer			1
Diode curve tracer			1
Transister curve tracer			1
Synchroscope			2
Direct-wiring electromagne	etic oscillograp	h	1
Universal counter			1
Digital tester			1
Automatic voltage regulate	or		
Capacitance tester	•		1

T T B M	Q'ty
0scillator	1
Detector	- 1
Vibrometer	1
Outside micrometer	6
Straight metal rule	6
Vernier cariper	3
Tools	
Portable electric grinder	2
Air grinder	1
Impact wrench	10
Portable tool set	5
Tool set for tool tray	5
Electrician's tool set	15
Tools for fitter	2
Carpenter's tools	1.
Tools for cleaning personnel	5 month v
Tools and instrument for permanent way	1
Accessories	
Locker for machine tool	11
Locker for storage of tools	2
Locker for storage of small parts	5
Working bench	17.
Working bench with oil bath	1
Wood working bench	1
Electric bench	2
Tool tray	5
Moyable screen	2
	52

Appendix 1-9 DETAILS OF PROJECT COST ESTIMATION

	Appendix 1-9 DETAILS OF PROJECT COST ESTIMATION
	Landa en la companya de la companya de la contents de la companya de la companya de la companya de la companya La companya de la co
	PROJECT COST (SUMMARY) ····································
I.	DETAILS
II.	Civil Work (Summary)
1.	Civil Work (Summary)
<u> </u>	1) Civil Work (Summary) ························A-51
en eller var 185	2) Track
en de la companya de La companya de la co	3) Structure of Way
1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4) Station
	5) Depot and Maintenance Shop
	6) Miscellaneous ····································
	8 1 8 7 1 1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1
2.	at in the state of the transfer of the control of t
	1) Electrical Facilities (Summary)
	2) Substation
100	3) Power Distribution ·······················A-81
	40 Signalling & Telecommunication ···········A-84
3.	Rolling Stock ······A-92
4.	Land Cost
5.	Engineering Services
	Unit Cost of Civil Work ······A-97
6.	OBTE COSE OF OTATY HOTO



I. PROJECT COST (SUMMARY)

PROJECT COST (SUMMARY) (1) CASE: Basic Case-1

. [-	· · · · ·	-	1 2		Γ.				•	<u>.::()</u>							ريسيسم	,
Prices	Total	1,181	9,669	2,227	2,575	989	16,308	1,315	566	415	31	2,327	10,328	145	117	262	1,085	596	31,275
TOTAL	7.€	494	5,167	1,435	1,604	201	105,3	1,128	385	353	0	1,866	10,274	0	o	o	718	767	t1
Sucree in 1985 Prices? TOTAL	D.2	687	205.2	792	971-	455	7,407	187	181	52	31	197	¥ .	145	117	262	367	471.	9,022 22,253
Million	Total		*	1	- 65	•	9	•	ı.		-	1	2,295	•	1	-	•		2,363
2010	F.C 1	Ç.	•	•	4.2		4.2	•	1	1	1	1	2,283 2	t	1	•	•	2	2,327 2
	L.C	1 (4) 1 (4) 2 (4) 2 (4)			23		23	•	- 3		-	•	12 2	•		•		1	36 2
	Total 1			•			ť	118		17	•	136	383		1	•	•	0	519
2000	F.C. To		-		_		•	110	0	15	•	125	381	•	-	-		0	906
20			20 E	•	-	-	•	8	1	2	-	11	2	1	•	-	-	0	13
	1. L.C			•	82		82	ı		-	•	1	30	, i	1	-	1	4	91
	Total			•	94	ı	99	•	- No No	_	_	1	2 1,530	1	1		ı	2	0 1,616
1996	F.C	1111 1112 1112		: :			7.7				ı		1,522						1,570
	r.c				36		36			- 1 A			8	.1	*		-	7	977
	Total				1,002		1,002	53	-		1	59	(10)	ŧ				50	1,876
1993	F.C				6.78		678	55		-		55	761	•	-	-	_	34	1,528
	1.0	1	_		324		324	7	1.		•	- J	7	1	•		_	16	348
	Total	1,181	6,669	2,227	1,426	959	15,159	1,138	565	398	31	2,132	5,355	145	117	262	1,085	908	24,901
1990	ာ သ	484	5,167	1,435	838	201	8,135 15,159	963	385	338	0	1,686	5,327	0	0	0.	718	456	16,322
	r.c	687	4,502	792	588	455	7,024	175	180	09	31	944	28	145	117	262	367	4.52	8,579
	್ರ	(4.1)	(A.2)	(A.3)	(A.A)	(4.5)	3	(3.1)	(B.2)	(8.3)	(8.4)	(B)	<u>(</u>)	(0.1)	(p.2)	(a)	(E)	(E)	9
Year	Currency				Shop					Telecommunication (B.3)			cks)				ion)		
			Fay		ennace				utton	communi			tock ing sto	ion			vices spervies	, y	38 t
			Structure of Way		Depot A Maintenance Shop (A.4)	Miscel lancous	ta1	Substation	Power Distribution	w)t41	Rolling Stock	Land Acquisition	Compensation	ra1	ring Ser	Contingency	Project Cost
	Item	Track	Struct	Station	Depot	Miscel	Sub-total	Substa	Power	Signal	Others	Sub-total	Rolling Stock (Number of rolling stocks)	Land A		Sub-total	Engineering Services (Survey, Design, Supervision)	S	Pro
				Hork	I I A	10				71 [F CCC				,	Land		(Surv		

⁽Note) 1. L.C * Local Currency Portion F.C * Foreign Currency Portion.

A.3 incl. structure of way

A.4 incl. track, mechanical and electrical facilities

A.5 incl. road improvement, obstacles elimination, etc.

A.4 - costs for EMELEC and IETEL

4. F = 5% of (E(A.1 - A.4) + B.2) + 20% of (A.5 + D.2)

¹ US\$ - 120 Sucres - 210 Yens 2. Exchange Rate

^{5.} G = E (A~F)

^{6.} Opening year and operating kilometerage in 1990, 14.7 km

CASE: Case A-1

Prices)		Total	1,183	3,668	2,228	2,579	657	16,315	1,316	567	1 428	31	3 2,342	9 10,333 (135)	0 145	0 117	0 262	4 1,369	4 - 965	0 31,586
in 1985	TOTAL	л. Б.	767	5,166	1,436	1,607	202	8,905	1,128	386	364	0	1,878	10,279		0		768	767	9.136 22.450
Sucree i	į	r.c	689	4,502	792	972	455	7,410	188	181	79	31	797	54	145	117	262	475	471	
Million 8		Total		,	ı	65		65	1	. 1	•	-	1	2,295	1.7	•	•	-	3	2,363
Unit: M	2010	F.C	'	 -		7.7	ı	77	1	.1	1	L.	1	2,283	1,	1		Ĺ	2	2,327
5		r.c	1	•	ı	23	1	23	1	. f	1	1	•	12	1	2 1	1	1	1	36
	i	Total	· ·		ì	1	1	1	118		17	1	136	383	•	-	i.	t	0	519
	2000	F.C Te	1	, ·	1	,	1	,	110	0	15		125	381	ı		i	1	0	506
	2(ပ	1	1	1		1,	, ,	ω		2	1	Ħ	2	1	11	1	1	0	13
		.81	1	,	,	82	1	82	1	1	1	1	1	1,530 (20)	1 ;	1	1	•	7	1.616
	91	C Total		-	i	949	1	97	1	1	-		-	$\frac{1,522}{(2)}$		1	1		2	ļ.,
	1996	F.C	1	1	1	36	1	36	,	1	1	1	1	8 1,5	1	1	1	•	2	46 1.570
		11 L.C	610	87	38		917		497	290	187	e.	526	30	18	30	84	705	538	
		Total		5,787	5 1,239	1,057		9,109				0		(50)	0	0	0			15,207
	1993	F.C	248	3,221	836	715	49	5,087	424	197	158		779	3,810				463	274	10,413
₹		1.C	362	2,566	403	342	349	4,022	73	93	29	m	198	20	18	30	87	242	797	4,794 10
ב שפש		Total	573	3,881	989	1,375	241	7,059	701	276	224	28	1,229	2,295	127	87	214	799	420	11,881
	1990	F.C	246	1,945	600	804	135	3,730	594	189	191	0	974	2,283	0	0	0	431	216	7,634 11,881
Ś		r.c	327	1,936	389	571	106	3,329	107	87	33	28	255	12	127	87	214	233	204	4,247
	14	acy	(A.1)	(A.2)	(A.3)	(A.4)	(A.5)	(A)	(B.1)	(3.2)	(3.3)	(3.4)	(g)	(0)	(D.1)	(D. 2)	(a)	(宝)	(£)	(9)
	Year	Currency				Shop					ication			ocks)						- %
				Way		tenance	8			bution	Telecommunication			Stock ling sto	tion			rvices	.y	380
		Item	**	Structure of	ion:	Depot & Maintenance Shop	Miscellaneous	Sub-total	Substation	Power Distribution	ত	T.8	Sub-total	Rolling Stock (Number of rolling stocks)	Land Acquisition	Compensation	Sub-total	Engineering Services (Survey, Design, Supervision	Contingency	Project Cost
		."	Track	L	Station		Misc	-qns	ļJ	ابسا	Signal	Others	-qns	(Numbe	Land		Sub-	Engine	ŭ	Ā
	<u></u>) E.F	ון אי					lesi tesit			A-			Land	:	ins)		

3. A.3 incl. structure of say
A.4 incl. track, mechanical and electrical facilities
A.5 incl. road improvement, obstacles elimination, etc.
A.4 = costs for EMELEC and IEFEL

4. F = 5% of (E(A.1 ~ A.4) + B.2) + 20% of (A.5 + D.2).

1 US\$ = 120 Sucres = 210 Yens

2. Exchange Rate

(Note) 1. L.C = Local Currency Fortion F.C = Foreign Currency Portion

5. G = 2 (A~F)

6. Opening year and operating kilometerage

in 1990, 6-7 km in 1993, 14-7 km

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			-	

Prices)		Total	1,185	699,6	2,227	2,577	929	16,314	1,316	568	438	31	2,353	10,329	145	117	262	1,456	396	31,680
1985 Pr	TOTAL	F.C T	567	5,166	1,436	1,609	201	8,907	1,128	-386	372	0	1,886	10,275 10	0	0	0	945 1	495	22,508 31
Sucres in 1985	E	1.c	069	\$ 503.4	791	968	455	7,407 8	188	182	99	31	467 1	54 C	145	117	262	115	471	9,172 22
Million Su		Total I	_	5 –	•	65	-	65 7	1	t	1	•	<u>.</u> - I	2,295	l l	1	1	ŀ	m	2,363 9,
- 1	0.			-	•	77		7.7	1	1	1	ı	1			ŧ		1.	2	
(Unit:	2010	D-4	•		_	23	-	23	1	,	1	1		12 2,283 (30)		,	1	1	1	36 2,327
	•	L.C	25.5 26.5		-	0	_	-	8	1.	7	0			1				. 0	
		Total							118		7.1		136	383						519
	2000	F.C	-		-	0			011	0	51.		125	381	t	· ·			0	506
		L.C		-	-	0	-	_	8	1.	2	-	11	2	ì	ì	1	•	0	13
		Total	730	4,137	634	102	131	5,434	767	200	114	3	814	4,208	18	30	849	555	308	11,367
٠.	1996	E.C	175	2,297	398	63	20	2,953	424	138	96	0	658	4,186	0	O	0	360	158	8,315
		r.c	255	1,840	236	39	111	2,481	73	62	31	6	156	22	18	30	84	195	150	3,052
	 	Total	182	1,651	709	1,035	787	3,756	0	16	83	o	174	1,148	1	1	1	237	235	5,550
	1993	F.C 7	7.4	924	438	700	949	2,183	1	59	70	1	129	1,142	1	1	,	154	119	3,726
			108	727	166	335	238	1,574		32	13	-	45	9	ı	1	,	83	116	1,824
7		Total	573	3,881	686	1,375	241	7,059	701	276	224	78	1,229	2,295	127	87	214	664	420	11,881
מ שמשה	1990	F.C. T.	246	1,945 3	009	804 1	135	3,730 7	594	189	191	0	974 1	2,283 2	0	0	0	431	216	7,634 11
- 11000	19	-	327	1,936 1,	389	571	106	3,329 3,	101	87	33	28	255	12 2	127	87	214	233	204	4,247 7
5		r.c		-						2)	3)	4)	iri			2)	·			
	Year	Currency	(A.1)	(A.2)	(A.3)	(A.4)	(A.5)	(A)	(8.1)	(B.2)	Telecommunication (B.3)	(B.4)	(B)	(c)	(D.1)	(0.2)	(a)	(E)	(E)	(5)
		∂				ance Sho				ton	omanicat			ck z stocks)	ď			tes rvisíon)		
				e of Way		Mainten	neous	1	uo Co	stributi	Telecor		1	ing Stock rolling	uisitio	tion		g Servi n, Supe	Contingency	Project Cost
	.i	Item	Track	Structure of Way	Station	Depot & Maintenance Shop	Miscellaneous	Sub-total	Substation	Power Distribution	Signal &	Ochers	Sub-total	Rolling Stoc	Land Acquisition	Compensation	Sub-total	Engineering Services (Survey, Design, Supervision)	Conti	Proje
		-	н	L	l	[A	Ļ—	S	S	aəj	1111 1111 0	284	S	(Nu	13	Land	_ w	Eng (Survey		
. '													۸	43						

(Note) 1. L.C . Local Currency Portion F.C . Foreign Currency Portion

2. Exchange Rate

1 US\$ # 120 Sucres = 210 Yens

A.3 incl. structure of way A.4 incl. track, mechanical and electrical facilities A.5 incl. road improvement, obstacles elimination, etc. A.4 * costs for EMELEC and IETEL

4. E = 5% of $(\Sigma(A.1-A.4) + B.2) + 20\%$ of (A.5 + D.2)

5. G = T (A-F)

6. Opening year and operating kilometerage

in 1990, 6.7 km in 1993, 9.1 km in 1996, 14.7 km

PROJECT COST (SUMMARY) (4)

ices)		Total	1,182	8,668	2,227	2,580	199	16,318	1,316	266	427	31	2,340	10,328 (135)	145	117	262	1,358	796	31,573
Million Sucres in 1985 Prices)	TOTAL	J 3.	767	5,166	1,436	1,607	707	8,907	1,128	385	364	0	1,877	10,274	a.	0	0	887	495	22,440
ucres in		T.C	889	4,502	791	973	457	7,411	138	181	63	31	463	75	145	117	262	171	472	9,133
fillion S		Total	,	ı	I	65	1	65	-	•	ì	1		2,295	I,	1	1	*	3	2,363
(Unit: }	2010	D.4	Ť	•	. 1	7.7	-	7.7	-	-	-	1	1	2,283	1 J	1	,	1	2	2,327
)		1.0	1	t	1	23	1	23	ı	-	†	1	ı	12	_	1	1	•	1	36
		Total	1	-	ì	1	1	,	118	+4	17	0	136	383	ı	*	i i	ı	5	519
	2000	P.C	ı	1	1	1	!	1	110	0	15	1	125	381	1.	•		ŧ	0	206
		L.C	•	1		1	,	;	8	1	2	•	11	2	1	-	. 1	1	0	13
		Total		l	-	82	i	82	1	t	1	1		1,530	-	1	1	ı	4	1,616
	1996	5. G	1	1	- 1	97		947	,	ì	1	,		1,522	1	•	١	•	2	1,570
		I.C	ı	ı	1	36	•	38		1	1	1	1	8	1	1	•	1	2	97
		Total	430	4,137	634	1,032	131	6,364	497	200	120	6	820	3,060	18	33	4.8	555	354	11,201
i	1993	F.C	175	2,297	398	697	22	3,587	424	138	102	0	799	3,044	O	0	0	360	189	7,844
İ		L.C	255	1,840	236	335	111	2,777	73	29	18	60	156	16	18	8	877	195	165	3,357
B-1		Total	752	5,531	1,593	1,401	530	9,807	701	365	290	28	1,384	3,060	127	87	214	803	909	15,874
. Case	1990	ъ.с	319	2,869	1,038	822	184	5,232	294	247	247	0	1,088	3,044	0	0	0	527	302	10,193
CASE:		I.C	627	2,662	555	579	346	4,575	107	118	43	28	209	19	127	87	214	276	304	5,681
	Sr.	ency	(4.1)	(A.2)	(4.3)	(A.4)	(A.5)	3	(3.1)	(3.2)	a (B.3)	(3.4)	æ	9	(9.1)	(D.2)	(a)	Ê	(£)	6)
	Year	Item	Track	Structure of Way	Station	Depot & Maintenance Shop	Miscellaneous	Sub-total	Substation	Power Distribution	Signal & Telecommonication (B.3)	Others	Sub-total	Rolling Stock (Number of rolling Stocks)	Land Acquisition	1 Compensation	Sub-total	Engineering Services (Survey Design Survey		Project Cost
	_			<u>د</u>	Hor	1343	G			is 89	isit isit	Riec	Δ.	-44		Land		, v		

4. F = 52 of (I(A.1-A.4) + B.2) + 20% of (A.5 + B.2)

5. G = \(\mathbb{Z}(\hat{A} - \bar{E})\)

6. Opening year and operating kilometerage in 1990, 9.1 km in 1993, 14.7 km

3. A.3 incl. structure of way
A.4 incl. track, mechanical and electrical facilities
A.5 incl. road improvement, obstacles elimination, etc.
A.4 m costs for IMELEC and IETEL

1 US\$ - 120 Sucres - 210 Yens

2. Exchange Rate

(Note) 1. L.C = Local Gurrency Portion F.C = Foreign Gurrency Portion

PROJECT COST (SUMMARY) (5)

CASE: Case C-1

res in 1985 Prices)		C F.C Total	689 494 1,183	4,502 5,166 9,668	792 1,435 2,227	972 - 1,607 - 2,579	455 202 657	7,410 8,904 16,314	187 1,127 1,314	995 58É 181	63 364 427	31 0 31	462 1,876 2,338	54 10,274 10,328 (135)	313 0 313	17 0 1,117	30 0 1,430	471 887 1,358	671 494 1,165	98 22.435 32.933
Million Sucres		Total L.C	•	- 4,	1	65	•	65 7,4		1	<u> </u>	1	7	2,295 (30)		- 1,117	- 1,430	4	3	2.363 10.498
(Unit:	2010	F.C		,	1	7.7	•	77		•	1	-		2,283	i	,	1		2	2.327
:		Total L.C	1	,		- 23	1	- 23	118	1	17	1	136	383 I2 (5)	-	1		1	0	36
	2000	F.C To	-	1	•	•	1		110	0	15	1	125	381	•	1		1	0	308
		1 L.C	-	1		82 –	1	82 -	8	-	- 2	-	_ 11	30			1	1	0	6 13
	1996	F.C Total	***	t		97	•	97		•	1	-		1,522 1,530 (20)	•	1	1	1	2	1 570 1 616
		D*1		•		36	1	36	•	1	•	•	_	8	1	,	ı	- 1	2	1 97
		Total	3 696	4 5,505	4 1,331	5 1,057	9 512	101'6 5	13 710	7 346	3 219	0 22	1,297	6 4,590	0 89	0 87	0 176	7 803	2 566	3 16 533
	1993	ויכ וּציכ	413 283	2,651 2,854	782 844	342 715	333 179	4,226 4,875	107 603	109 237	36 183	22	274 1,023	24 4,566	68	87	176	276 527	284 282	5.260 11.27
+)		Total I	487	4,163 2	968	1,375	145	7,066 4	987	219	161	6	506	1,530 (20)	224	1,030	1,254	555	592	11.902 5
	1990	F.C	5 211	1 2,312	5 591	804	2 23	3,941	7[7	148	3 166	0 6	7 728	8 1,522	0	0	0	360	508	3 6.759
		r.c	1) 276	2) 1,851	3) 305	4) 571	5) 122	3,125	1) 72	2) 71	3): 25		177		1) 224	2) 1,030	1,254	195	384	5,143
	Year	Item	Track (A.1)	Structure of Way (A.2)	Station (A.3)	Depot & Maintenance Shop (A.4)	Miscellaneous (A.5)	Sub-total (A)	Substation (B.1)	Power Distribution (B.2)	Signal & Telecommunication (B.3)	Others (B.4)	Sub-total (B)	Rolling Stock (Number of rolling stocks) (C)	Land Acquisition (D.1)	Land Compensation (D.2)	Sub-total (D)	Engineering Services (Survey, Design, Supervision)	. Contingency (F)	Project Cost (G)

(Note) 1. I.C = Local Currency Portion F.C " Foreign Currency Portion

2. Exchange Rate

1 US\$ = 120 Sucres = 210 Yens

A.3 incl. structure of way
 A.4 incl. track, mechanical and electrical facilities
 A.5 incl. road improvement, obstacles elimination, etc.
 A.4 = costs for EMELEC and LETEL

4. F = 5% of ($\Sigma(A.1-A.4) + B.2) + 20%$ of (A.5 + D.2)

5. G . E (A~F)

6. Opening year and operating kilometerage in 1990, 5.6 km in 1993, 14.7 km

PROJECT COST (SUMMARY) (6)

CASE: Case C-2

rices)		Total	1,185	9,668	2,226	2,574	654	16,307	1,315	268	436	31	2,350	10,328 (135)	313	1,117	1,430	1,456	1,165	33,036
Million Sucres in 1985 Prices)	TOTAL	F, C	767	5,166	1,435	1,606	200	8,901	1,127	386	371	0	1,884	10,274	0	0	0	576	787	22,499
ucres in		r.c	169	4,502	161	896	454	7,405	138	182	65	31	997	54	313	1,117	1,430	511	671	2,363 10,537 22,499
(illion S	,	Total	1	1	1	65		65	1	1	-	ì	1	2,295	ì	1	1	-	3	2,363
(Unit: M	2010	F.C	ì	١	3	75	•	42		t	i		t	2,283	1	ı	ŧ	_	2	2,327
Š		L.C	1	1	-	23	-	23	1	t	-	1	1	12	ı	•	-	-		36
		Total	-	1	-	1	ı	i	118	T	17	0	136	383	1	1	-	t	0	519
	2002	F.C	1	1	.1	1	t	1	110	0	15	-	125	381	1	•	1	1	0	506
		I.C	•	1	-	ì	1	1	8	1	2	1	11	2	1	•	ı	•	0	13
		Total	517	3,863	726	124	227	5,457	169	257	145	20	919	4,590 (60)	68	87	176	564	337	12,143
	1996	F.C .	210	1,935	907	- 77	132	2,760	424	179	120	0	723	4,566	0	0	0	431	167	8,647
		r.c	307	1,928	320	47	95	2,697	73	78	25	20	961	24	96	87	176	233	170	3,496
		Total	181	1,642	709	1,010	282	3,719	214	16	83	2	390	1,530	ı	1	-	237	233	601,3
	1993	F.C	73	919	438	683	45	2,158	179	59	70	0	308	1,522	1	,	-	154	118	4,260
		0	108	723	166	327	237	1,561	35	32	13	2	82	8	1	-	1	83	115	1,849
7_7		Total	487	4,163	968	1,375	145	7,066	984	219	191	6	905	1,530	224	1,030	1,254	555	592	11,902
2-0 acec	1990	F.C	211	2,312	165	804	23	3,941	414	148	166	0	728	1,522	0	0	0	360	208	6,759
• 110		1.0	276	1,851	305	17.5	122	3,125	72	17	25	6	177	8	224	1,030	1,254	195	384	5,143
)	l-	ncy	(A.1)	(A.2)	(A.3)	(A.4)	(4.5)	€	(3.1)	(B.2)	(B.3)	(B.4)	(£)	(C)	(D.1)	(0.2)	(a)	(E)	(E)	(0)
	Year	Currency				e Shop					nication			tocks)		1		ion)		
				of Way		intenanc	ous.			ribution	Telecommunication (B.3)			g Stock olling st	sition	ac.		Services Supervision)	ency	Cost
		Item	Track	Structure	Station	Depot & Maintenance	Miscellaneous	Sub-total	Substation	Power Distribution	Signal & T	Others	Sub-total	Rolling Stock Number of rolling stocks)	Land Acquisition	Compensation	Sub-total	neering Design,	Contingency	Project Cost
			មី	اا	NO IK		لينا	Sr	is.	asi3	1110 1111 Si 111	└─ <u></u>	n'S	(Num	La	Lend	Su	Engir (Survey,		
													r.	A-4	6				1	

(Note) 1. L.C = Local Currency Portion F.C = Foreign Currency Portion

4. F = 5% of ($\Sigma(A.1-A.4) + B.2$) + 20% of (A.5 + D.2) (x 0.05)

5. G = 2 (A-F)

6. Opening year and operating kilometerage

A.3 incl. structure of way
A.4 incl. track, mechanical and electrical facilities
A.5 incl. road improvement, obstacles elimination, etc.
A.4 ~ costs for EVELEC and IEIEL

1 US\$ = 120 Sucres = 210 Yens

~

2. Exchange Rate

in 1993, 5.6 km in 1993, 8.0 km in 1996, 14.7 km

PROJECT COST (SUMMARY) (7)

KX) (7)
CASE: Case D-1

		·			P					· .										
	rrices)	Total	1,183	9,668	2,226	2,580	959	16,313	1,316	567	427	31	2,341	10,328 (135)	313	1,117	1,430	1,369	1,165	32,946
t. Q	Sucres in 1985 Frices)	F.C	787	5,166	1,435	1,607	202	8,904	1,128	386	364	0	1,878	10,274	0	o	0	894	787	22,444
c	Sucres	2.7	689	4,502	161	973	757	7,409	188	181	63	31	763	54	313	1,117	1,430	475	671	10,502
1	M1 L110n	Total	•	'	ı	65	1.2	65	,	-	1	1	t	2,295	1	1		-	٣	2,363
	2010	F.C	1	-	•	42	•	77	1	ì	1	-	1	2,283	1	1	1	1	2	2,327
		J. C	1	1	ı	23	1	23	1	1	1	-ji	-	12	. 1	1.	1	ı	Ħ	36
: ::		Total	1 "		T	1	!	1	118	1	17	Ö	136	383	 I	ı	1	1	0	519
: :	2000	7.C	1	1	1	1			110	0	15	,	125	381		 	'	1	0	506
		1.0	1:		1		1	i	8	H	2	,	11	2	1	<u>'</u>	 	1	0	13
		Total	1	į	1	82	1	82	!	<u> </u>	1	,	!	1,530 (20)	1	-	•	1	7	1,616
	1996	0	1	-	'	94	•	97	-	.,	,	-	-	1,522 1	<u>'</u>	1,	 -	1	2	1 075,
:		J.	.1		ı	36		36	1			1	1	88			1	-	2	7 7 7
		tal L	517	863	726	032	228	366	497	257	150	20	924	090	68	87	176	999	383	573
	1993	F.C To	210	1,935 3,	907	697 1,	133	3,381 6,	727	179	125	0	728	3,044 3,	0	0	0	431	198	7,782 11,
	19	-	307	1,928 1,	320	335	95	2,985 3,	73	78	25	20	196	16 3,	68	87	176	233	185	3,791 7,
r-l		al L.C	999	5,805 1,	1,500	1,401	428	9,800 2,	701	309	260	11	1,281	3,060	224	1,030	1,254	705	775	\vdash
Case D-1	Ş	C Total	787			822 1,4	7 69		504	207	224	0	1,025 1,	3,044 3,0	0	0 1,(0 1,	463	292	16,875
	1990	F.C	382 2	74 3,231	471 1,029	519 8	359	65 5,435	107	102 2	36 2	11	256 1,0	16 3,0	224	30	54	242 4	483 2	16 10,259
(7) CASE:		L.C	2+ \$1	2,574	i.			4,365							·	2) 1,030	1,254			6,616
. (XZ)	Year	Currency	(4.1)	(A.2)	(A.3)	(A.4)	(A.5)	(Y)	(3.1)	(B.2)	ion (B.	(B.4)	(B)	(c)	(D.1)	(0.2)	â	(国)	· (F)	(0)
PROJECT COST (SUMMARY)		Item	Track	Structure of Way	Station	Depot & Maintenance Shop	Miscellaneous	Sub-total	Substation	Power Distribution	Signal & Telecommunication (8.3)	Others	Sub-total	Rolling Stock (Number of rolling stocks)		Compensation	Sub-total	Engineering Services (Survey, Design, Supervision)	Contingency	Project Cost
P.R.				ĸ	Mor	1111	o .				1125	Ele	<u></u>			Land		(Surv		

(Note) 1. L.C * Local Currency Portion F.C * Foreign Currency Fortion

2. Exchange Rate

1 US\$ # 120 Sucres # 210 Yens

۳.

A.3 incl. structure of way
A.4 incl. track, mechanical and electrical facilities
A.5 incl. road improvement, obstacles elimination, etc.
A.4 " costs for EMELEC and IETEL

4. F = 5% of (E(A.1-A.4) + B.2) + 20% of (A.5 + D.2)

5. G = 2 (A - F)

6. Opening year and operating kilometerage

in 1990, 8.0 km in 1993, 14.7 km

PROJECT COST (SUMMARY) (8)

CASE: Case E

				1990			1993			1996			2000			2010		TOTAL	TOTAL	
	Item	, lcy	L.C	F.C	Total	r.c	F.C	Total	1.0	F.C	Total	7.C	F.C	Total	1.0	F.C	Total	2.0	7.C	Total
	Track	(A.1)	327	546	573	1	. I	1	1	1	1	1	1	1	1	1	t	327	246	573
	Structure of Way	(A.2)	1,936	1,945	3,881	1	1	j	1	-	-	١	ı	,	,	1	1	1,936	1,945	3,881
	Station	(A.3)	389	909	686	ı	1	1	-	-	-	1	1	-	1	ł	-	389	900	686
	Depot & Maintenance Shop	(A.4)	571	708	1,375	327	683	1,010	-	-	-	•	‡	-	1	1	ŧ	898	1,487	2,385
	Miscellaneous	(4.5)	106	135	241	1	1	•	1	1	•	1	ì	*	t	-	ŧ	106	135	241
	Sub-tots1	€	3,329	3,730	7,059	327	683	1,010	I	ı	1	1	1	1	1	1	1	3,656	4,413	8,069
, -	Substation	(B.1)	106	709	710	1	1	1	1	ı	-	,	ŧ	1	7	55	59	110	629	769
	Power Distribution	(8.2)	87	189	276	1	1	-	1	1	١	ì		_	1	-	O	87	189	276
3313	Signal & Telecommunication	(8.3)	33	197	230	-		•	i	-	-	ì.	_		l	-	0	33	197	230
	Отретз	(3.4)	28	0	28	1	1	,	3	,	1	•	_	•	1	ı	0	28	O	28
-	Sub-total	(3)	254	066	1,244	ı	1	ı	ı	1	1	•	1		47	55	59	258	1,045	1,303
	Rolling Stock (Number of rolling stocks)	9	12	2,283	2,295	3	381	383		ı	•		1	,	2	381	383 (5)	16	3,045	3,061
· ·		(0.1)	127	0	127	1	,			,	,	-	L	•	-			127	0	127
Land	Compensation	(0.2)	87	0	87	1	i		1	1	1	-	1	•	1	1		87	0	87
	Sub-total	â	214	0	214	•	2	1	-	1	7	•	-	1	-	,1		214	0	214
اختسن	Engineering Services (Survey, Design, Supervision)	(王)	233	431	799	,	*	-	7	,	-	-	1	1	1	_	•	233	431	799
	ency	(F)	204	216	420	16	34	S	•	•	-	,	1	'	'	ľ	•	220	250	470
	Project Cost	<u></u>	4,246	7,650	11,896	345	1,098	1,443	•	1	'	•	-	•	9	436	777	765.4	9,184	13,781

(Note) 1. L.C * Local Currency Fortion F.C * Foreign Currency Portion

1 US\$ = 120 Sucres = 210 Yens 2. Exchange Race

3. A.3 incl. structure of way
A.4 incl. track, mechanical and electrical facilities
A.5 incl. road improvement, obstacles elimination, etc.
A.4 m costs for EMELEC and IDTEL

4. F = 5% of (E(A.1 - A.4) + B.2) + 20% of (A.5 + D.2)

5. G = Σ(A~F)

6. Opening year and operating kilometerage in 1990, 6.7 km (no further construction of the sytem)

PROJECT COST (SUMMARY) (9)

CASE: Case F

			4 A													(Unit:	Million Sucres in 1985 Prices	Sucres	п 1985 1	rices)
,		ar.		1990			1993			1996			2000			2010			TOTAL	
	Item	ency	J.C	υ. Ψ	Total	r. c	F.C	Total	r.c	F.C.	Total	L.C	F.C	Total	r.c	F.C	Total	r.c	F.C	Total
	Track	(A.1)	433	319	752	1	ī	1	1	-	•	_	-	1	-	1	1	433	319	752
	Structure of Way	(A.2)	2,662	2,869	5,531	1	1	ı	1	3	1	1	ı	1	1	1	ŧ	2,662	2,869	5,531
	Station	(A.3)	555	1,038	1,593	1	1	•	ı	ì	1	1	ı	•	1	1 -	1	555	1,038	1,593
	Depot & Maintenance Shop	(A.4)	579	827	1,401	336	681	1,007	1	1	ŀ.	.1		1	1	15	22	912	1,518	2,430
	Miscellaneous	(A.5)	346	184	530	34	-	1)	1	1.	1	1	: 1		1	1	346	187	530
	Sub-total	(A)	4,575	5,232	9,807	326	681	1,007	1	\$	ı	1	1		7	1.5	22	4,908	5,928	10,836
	Substation	(B.1)	901	709	710	-	ł	ı	f	1	-	1	1	-	7	55	65	110	629	769
	Power Distribution	(B.2)	113	27.2	365	I I	1	1	1	t	-	1	1 ,:	1	ı	1	0	118	247	365
	Signal & Telecommunication (B.3)	(B.3)	43	250	293		í	. 1	ŧ	i	-	1	- <u> </u>	1	1	-	0	43	250	293
	Others	(8.4)	28	0	28	1	i	1	a .	1		1	•	1	ŀ	-	0	23	0	28
	Sub-total	(3)	295	101,1	1,396	i	1	1	.1	1	1	1		1	7	55	59	299	1,156	1,455
	Rolling Stock (Number of rolling stocks)	(0)	16	3,044	3,060 (40)	2	381	383	2	381	383	t	Ι.	-	10	1,903	1,913	30	5,709	5,739
-	Land Acquisition	(D.1)	127	0	127	•	1	ı	1	ŧ	1	1:	· ·	t	l l	1	1	127	0	127
	Compensation	(D.2)	87	0	87	-	1	1	1	-	1	1	1	1	1	1	•	87	0	87
	Sub-rotal	(a)	717	0	214	1	-	1	1	1	1 .	1	ţ	1	1	1	1	214	0	214
	Engineering Services (Survey, Design, Supervision)	(E)	276	527	803	ŧ	-		i	'	ı	1	·	ľ	1.	-	-	276	527	803
	Contingency	(E)	304	302	909	16	34	50	'	1	1	•	į	'	·	7	FI.	320	337	657
	Project Cost	(9)	5,680	5,680 10,206	15,886	344	1,096	1,440	7	381	383	1	l	1	77	1,974	1,995	6,047	13,657	19,704

4. F = 5% of $(\Sigma(A.1 - A.4) + B.2) + 20\%$ of (A.5 + D.2)

(Note) 1. L.C * Local Currency Portion F.C * Foreign Currency Portion

1 US\$ = 120 Sucres = 210 Yens

2. Exchange Rate

5. G = . E(A - F)

in 1990, 9.1 km (no further construction of the system) 6. Opening year and operating kilometerage

A.3 incl. structure of way
 A.4 incl. track, mechanical and electrical facilities
 A.5 incl. road improvement, obstacles elimination, etc.
 A.4 m costs for EMELEC and ISTEL

PROJECT COST (SUMMARY) (10)

CASE: Case G

	Ā			000,			0000			200.			0000				Militon Sucres in 1903 Frices	Duckes	7067 1	
Item	Curi	Currency	1.0	1930 F.C	Total	1.1	1995	Torel	1.0	F.C	Total	0,1	2000	1010	0 1	2010	Total	1	TOTAL	1000
Track		(A.1)	382	284	999	'		1	1			'	,				,	382	1,4	999
Structure of	Way	(A.2)	2,574	3,231	5,805		,	1			-	,	•	'	'	,		2,574	3,231	5,805
Station		(A.3)	471	1,029	1,500	,	,	,	,	'	-	,	,	1		1	1	727	1,029	1,500
Depot & Main	Depot & Maintenance Shop	(A.4)	579	802	1,401	317	799	186	:1	,	'	1	.1	•	6	17	26	905	1,503	2,408
Miscellaneous	8	(A5)	359	69	428	ı	-		1	'	-	1	,	3 -	,	ı	1	359	69	428
Sub-total		3	4,365	5,435	9,800	317	799	186	•	'	'	1	,	•	6	11	26	4,693	6,116	10,807
Substation		(3.1)	106	604	710	,		,	-	,	-		,	ł	4	55	59	110	659	769
Power Distribution	bution	(8.2)	102	207	309	•			ij	•	1	1	,	ł	1	1	0	102	207	309
Signal & Tel	& Telecommunication (8.3)	on (8.3)	36	225	261	,	'	,	1	•	1	ł	,	1	-	1	O	36	225	261
Others		(\$.4)	Ħ	0	11	1	,	1	1	,	-	1	. 1	,	ŧ	1	0	11	0	11
Sub-total		Ê	255	1,036	1,291	1		,	,	1	,	1	,	l	77	55	65	259	1,091	1,350
Rolling Stock	Rolling Stock (Number of rolling stocks)	9	16	3,044	3,060		ī	١	-	-	1	•	1	-	2	381	383	81	3,425	3,443 (45)
Land Acquisition	tion	(p.1)	224	0	224	ı	•	ì	1		ı	1		1	1	l	- 2012	224	0	224
Compensation		(5.0)	1,030	0	1,030	,	•	,	1	,	1	ŧ		1	-	1	•	1,030	0	1,030
Sub-total		ê	1,254	0	1,254	ŧ.	•	1	,	-	-	1	,	1	1	2 4		1,254	0	1,254
Engineering Services- (Survey, Design, Supervision)	rvices upervision)	(E)	242	763	705	1	-				-			-	-	ı		242	763	705
Contingency	cy	(F)	483	292	775	16	33	67	1	-	1	_	•		0	.	ī	667	326	825
Project Cost	ost	(3)	6,615	10,270	16,885	333	169	1,030	1	•	1			1	15	757	697	6,963	11,421	18,384
																		ļ		

4. F = 52 of (E(A.1-A.4) + B.2) + 202 of <math>(A.5 + D.2)

(Note) 1. L.C = Local Currency Fortion F.C = Foreign Currency Portion

1 US\$ = 120 Sucres = 210 Yens

2. Exchange Rate

5. G = 2 (A-F)

in 1990, 8.0 km (no further construction of the system) 6. Opening year and operating kilometerage

3. A.3 incl. structure of way A.4 incl. track, mechanical and electrical facilities A.5 incl. road improvement, obstacles elimination, etc. A.4 " costs for EMELEC and IETEL

DETAILS
 Civil Work
 Civil Work (Summary) (1)

															(Unit:	1,000 s	sucres)
8				1990			1993			1996			2010			TOTAL	
			L.C	D.	Total	r.c	F.C	Total	L.C	F.C	Total	2.1	F.C	Total	I.C	F,C	Total
	Track		687	494	1,181	-			-	.	1	ı	1		687	494	1,181
	Structure of Way	S OF Way	4,502	2,167	9,669	1.0	,			1.	-	ì	1	1	4,502	5,167	699'6
- - -	Station		792	1,435	2,227		•	1		1	1	•	1	1	792	1,435	2,227
Basic	Depot & Mainte-	Civil Electrical	797 797	215	679	256	184	640	21	20 20	4.2	1.9	23	42	760	442	1,202
Case		Mechanical	26	387	413	32	470	205	0	0	, 0	, 0	} . •	} .0	3 85	857	315
	3	Sub Total	588	838	1,426	324	678	1,002	36	46	82	23	42	. 65	971	1,604	2,575
	Miscellaneous	reous	455	201	656	ļ	1	1	1	Ţ		,	•	1	455	201	959
	Ħ	Total	7,024	8,135	15,159	324	879	1,002	36	46	82	23	42	65	7,407	106'8	16,308
	Track		327	246	573	362	248	610		ì	-	1	1	1	689	494	1,183
	Structure	e of Way	1,936	1,945	3,881	2,566	3,221	5,787	ı		•	,		ı	4,502	5,166	9,668
	Station		389	009	686	403	988	1,239	•	ţ	1.	1	1	ı	792	1,436	2,228
	Depot &	Civil	451	200	651	270	201	471	21	20	41	13	23	42	191	444	1,205
Case	Mainte-	Electrical	76	217	311	6.0	44	88	15	56	4	4	13	23	153	306	459
!	nance	Mechanical	26	387	413	32	470	502	0	. 0	0	0	0	O	58	857	915
:	4	Sub Total	175	804	1,375	342	71.5	1,057	36	46	82	23	42	65	972	1,607	2,579
	Miscellaneous	neous	106	135	241	349	. 69	416	í	-	3	_	•	1	455	202	657
	ŭ	Total	3,329	3,730	7,059	4,022	5,087	601'6	36	46	82	23	42	65	7,410	8,905	16,315
	Track		327	246	573	108	7.4	182	255	175	430	l	-	-	069	567	1,185
	Structure	e of Way	1,936	1,945	3,881	727	924	1,651	1,840	2,297	4,137	-	ı	_	4,503	5,166	699*6
	Station		389	600	989	166	438	604	236	398	634	-	1	ı	162	1,436	2,227
,	Depot &	Civil	451	200	651	265	194	459	22	28	20	13	23	42	757	445	1,202
Case A-2	Mainte- nance	Electrical Mechanical	94 26	217	311	32	36	74	17	35	525	40	61	23	153	307	460
,); }	Sub Total	571	804	1,375	335	700	1,035	39	63	102	23	42.	65	896	1,609	2,577
	Miscellaneous	neous	106	135	241	238	97	284	113	20	131	-	1	1	455	261	939
	F	Total	3,329	3,730	7,059	1,574	2,182	3,756	2,481	2,953	5,434	23	42	65	7,407	8,907	16,314
												4					

1) Civil Work (Summary) (2)

96 2010 Cunit. °C Total L.C F.C Total L.C °C Total L.C F.C Total L.C °C — — — 688 °C 41 19 23 42 752 °C 41 19 23 42 761 °C 41 4 19 23 153 °C 41 4 19 23 153 °C 42 65 7,411 °C 0 0 0 0 5,52 °C 41 4 19 23 153 °C 42 65 7,410 °C 23 42 65	1990 1993 19	Total L.C F.C Total L.C	0 752 255 175 430	2,869 5,531 1,840 2,297 4,137 -	1,038 1,593 236 398 634 -	207 664 265 194 459 21	228 324 38 33 71 15	387 413 32 470 502 Q	822 1,401 335 697 1,032 36	184 530 111 20 131 -	5,232 9,807 2,777 3,587 6,364 36	211 487 413 283 696 -	2,312 4,163 2,651 2,854 5,505 -	591 896 487 844 1,331 -	200 651 270 201 471 21	217 311 40 44 84 15	387 413 32 470 502 0	804 1,375 342 715 1,057 36	23 145 333 179 512 -	3,941 7,066 4,226 4,875 9,101 36	211 487 108 73 181 307	2,312 4,163 723 919 1,642 1,928 1	591 896 166 438 604 320	200 651 258 186 444 29	217 311 37 27 64 18	387 413 32 470 502 0	804 1,375 327 683 1,010 47	23 145 237 45 282 95	3,941 7,066 1,561 2,158 3,719 2,697 2
96 2010 Chri .C Total L.C F.C Total L.C - - - - 4 5 - - - - - 4 5 - - - - - 4 4 5 20 41 19 23 42 6 7 20 41 4 19 23 42 6 46 82 23 42 65 7 20 0 0 0 0 6 7 20 41 4 19 23 42 4 20 41 19 23 42 4 4 20 41 19 23 42 4 4 46 82 23 42 65 7 406 73 23 42 4 406	93	Total	430	4,137	634	459	77	502	1,032	131	6,364	969	5,505		471	84	502	1,057	512	101'6	181	1,642 1,	604	444	84	502	1,010	282	3,719
C F.C Total L. (Uni L. (Un	1996				1				8 9	-					<u> </u>							3						132	2
Total L.(Initial L.) Total L.) 42	2010	U			1				3 4	-						:													
	(Uni	-}	-	┼-	 	42	23		2	1	65. 7	_	1	-						65	•								65
	sucres)	Total	1,182	9,668	2,227	1,206	459	915	2,580	661	16,313	1,183	9,668	2,227	1,205	459	915	2,579	657	16,314	1,185	9,668	2,226	1,200	459	915	2,574	654	16,307

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N.
(Summary
Ñ
Civil Work
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Item		ŕ												TOTAL	
	0.1	C)	Total	r O	O Fe	Total	D.	D. ₩	Total	L.C	P.C	Total	r.c	F.C	Total
	382	284	999	307	210	1217	-	,			1	ı	689	494	1,183
of Way 2	2,574	3,231	5,805	1,928	1,935	3,863	1	1	1	ı	1	1	4,502	5,166	899'6
	17.1	1,029	1,500	320	406	726	!	1	1	1	1	1	791	1,435	2,226
Civil	457	207	664	265	194	459	21	20	41	19	23	42	762	717	1,206
Electrical	96	228	324	38	33	7	15	26	41	4	19	23	153	306	459
Mechanical	26	387	413	32	470	502	0	0	0	0	a	0	58	857	915
Sub Total	579	822	1,401	335	697	1,032	36	46	82	23	42	65	973	1,607	2,580
Miscellaneous	359	69	428	95	133	228	1	1	,	ì	1	ı	454	202	656
Total 4	4,365	5,435	9,800	2,985	3,381	6,366	36	46	82	23	42	65	7,409	8,904	16,316
	327	246	573	-	1	1	•	ı	1	1		1	327	246	573
of Way 1	1,936	1,945	3,881	ı	-	ı	1	1	1	•	1	Į	1,936	1,945	3,881
	389	600	686	1	•	1			1	1	,	ı	389	009	686
Civil	451	200	159	258	186	444	1		1	1	ı	1	709	386	1,095
Electrical	94	217	313	37	27	64	ı	ì	1	ı	1	ı	131	244	375
Mechanical	26	387	413	32	470	502		ı	r	1	1	١	58	857	915
Sub Total	571	804	1,375	327	683	1,010	_	_	-1	-	_	t	898	1,487	2,385
Miscellaneous	106	135	241	_	•	ì	1	1	ı	ı	-	ı	106	135	241
Total	3,329	3,730	7,059	327	683	1,010	ī	1	1	-	1	1	3,656	4,413	8,069
	433	319	752	-	1	ı	-	1	-		-	-	433	319	752
of Way	2,662	2,869	2,531	-	1	1	-	1	-	-	1	1	2,662	5,869	5,531
	555	1,038	1,593	1	1	•.	1	1	1	1	_	1	555	1,038	1,593
Civil	457	207	664	258	186	777	1	1	1	5	7	12	720	00\$	1,120
Electrical	96	228	324	36	25	ថ	1.	1	1	7	00	10	134	797	395
Mechanical	26	387	413	32	470	205	-	1	1	0	0	0	58	857	915
Sub Total	579	822	1,401	326	681	1,007	t	1	1	7	15	22	912	1,518	2,430
Miscellaneous	346	184	530	1	1	i	ľ	1	-	1	1:	-	346	184	530
Total '	4,575	5,232	9,807	326	189	1,007	!	1	ı	7	15	22	4,908	5,928	10,836

1) Civil Work (Summary) (4)

															10,141	Tree section	(00 177
	;			1990			1993			1996			2010			TOTAL	
S S S S	Toom		L.C	F.C	Total	T.C	F.C	Total	ī.Ċ	F.C	Total	r.c	F.C	Total	ប°ជ	D. 4	Total
	Track		382	284	999	1	-	1		1	ı	l '	,	1	382	284	999
	Structure of Way	f Way	2,574	3,231	5,805	-	1	-	1	J	1	1	_	-	2,574	3,231	5,805
Case	Station		471	1,029	1,500	1	_	1	1	1	ı	_	1	1	471	1,029	1,500
נ	Depot & Ci	Civil	457	207	664	251	178	429	ł	• 1	i	7	8	15	71.5	393	1,108
		Electrical	96	228	324	34	16	20	ı	ł	1	71	Ø	H	132	253	385
	nance Me	Mechanical	56	387	413	32	470	502	ı	ı	ı	0	0	0	58	857	915
- -		Sub Total	579	822	1,401	317	664	981	1	-		6	17	56	902	1,503	2,408
	Miscellaneous	sn	359	69	. 428	1	1	1	ı	-	•	1	1	ı	359	69	428
	Total	-	4,365	4,365 5,435	008,6	317	664	186	1	_	1	6	17	26	4,691	5,116	10,807

| Civil Rork: 2) Track (1)

					Lo	cal Curre	ncy Fortion			Foreig	n Currency	Portion		Grand
Applicable Case	[tem	Specification	Q'ty	Onit	Haterial	Labor	Equipment	Total	Haterial	Labor	Equipment	Transport & Insurance	Total	Total
	Double Track	50 kg/a	14.82	ke	92,180	360,126	161,390	613,969	249,865	0	35,568.	43,274	328,707	942,403
	Single track	40 kg/m	0.47	km.	1,358	3,835	1,894	7,087	2,585	0	390	390	3,365	10,452
354ic Caso	Turnout	sc 8 4	2	Set	810	3,620	2,830	7,260	20,640	0	100	3,100	23,840	31,100
in 1990	Sub-total				94,348	367,581	166,114	628,043	273,090	0	36,058	46,764	355,912	883,955
	Indirect Cost							59,037					137,754	196,791
	Total							687,087			1 .		1,493,666	1,180,746
	Double Track	50 kg/m	6.85	km.	42,607	166,455	74,597	283,659	115,491	0	16,440	20,002	151,933	435,592
	Single Track	40 kg/m	0.47	km.	1,358	3,835	1,894	7,087	2,585	. 0	390	390	3,365	10,452
Case A-1. In 1990	Turnout	sc 8#	2	Set	810	3,620	2,830	7,260	20,640	0	100	3,100	23,840	31,100
Case A-2 In 1990	Sub-total				44,775	173,910	79,321	298,006	138,716	0	16,930	23,492	179,138	477,144
Case E in 1990	Indirect Cost							28,629					66,800	95,429
	Total			:				326,635					245,938	572,573
	Double Track	50 kg/m	7.97	km.	49,573	193,673	86,793	330,039	134,374	0	19,128	23,272	176,774	506,813
Case A-1 in 1993	Turnout (relocation)	sc 8#	1	Set	90	905	270	1,265	0	0	0	0.	0	1,265
	Sub-total				49,663	194,578	87,063	331,304	134,374	0	19,128	23,271	176,774	508,078
	Indirect Cost							30,485					71,131	101,616
	Total		l	-	<u> </u>			361,789					247,905	609,694

1. (ivil Work: 2) Track (2)

	ſ				Lo	cal Curre	ncy Portion		1.	Forcig	n Currency	Portion		Grand
Applicable Çase	Iten	Specification	Q'ty	Unit	Haterial	Labor	Equipment	Total	Haterial	Labor	Equipment	Transport.& Insurance	Total	Total
	Double Track	50 kg/m	2.36	km	14,679	57,348	25,700	97,727	39,790	0	5,664	6,891	52,345	150,072
Case A-2	Turnout (relocation)	sc 8#	l.	Set	90	905	270	1,265	0	0	0	0	0	1,265
in 1993	Sub-total				14,769	58,253	25,970	98,992	39,790	0	5,664	6,891	52,345	151,337
	Indirect Cost							9,080					21,187	30,267
	Total			·.	<u> </u>			108,072		1	<u> </u>		73,532	181,604
	Double Track	50 kg/m	5.61	k m	34,894	136,323	61,093	232,310	94,585	0	13,464	16,381	124,430	356 ,740
Case A-2 (a 1996.	Turnout (relocation)	sc 8≢	1	Set	90	905	270	1,265	o	0	0	0	0	1,265
Case B-1 In 1993	Sub-total			-	34,984	137,228	61,363	233,575	94,585	0	13,464	16,381	124,430	358,003
		 	·		 		<u> </u>	21,480					50,121	71,601
	Indirect Cost		-		 			255,055					174,551	429,606
	Total	40.5	9,21	kn	57,286	223.803	100,297	381,386	155,281	0	22,104	26,893	204,278	585,664
	Double Track	50 kg/m	0.47	l	1,358	3,835	1,894	7,087	2,585	0	390	390	3,365	10,452
Case B-1 in 1990,	Single Track	40 kg/m	2	Set	810	3,620	2,830	7,260	20,640	0	100	3,100	23,840	31,100
Case F in 1990	Turnout	30. 01	+		59,454	231,258	105,021	395,733	178,506	0	22,594	30,383	231,483	627,216
	Sub-total	 		-	1,7,454	252,130		37,633	 -		1		87,810	125,443
	Indirect Cost	ļ	 	ļ	 				 	 	1		319,293	752,659
	Total	 					<u> </u>	433,366				1	319,293	132

1. Civil Work: 2) Track (3)

	1				L	cal Curre	ncy Portio	n .		toreig	n Currency	Portion	200	
Applicable Case	î ten	Specification	O, ch	Unit	Haterial	Todel	Equipment	Total	Katerial	Labor	Equipment	Transport & Insurance	Total	Grand Total
	Double Track	50 kg/m	5.72	km	35,578	138,996	62,291	236,865	96,439	0	13,728	16,702	126,869	363,734
	Single Track	40 kg/m	0.47	kta .	1,358	3,835	1,894	7,087	2,585	0	390	390	3,365	10,452
Case C-1 in 1990,	Turnout	SC 8#	2	Set	810	3,620	2,830	7,260	20,640	0	100	3,100	23,840	31,100
Case C-2 in 1990	Sub-total				37,746	146,451	67,015	251,212	119,664	0	14,218	20,192	154,074	405,286
	Indirect Cost							24,317					56,740	81,657
	Total					i - +		275,529			100		210,814	486,343
	Double Track	50 kg/m.	9.10	km	56,602	221,130	99,099	376,831	153,426	0	21,840	26,572	201,818	578,669
Case C-1	Turnout (relocation)	SC 8#	1	Şet	90	905	270	1,265	Ó	0	0	0	0	1,265
in 1993	Sub-total				56,692	222,035	99,369	378,096	153,426	0	21,840	26,572	201,838	579,934
	Indirect Cost				1 2			34,796					81,191	115,987
	Total							412,892					283,029	695,921
	Double Track	50 kg/m	2.35	ks	14,617	57,105	25,592	97,314	39,621	. 0	5,640	6,862	52,123	149,437
Case C-2	Turnout (relocation)	SC 8#	1	Set	90	905	270	1,265	0	0	0	0	0	1,765
in 1993	Sub-total				14,707	58,010	25,862	98,579	39,621	0	5,640	6,862	52,123	150,702
	Indirect Cost							9,042					21,098	30,140
ſ	Total							107,621					73,221	180,842

1. Civl Work; 2) Track (4)

Applicable	Item	Specification	0'1	Unit	Ĺ	ocal Curre	ncy Portion			Foreig	n Currency	Portion	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Grand
Case				0.110	Material	Labor	Equipment	Total	Material	Lebor	Equipment	Transport & Insurance	Total	Total
	Double Track	50 kg/m	6.75	km.	41,985	164,025	73,508	279,518	113,805	0	16,200	19,710	149,715	429,233
Case C-2 in 1996	Turnout (relocation)	SC 8#	1	Set	90	905	270	1,265	0	0	0	ing you	o (0	1,265
Case b-1 in 1993	Sub-total				42,075	164,930	73,778	280,783	113,805	0	16,200	19,710	149,715	430,498
Į	Indirect Cost					-		25,830					50,270	85,100
	Total				,			306,613					209,985	516,598
	Double Track	50 kg/m	8.07	kn	50,195	196,101	87,882	334,178	136,060	0	19,368	23,564	178,992	513,170
Case D-1	Single Track	40 kg/m	0.47	ka.	1,358	3,835	1,894	7,087	2,585	0	390	390	3,365	10,452
in 1990 Case G	Turnout	SC 8#	2	Set	810	3,670	2,830	7,260	20,640	0	100	3,100	23,840	31,100
in 1990	Sub-total				52,363	203,555	92,606	348,525	159,285	0	19,858	27,054	206,197	554,722
	Indirect Cost							33,283					77,661	110,944
	Total							381,808			·		283,858	665,666

1. Civil Nork: 3) Structure of May (1)

(Unit: 1,000 Sucres)

					Lo	cal Curre	ncy Portion	1	-	Foreig	n Currency	Portion		Grand
Applicable Case	Itom	Specification	Q'ty	Unit	Material	Labor	Equipment	Total	Haterial	Labor	Equipment	Transport & Insurance	Total	Total
	Ground		1,160		19,711	4,090	43,534	67,335	5,720	0	2,383	970	9,073	76,408
	Rigid A		302	ta :	30,502	13,348	40,951	94,801	6,765	∵o	14,315	1,117	22,197	106,998
	Rigid B		1,302	п	124,732	61,066	110,279	296,075	29,035	0	57,679	4,817	91,531	387,606
	Ctidet (N) Y		760	-	96,026	59,090	72,428	227,544	25,764	34,428	216,334	4,522	281,048	508,592
	Girder (W) B		9,250	m.	1,150,700	684,870	916,860	2,752,430	300,440	363,340	2,428,680	52,910	3,145,370	5,897,800
Rasic Case	Girder (W) C	1747	379	m .	44,737	27,087	38,533	110,357	11,927	13,367	93,905	2,100	121,299	231,656
In 1990	Girder (S) B	-	325	TO.	26,952	16,042	21,476	64,470	7,036	8,512	56,888	- 1,238	73,674	138,144
1.7	Girder (S) C		40	6	3,148	1,906	2,711	7,765	839	940	6,607	148	8,534	16,299
	Special A		120	*	21,004	10,800	25,158	36,962	3,328	4,264	40,708	586	48,886	105,848
	Special B	3 3 11 3	570	п.	115,482	56,191	179,254	350,927	16,046	20,252	197,904	2,822	237,025	581,951
	Sub-total		- 1 Pag		2,632,994	934,488	1,451,184	4,018,666	406,900	445,103	3,115,403	71,230		8,051,302
	Indirect Cost							483,438			-			1,611,460
	Total			<u> </u>			-	4,502,104					5,166,638	9,668,762
			1,160	 =	19,711	4,090	43,534	67,335	5,720	0	2,383	970	9,073	76,408
	Rigid A		302	n.	30,502	13,348	40,951	84,801	6,765	0	14,315	1,117	22,197	106,998
	Rigid B	e te de	1,302	a .	124,732	61,064	110,279	296,075	29,035	0	57,679	4,817	91,531	387,606
	Girder (W) A		147	pa .	18,573	11,429	14,009	44,011	4,983	6,659	41,844	875	54,361	98,372
Case A-1	Girder (W) B		2,975	15	370,090	220,269	294,882	885,241	96,628	116 858	781,116	17,017		1,896,860
in 1990 Case A-2	Girder (W) C		199	za i	23,490	14,223	20,232	57,945	6,263	7,019	49,306	1,102	63,690	1 .
in 1990	Girder (S) B		325	or ;:	26,952	16,042	21,476	64,470	7,036	8,512	56,888	1,238	73,674	138,145
Case B in 1990	Girder (S) C		40	•	3,148	1,906	. 2,711	7,765	839	940	6,607	148	8,534	16,299
*** *****	Special A		0	•			5 5 4							
	Special B		380	-	76,988	37,460	119,502	233,947	10,697	13,501	131,936	1,881	158,015	391,962
	Sub-total				694,186	379,831	667,576	1,741,599	167,966	153,489	1,142,074	29,165		3,234,287
	Indirect Cost				<u> </u>			194,057			<u> </u>		452,800	646,857
	Total			1				1,935,650					1,945,494	3,881,144

i. Civil Work: 3) Structure of Way (2)

					L.O	cal Curre	ncy Portion			foreig	n Currency	Portion		Grand
Applicable Case	Item	Specification	Q'ty	Unit	Katerial	Labor	Equipment	Total	Kateriai	Labor	Equipment	Transport & Insurance	lotal	Total
	Cround		0	-										
	Rigid A		0	-52							•	•		
	Rigid B		0											
	Girder (W) A		613	18	77,453	47,661	58,419	183,532	20,781	27,769	174,490	3,647	226,687	
	Girder (W) B		6,275	,	780,610	464,601	621,978	1,857,189	203,812	246,482	1,647,564	35,893	2,133,751	4,000,940
57 H.M.	Girder (W) C		180		21,247	12,865	18,301	52,413	5,665	6,349	44,599	997	57,610	110,023
Case A-1	Girder (S) B		0	29	0	0	0	0	: 0	0	0	0	0	0
in 1993	Cirder (S) C		. 0		0	0	O	0	0	.0	0	0	0	0
100	Spacial A		120	R	21 004	10,800	25,158	56,962	3,328	4,264	40,708	586	40,886	105,848
	Special B		190	12.	38 494	18,730	59,751	116,975	5,349	6,751	65,968	941	79,009	195,984
	Sub-total				938,808	554,657	783,607	2,277,071	238,935	291,615	1,973,329	42,064	2,545,943	
	Tedirect Cost	-						289,381				<u> </u>	675,222	964,603
	Total							2,566,452			<u> </u>		3,221,165	5,787,617
			0											
	Ground		٥	- a										
	Rigid A Rigid B	1	0											
	Cirder (W) A		293	"	37,021	22,781	27,923	87,725	9,933	13,273	83,402	1,743	108,351	196,076
	Cirder (W) B		1,600		199 040	118,464	158,592	476,096	51,968	62,848	420,096	9,152	544,064	1,020,160
100	Girder (W) C		145		17 116	10,363	14,742	42,221	4,563	5,114	35,927	803	46,407	88,628
Case A-2	Girder (S) B		0		1/,120	*,								
in 1993			0	2										
	Girder (S) C Special A		80] _ '	14,002	7,200	16,772	37,974	2,218	2,842	27,138	390	32,588	70,567
		2137. 219.	- 0		21,00								İ	
34.145.5	Special B Sub-total			<u> </u>	267, 179	158,808	218,029	644,016	68,682	84,077	566,563	12,088	731,410	1,375,426
						,		82,526					192,560	275,066
	Indizect Cost Total							726,542					923,970	1,650,512

Civil Work:		of Way (3)	Γ	Ĭ	to	cal Curre	ncy Portion			Foreig	n Currency			Grand
Applicable Case	1 tem	Specification	G, ch	Valt	Kateiral	Lebor	Equipment	Total	Material	Labor	Equipment	Transport & Insurance	Total	Total
Case A-2	Cround Rigid A Rigid B Girder (W) A Cirder (W) B Girder (W) C		0. 0 0 320 4,673 35	11. 12. 15. 19. 19.	40,432 581,570 4,131	24,880 346,137 2,501	30,496 463,386 3,558	95,808 1,391,093 10,191	151,844	14,496 183,634 1,234	91,088 1,227,468 8,672	1,904 26,741 194	118,336 1,589,687 11,202	
in 1996, Case 8-1 in 1993	Girder (S) B Girder (S) C Special A Special B Sub-total Indirect Cost		0 0 40 190	23 23 24	7,001 38,494 671,628	3,600 18,730 395,848	8,386 59,751 565,577	18,987 116,974 1,633,053 206,855 1,839,908	1,109 5,349 170,251	1,421 6,751 207,536	13,569 65,968 1,406,765	195 941 29,975	16,294 79,008 1,814,527 482,661 2,297,188	689
Case B-1 in 1990, Case F in 1990	Total Cround Rigid A Rigid B Cirder (W) A Cirder (W) B Cirder (W) C Cirder (S) B Cirder (S) C Special A Special B Sub-total Indirect Cost		1,160 302 1,302 440 4,575 344 325 40 80 380		19,711 30,502 124,732 55,594 569,130 40,606 26,952 3,148 14,002 76,988 961,365	4,090 13,348 61,064 34,210 338,733 24,586 16,042 1,906 7,200 37,460 538,639	43,534 40,951 110,279 41,932 453,474 34,974 21,476 2,711 16,772 119,502 885,605	67,335 84,801 296,075 131,736 1,361,337 100,166 64,470 7,765 37,974 233,950 2,385,609 276,583 2,662,192	6,765 29,035 14,916 148,596 10,826 7,036 339 2,218 10,697 236,648	0 0 0 19,932 179,706 12,133 8,512 940 2,842 13,501 237,566	2,383 14,315 57,679 125,246 1,201,212 85,233 56,888 6,607 27,138 131,936 1,708,637	970 1,117 4,817 2,618 26,169 1,906 1,238 148 390 1,881 41,254	9,073 22,197 91,531 162,712 1,555,683 110,098 73,674 8,534 32,588 158,015 2,224,105 645,360 2,869,465	2,917,0 210,1 138,1 16,4 70,1 391,0 4,609,

Applicable					i.c	cal Corre	ncy Portion	<i>y</i> .		Foreig	n Currency	Portion	1000	Grand
Case	î tem.	Specification	Q'ty	Unit	Material	Labor	Equipment	Total	Material	Labor	Equipment	Transport & Insurance	Total	Total
	Ground		0											
	Rigid A		0											i
	Rigid B											1 1		
	Cirder (M) Y		353	"	44,502	27,446	33,641	105,689	11,967	15,991	100,481	2,100	130,539	236,2
	Cirder (W) B	·	4,675	_	581,570	346,137	463,386	1,391,093	151 844	183,634	1,227,468	26,741	1,589,687	2,980,7
Case C-1	Girder (W) C		35		4,131	2,501	3,558	10,191	1,101	1,234	8,672	194	11,202	21,3
in 1990,	Girder (S) B		0		,	-,,,,,		,	-,,,,,,					
Case C~2 in 1990	Girder (5) C		ő	_	1)			
111 1770	Special A		40	rž.	7,001	3,600	8,386	18,987	1,109	1,421	13,569	195	16,294	35,2
	Special B		190	5	38,494	18.730	59,751	116,974	5,349	6,751	65,968	941	79,008	195,9
	Sub-total		<u> </u>	<u> </u>	675,798	418,414	568,722	1,642,934	71,370	209,031	1,416,158	30,171	1,826,730	3,469,
	Indirect Cost		-					208,180		4			485,753	693,9
	Total							1,851,114				- 11 1A 30	2,312,483	4,163,5
	Cround		1,160	a.	19,711	4,090	43,534	67,335	5,720	0	2,383	970	9,073	16,4
	Rigid A		302	DJ	30,502	13,348	40,951	84,801	6,765	.0	14,315	1,117	22,197	106,9
	Rigid B		1,302	52	124,732	61,064	110,279	296 075	29 035	0	57,679	4,817	91,531	361,6
	Girder (W) A	'	407	ů.	51,424	31,644	38,787	121,855	13,797	18,437	115,853	2,422	150,509	272,
	Girder (W) B		4,575	tu	569,130	338,733	453,474	1,361,337	148,596	179,706	1,201,212	26,169	1,555,683	2,917,0
Case C-1 in 1993	Girder (W) C		344	23.	40,606	24,586	34,974	100,166	10,826	12,133	85,233	1,906	110,097	210,2
111 1793	Girder (S) B		325	70	26,952	16,042	21,476	64 470	7,036	8,312	56,888	1,239	73,674	138,
	Girder (S) C		40	23	3,148	1,906	2,711	7,765	839	940	6,607	148	8,534	16,
	Special A		80	15	14,002	7,200	16,772	37,974	2,218	2,842	27,138	390	32,588	70,5
	Special B		380	30.	76,388	37,460	119,502	233,947	10,697	13,501	131,936	1,881	158,015	391,9
	Sub-total				957,195	536,073	882,460	2,375,728	235,529	236,071	1,699,244	41,058	2,211,902	
	Indirect Cost							275,258					642,268	917,5
	Total						[2,650,986	[2,854,170	5,505,1

1. Givil Work; 3) Structure of Way (5) (Unit: 1,000 Sucres)

344410	.		24.2		Lo	cal Curre	ncy Portion		. ,	Foreig	n Currency	Portion		Grand
Applicable Case	Item	Spacification	Q' ty	Vait	Material	Labor	Equipment	Total	Haterial	Labor	Equipment	Transport & Insurance	Total	Total
				[i							ļ !		, !
	Ground		0	. n	İ	1 1								
	Kraiq V			125								ļ		
1 To 1	Rigid B		0	.									104,284	188,716
	Girder (W) A		282	B :	35,631	21,926	26,875	84,432	9,560	12,775	80,271	1,678		
14.1	Girder (W) B		1,600		199,040	118,464	158,592	476,096	51,968	62,848	420,096	9,152		1,020,160
ا م	Girder (W) C		:145	. m.	17,116	10,363	14,742	42,221	4,563	5,114	35,927	803	46,407	88,628
Case C-2 in 1993	Girder (S) B		0	.= .					- 1					·
	Girder (S) C	**	0											
	Special A		80	*	14,002	7,200	16,772	37,974	2,218	2,842	27,138	390	32,588	70,562
	Special B		0						<u> </u>	·····				
	Sub-total		ļ		265,789	157,953	216,981	640,723	68,309	83,579	563,432	12,023		1,368,066
100	Indirect Cost		.	<u> </u>				82,084					191,529	273,613
17 W 4.	Total		<u> </u>	<u> </u>				722,807			ļ		918,872	1,641,679
	Ground		1,160	a a	19,711	4,090	43,534	67,335	5,720	0	2,383	970	9,073	76,408
	Rigid A		302	д.	30,502	13,348	40,951	84,801	6,765	0	14,315	1,117	22,197	106,998
: .	Rigid B		1,302	n .	124,732	61,064	110,279	296,075	29,035	0	57,679	4,817	91,531	387,606
1.0	Girder (W) A		125	163	15,793	9,719	11,913	37,425	4,238	5,663	35,580	744	46,225	83,650
	Girder (W) B		2,975] ₋ , ,	370,090	220,269	294,882	885,241	96,628	116,858	781,116	17,017	1,011,619	1,896,860
Case C-2	Girder (W) C		199	l Re	23,490	14,223	20,232	57,945	6,263	7,019	49,306	1,102	63,690	
in 1996.	Girder (S) B		325	<u></u> .	26,952	16,042	21,476	64,470	7,036	8,512	56,886	1,238	73,674	138,145
Case D-1 in 1993	Girder (S) C		40	n	3,148	1,906	2,711	7,765	839	940	6,607	148	8,534	16,299
- ** -	Spacial A	lage of the second	0	120	1 .					l				
	Special B		380	W.	76,988	37,460	119,502	233,947	10,697	13,501	131,936		158,015	391,962
	Sub-total		 	-	691,406	378,121	665,480	1,735,007	167,221	152,493	1,135,810	29,034		3,219,565
1.0	Indirect Cost		T .	1	1	T		193,174		<u></u>	L		450,739	·
	Total	 						1,928,181		L	<u>L</u>	<u> </u>	1,935,297	3,863,478

. Civil Work: 3) Structure of Way (6)	•		(Unit: 1,000 Sucres)

Applicable	٠.		1		L	cal Curre	ncy Portion	s 1 2		foreig	u Currency	Portion	1	Grand
Case	Item	Specification	Q, th	Unit	Material	Labor	Equipment	Total	Haterial	Labor	Equipment	Transport & Insurance	Total	Total
	dia dia dia dia dia dia dia dia dia dia		1	1	<u> </u>									
- 1	Ground		0	Trò .			· i			1	ļ	ļ		
2.77	Rigid A		0	23						-				
	Rigid B		; 0	- 79										
100	Girder (W) A		635	, a	80,232	49,371	60,516	190,119	21,527	28,766	180,753	3,778	234,824	424,94
	Girder (W) B		6,275		780,610	464,601	621,978	1,867,189	203,812	246,482	1,647,564	35,893	2,133,751	4,000,94
	Girder (W) C		180		21,247	12,865	18, 301	52,413	5,665	6,349	44,599	997	57,610	110,02
n 100A	Girder (S) B		0			0	a	0	0	0	0	lo	0	
ase C n 1990	Girder (S) C		. 0	_		0	0	0	0	۰	0	0	0	
			120		21,004	10,800	25,158	56,962	3,328	4,264	40,708	586	48,886	105,84
	Special A		i		1		59,751	116,975	5,349	6,751	65,968	ſ	79,009	195,98
	Special B		190	9	38,494	15,730							2,554,080	
34	Sub-sotal		·		941,587	556,367	785,704	2,283,658	239,681	292,612	1,979,592	42,193		
	Indirect Cost			Ī .				290,264					677,283	<u> </u>
	Total		1	1	1			2,573,922			1	1	3 231 363	5,805,2

1. Civil Work: 4) Station (1)

·			1	T	Le	cal Curre	ndy Portion	1		Foxels	a Currancy			Crapd
Appli- cable Case	Itea	Specification	Q'ty	Unit	Material	Labor	Equipment	Total	Material	Labor	Equipment	Transport & Insutance	Total	Total
	No. 12 st		1		41,989	29,971	45,265	117,225	30,698	251	4,423	5,417	40,789	158,014
	No. 11 st		1		25,960	19,040	25,670	70,670	11,740	0	1,290	2,070	15,100	85,770
	No. 1 st	* :	i	i i	30,160	22,090	31,400	83,650	13.910	0	1,860	2,280	T3,020	1.00,100
Basic	Hain St.	No. 5, 8, 10	3		65,538	35,534	67,974	167,046	396,873	9,561	12,783	70,035	489,252	656,298
Case in 1990	Standard		6		94,992	51,120	95,592	241,704	497,418	10,968	17,076	87,780	613,242	854,946
. '	Sub-total				258,639	157,755	265,901	680,295	949,639	20,780	37,432	167,582	1,175,433	1,855,728
i	Indirect Cost	15						111,344					259,802	371,146
٠.,	Total							791,639			12.6%		1,435,235	2,226,874
	No. 12 st		1		41,989	29,971	45,265	117,225	30,698	251	4,423	5,417	40,789	158,014
	No. 11 st		1		25,960	19,040	25,670	70,670	11,740	0	1,290	2,070	15,100	85,710
Case : A-l.in : 1990,	No. 1 st													
Case A-2 in	Hain St.	No. 8, 10	2		43,692	22,356	45,316	111,364	264,582	6,374		46,690	326,168	437,531
1990, Case E- in 1990	Standard		1		15,832	8,520	15,932	40,284	82,903	1,828	2,846	14,630	102,207	142,491
	Sub-total	ļ	<u> </u>		127,473	79,887	132,183	339,543	389,923	8,453	17,081	68,807	484,264	823,80
j. i	Indirect Cost			ļ			1 1 1	49,428					115,333	164,761
	Total	.	ļ		[388,971		L	<u> </u>	<u>L</u>	599,597	988,568

1. Civil Work: 4) Station (2)

Appli-		1	1	<u> </u>	L	ocal Curre	ncy Portion			Foreig	n Currency	Portion		Grand
cable Case	Item	Specification	Q'ty	Unit	Katerial	Labor	Equipment	Total	Ksterial	rodal	Equipment	Transport & Insurance	Total	Total
-	No. 12 st													
	No. 11 st	·												
	No. 1 st		1		30,160	22,090	31,400	83,650	12,910	0	1,860	2,280	17,050	100,700
Case A-1 in	Hain St.	180, 5	1		21,846	11,178	22,658	55,682	132,291	3,187	4,261	23, 345	163,084	218,766
1993	Standard		5		79,160	42,600	79,660	201,420	414,515	9,140	14,230	73,150	511,035	112,455
	Sub-total		. :		131,166	75,868	133,718	340,752	559,716	12,327	20,351	98,775	691,169	1,031,921
	Indirect Cost							61,915					144,469	266,384
	Total							402,667			J		635,638	1,238,305
- 11.	No. 12 st													
	No. 11 st													
	No. 1 st		İ		.						1 2.1			
Case A-2 fo 1993,	Main St.	No. 5 or 8	1	ļ	21,846	11,178	22,658	55,682	132,291	3,187	4,261	23,345	163,084	218,766
Case C-2 in	Standard		2		31,664	17,040	31,864	80,568	165,806	3,656	5,692	29,260	204,414	284,982
1993	Sub-total				53,510	28,218	54,522	136,250	298,097	6,843	9,953	52,065	367,498	503,748
i	Indirect Cost							30,225					10,525	100,750
:	Total							166,475					438,023	604,498

civil Workt 4) Station (3)

Appli-	Fig. 1. Berg.				Lo	cal Curre	ncy Portion			Foreig	n Currency	Portion		Grand
cable (ase	Item .	Specification	Q ¹ ty	Unit	Material	Labor	Equipment	Total	Nateriol	Labor	Equipment	Transport & Insurance	Total	Total
	No. 12 st							1 4						
	No. 11 st	*												
	No. 1 st		1		30,160	22,090	31,400	83,650	12,910	0	1,860	2,280	17,050	100,700
(ese 1-2 in 1996	Nain Sb.													
(ase	Standard		3		47,496	25,560	47,796	120,852	248,709	5,484	8,538	43,890	306,621	427,473
1993	Sub-total				77,656	47,650	79,196	204,502	261,619	5,484	10,398	46,170	323,671	528,173
	Indirect Cost							31,690					73,944	105,634
	Tótal							236,192					397,615	633,807
	No. 12 st		1.		41,989	29,971	45,265	117,225	30,698	. 251	4,423	5,417	40,789	158,014
	No. 11 st		1		25,960	19,040	25,670	70,670	11,740	0	1,290	2,070	15,190	85,770
	No. 1 st				1					·				
Case 3-1 in 1990	Main St.	No. 5, 8, 10	3		65,538	35,534	67,974	167,046	396,873	9,561	12,783	70,035	489,252	656,298
Case F In 1990	Standard		3		47,496	25,560	47,796	120,852	248,709	5,484	8,538	43,890	306,621	421,473
	Sub-total				180,983	110,105	186,705	475,793	688,020	15,296	27,034	121,412	851,762	1,327,555
	Indiract Cost				:			79,653				ļ	185,858	265,511
	Total							555,446			L		1,037,620	1,593,066

I. Civl Work: 4) Station (4)

Appli-		,			Lo	cal Curre	ncy Portion	ı	į.	· Foreign	Currency	Port ion		Grand
cable Case	Item	Specification	Q'ty	Vnit	Haterial	Labor	Equipment	Total	Material	Labor	Equipment	Transport & Insurance	Total	Total
	No. 12 st											4.		i
	No. 11 st		1		30,160	229,090	31,400	83,650	12,910	0	1,860	2,280	17,050	100,700
Case C-l in	Hain St.	NO. 5	1		21,846	11,178	22,658	55,682	132,291	3,187	4,261	23,345	163,084	218,766
1990. Case C-2 in	Standard		3		47,496	25,560	47,796	120,852	248,709	5,484	8,538	43,890	306,621	427,473
1990	Sub-total				99,502	58,828	101,854	260,184	393,910	8,671	14,659	69,515	486,755	746,939
	Indirect Cost							44,816					104,571	149,387
	Total	1214	,.					305,000					591,326	896,326
	No. 12 st		1		41,989	29,971	45,265	117,225	30,698	251	4,423	5,417	40,789	158,014
	No. 11 st		. 1		25,960	19,040	25,670	70,670	11,740	0	1,290	2,070	15,100	85,770
	Ro. 1 st								264,582	6,374	8,522	46,690	326,168	437,532
Case C-1 in 1993	Main St. Standard	No. 8, 10	3		43,692 47,496	22,356 25,560	45,316 47,796	111,364	248,709	5,484	8,538	43,890	306,621	427,473
	Sub-total				159,137	96,926	164,047	420,111	555,729	12,109	22,773	98,067	688,678	1,108,789
	Indirect Cost							66,527					155,230	221,758
	Total							486,638					843,908	1,330,547

1. Civil Work: 4) Station (5)

	<u></u>		<u> </u>	<u> </u>	Lo	cal Curre	ncy Portion		la e e ki y	Foreig	n Cutroncy	Portion		Crand
Appli- cable Case	ltem	Specification	Q'es	Unit	Haterial	Labor	Equipment	Total	Material	Labor	Equipment	Transport & Insurance	Total	Intal
	No. 12 at		1		41,989	29,971	45,265	117,223	30,698	251	4,423	5,417	40,789	158,01
	No, 11 st		1		25,950	19,040	25,610	70,670	11,740	Q	1,290	2,070	15,100	62,13
Case	No. 1 st								\$. **					
C-2 in 1996,	Main St.	No. 10	1	ļ	21,846	11,178	22,658	55,682	132,291	3,187	4,261	23,345	163,084	219,76
Cáse D-1 in 1993	Standard		1		15,832	8,520	15,932	40,284	82,903	1,828	2,846	14,630	102,207	142,49
1773	Sub-total				105,627	68,709	109,525	283,861	257,632	5,266	12,820	45,462	321,180	605,0
	Indirect Cost							36,302					84,706	121,0
	Total							320,163	12 × 12 × 4				405,886	726,0
	No. 12 st													
	No. 11 st				}.							teath of		
	No. 1 st		1		30,160	22,090	31,400	83,650	12,910	0	1,860	2,280	17,050	100,7
Case D-1 in	Main St.	No. 5, 8	2		43,692	22,356	45,316	111,364	264,582	6.374	8,522	46,690	326,168	437,5
1990, Case G	Standard		5		79,160	42,600	79,660	201,420	414,515	9,140	14,230	73,150	511,035	712.4
in 1990	Sub-cotal				153,012	87,046	156,376	396,434	692,007	15,514	24,612	122,120	854,253	1,250,6
	Indirect Cost							75,041		· .	· ·		175,096	250,1
	Total							471,475		•	4.		1,029,349	1,500,8

Civil Work: 5) Depot and Maintenance Shop: A. Civil Work (1)

Appli-					Lo	cal Curre	acy Portion			Foreig	n Currency	Portion		Grand
Case	I ten	Specification	Q'ty	Unit	Material	Labor	Equipment	Total	Katerial	Labor	Equipment	Transport & Insurance	Total	Tatal
	Site Clearance		94,000	27,	38,299	5,135	4,418	48,872	4,255	0	6,487	750	11,492	60,364
	Hain Office	RC 3F	3,240	ps 2	57,024	49,896	71,280	178,200	0	0	٥	. 0	0	178,200
	Main Store, Signal Cabin, Control room	RC 1F	1,560	д2	15,575	13,628	19,469	48,672	. 0	0		o	0	48,677
Basic Case .	Other building	SC 1F	3,720	₇₂ 2	23,152	: 20,258	28,940	72,350	36,325	0	6,415	7,308	50,048	122,398
in 1990	Track (Single)	40 kg/m	4.52	ķœ	13,063	36,883	18,216	68,162	24,860	0	3,752	3,752	32,364	100,520
	Turnout	6#	22	Set	1,540	6,820	5,236	13,596	36,300	0	220	5,500	42,020	33,618
	Sub-total				148,653	133,640	147,559	429,852	101,740	0	16,874	17,310	135,924	565,776
	Indirect Cost							33,947					79,209	113, 156
	Total							463,799					215,133	678,93
	Work Shop	SC 12	8,190	72 Z	73,326	64,160	91,658	229,144	92,642	0	16,347	18,637	127,626	356,776
	Track	40 kg/m	0.23	ksa	665	1,877	927	3,469	1,265	0	191	191	1,647	5,110
Basic Case	Turnout	6#	2	Set	140	620	476	1,236	3,300	0	20	560	3,820	5,05
in 1993	Sub-total				74,131	66,657	93,061	233,849	97,207	0	16,558	19,328	133,093	366,94
	Indirect Cost							22,017					51,372	73, 18
	Total							255,866					184,465	440,33

1. Civil Nork: 5) Depot and Maintenance Shop: A. Civil Work (2)

Appli-	4 4 5 4 4 4 4					cal Curre	ncy Portion			Foreig	n Currency	Portion		Grand
Cable Case	Item	Specification	Q'ty	Unit	Material	Labor	Equipment	Total	Material	Labor	Equipment	Transport & Insurance	Total	Total
*svic	Track	40 kg/m	0.87	kas	2,514	7,099	3,506	13,119	4,785	0	722	722	6,229	19,348
Case in 2010, Case A-1 in 2010,	Turnout	61	6	Set	420	1,860	1,428	3,708	9,900	0	60	1,500	11,460	15,168
case A-2 in 2010.	Sub-total		:		2,934	8,959	4,934	16,827	14,685	0	782	2,222	17,689	34,516
in 2010, Case C-1	Indirect Cost	1						2,071					4,832	6,903
Case C-2 in 2010. Case D-1	Total							18,898			1		22,521	41,419
in 2010	Work Shop	SC 1F	8,190	m²	73,326	64,160	91,658	229,144	92,642	0	16,347	18,637	127,626	356,770
	Track	40 kg/m	0.96	kna	2,774	7,834	3,869	14,477	5,280	0	797	797	6,874	21,351
	Turnout	6₽	8	Set	560	2,480	1,904	4,944	13,200	0	80	2,000	15,280	20,224
	Sub-total	11.44			76,660	74,474	97,431	248,565	111,122	0	17,224	21,434	149,780	398,345
	Indirect Cost							23,901					55,768	79,669
	Total							272,466				<u> </u>	205,548	478,014

1. Civil Worki S) Depot and Maintenance Shop: A. Civil Work (3)

(Unit: 1,000 Sucres)

Appli-		<u> </u>	T		Lo	cal Curre	ncy Portion		,	Foreig	n Currency	Portion		Grand
cable Case	Item	Specification	Qıty	Unit	Material	Labor	Equipment	Total	Material	Labor	Equipment	Transport & Insurance	Total	Total
Case A-l in	Site Clearance		94,000	.E.S	38,299	6,155	4,418	48,872	4,255	0	6,487	750	11,492	60,364
1998, Case	Main Office	RC 3F	3,240	B) ²	57,024	49,896	71,280	178,200	0	0	0	0	a	178,200
A-2 in 1990, Case C-1 in 1990,	Main Store, Signal Cabin, Control room	RC 1F	1,560	u,²	15,570	13,628	19,469	48,672	0	0	0	0	0	48,672
Case C-2 in	Other building	SC 17	3,720	m².	23,152	- 20,258	28,940	72,350	36,325	0	6,415	7,308	50,048	122,398
1990, Case-E in	Track (Single)	40 kg/m	3.93	km	11,358	12,070	15,838	59,266	21,615	0	3,262	3,262	28,139	87,405
1990	Turnout	6#	18	Set	1,260	5,580	4,284	11,124	29,700	0	189	4,500	34,380	45,504
	Sub-total				146,668	127,587	144,229	418,484	91,898	0	16,344	15,820	124,059	542,543
	Indirect Cost							32,554					75,956	108,509
	Total							451,037				<u>.</u>	200,015	651,052
Case A-1 in	Truck	40 kg/m	0.75	ke	6,675	6,120	3,023	15,818	4,125	0	623	623	5,371	21,189
1996. Bisic	Turnout	61	5	Set	350	1,550	1,190	3,090	8,250	0	50	1,250	9,550	12,640
Case in 1996, Case	Sub-total		 		7,025	7,670	4,213	18,908	12,375	0	673	1,873	14,921	
#-1 in 1996.	Indirect Cost	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1						2,030					4,736	6,766
Case C-1 In 1996,	Total							20,938		! 			19,657	40,595

Ceșe D-I in 1996 1. Civil Work: 5) Depot and Maintenance Shop: A. Civil Work (4)

	T			Lo	cal Curre	ncy Portion	1.1		Fore 12				Grand
Item	Specification	O, tA	Unit	Material	Labor	Equipment	Total	Material	Labor	Equipment	Insurance	Total	Total
	 		 	ļ									
Kark Shop	SC 1F	8,190	n.	73,326	64,160	91,658	229,144	92,642	0	16,347	18,637	127,626	356,770
Track	40 kg/m	0,93	ka.	2,688	7,589	3,748	14,025	5,115	0	772	772	6,659	20,684

Turnout	60	6	Set	420	1,860	1,428	3,708	9,900	0	60	1,500	11,400	15,168
Sub-total				76,434	73,609	96,834	246,877	107,657	0	17,179	20,909	145,745	392,622
Indirect Cost							23,557					54,967	78,524
Total			-				270,434					200,712	471,166
Work Shop	SC 1F	8,190	78	13,326	64,160	91,658	229,144	92,642	0	16,347	18,637	127,626	356,770
Track	40 kg/m	0.70	k ₂₀	2,023	5,712	1,821	10,556	3,850	0	581	581	5,012	15,566
Turnout	6#	4	Set	280	1,240	952	2,472	6,600	0	40	1,000	7,640	10, 11
Sub-rotal				75,629	71,112	95,431	242,172	103,092	0	16,968	20,218	140,278	382,450
Indirect Cost							22,947					33,543	16,49
Total	 		1	1			265,119					193, 821	458,94
<u> </u>			<u> </u>						—, . —				
13 44 -1 45 8				r Cledi	Union /El		:				1. 1	(United 1	000 Sucri
	Wark Shop Track Turnout Sub-total Indirect Cost Total Work Shop Track Turnout Sub-total Indirect Cost	Trem Specification Work Shop SC 1F Track 40 kg/m Turnout 59 Sub-total Indirect Cost Total SC 1F Track 40 kg/m Turnout 59 Sub-total Indirect Cost Total Indirect Cost Total Turnout 59	Trem	Item Specification Q'ty Unit Wark Shop SC 1F 5,190 m Track 40 kg/m 0.93 km Turnout 5\$ 6 Sat Sub-total Indirect Cost Work Shop SC 1F 3,190 m Track 40 kg/m 0.70 km Turnout 5\$ 4 Sat Sub-total Indirect Cost	Item Specification Q'ty Unit Material Wark Shop SC 1F 6,190 m 73,326 Track 40 kg/m 0.93 km 2,698 Turnout 66 5 at 420 Sub-total 76,434 Indirect Cost Work Shop SC 1F 3,190 m 13,326 Track 40 kg/m 0.70 km 2,023 Turnout 58 4 Sat 280 Sub-total Total	Item Spacification Q'ty Unit Local Curre Wark Shop SC 1F 6,190 m 73,326 64,160 Track 40 kg/m 0.93 km 2,638 1,589 Turnout 69 6 Sat 420 1,860 Sub-total 76,434 73,609 Indirect Cost 76,434 73,609 Work Shop SC 1F 8,190 m 13,326 64,160 Track 40 kg/m 0.70 km 2,023 5,712 Turnout 69 4 Sat 280 1,240 Sub-rotal 75,629 71,112 Indirect Cost 75,629 71,112	Item Specification Q'ty Unit Local Currency Portion Wark Shop SC 1F 8,190 m 73,326 64,160 91,653 Track 40 kg/m 0.93 km 2,888 7,589 3,748 Turnout 69 6 Set 420 1,860 1,428 Sub-total 76,434 73,609 96,834 Indirect Cost 70 m 73,326 64,160 91,558 Track 40 kg/m 0.70 km 2,023 5,712 2,821 Turnout 69 4 Sat 280 1,240 952 Sub-rotal 75,629 71,112 95,431 Indirect Cost 75,629 71,112 95,431	Item	Tem	Trank	Tree Specification Q'ty Unit Naterial Labor Equipment Total Naterial Labor Equipment Naterial Labor Equipment Naterial Labor Equipment Naterial Labor Equipment Naterial Labor Equipment Naterial Labor Equipment Naterial Labor Equipment Naterial Labor Equipment Naterial Labor Equipment Naterial Labor Equipment Naterial Labor Equipment Naterial Labor Equipment Naterial Labor Equipment Naterial Nat	Treak	Tree Specification Q'ty Unit Total Cast Currency Portion Total State Cast Currency Portion Total State Cast Currency Portion Total State Cast Currency Portion Total State Cast Currency Portion Total State Cast Currency Portion Total State Cast Currency Portion Total State Cast Currency Portion Total State Cast Currency Portion Total State Cast Currency Portion Total Cast Currency Portion

Appli-	T	1		T	I.o	cal Curre	ncy Portion		Ţ	foreign	Currency	and the second section	94. P. <u>224</u>	Grand
cable Case	Item	Specification	Q'ty	Unit	Material	Labor	Equipment	Total	Material	Labor	Equip#ent	Transport & Insurance	Total	Total
	Track	40 kg/m	0.95	ka	2,774	7,834	3,869	14,477	5,280	0	397	797	6,874	21,351
İ	Turnout	6#	8	Sec	560	2,480	1,904	4,944	13,200	0	63	2,000	15,280	20,224
Case A-2 in 1996	Sub-total				3,334	10,314	5,773	19,421	18,480	0	877	2,797	22,154	41,575
1990	Indirect Cost							2,495					5,821	8,316
	Total							21,916	25				27,975	49,891
	Site Clearance		94,000	₽2	38,299	6,155	4,418	48,872	4,225	0	6,487	750	11,492	60,364
	Hain Office	RC 3F	3,240	6 2	57,024	49,896	71,280	178,200	0	0	0	0	0	178,200
Case	Hain Store, Signal Cabin, Control room	RC 1F	1,560	m²	15,575	13,628	19,469	48,672	0	0	.0	0	0	48,672
B-1 in 1990, Case	Other building	SC 1F	3,720	pl ²	23,152	20,258	28,940	72,350	36,325	0	6,415	7,308	50,048	122,398
D-1 in 1990,	Track (Single)	40 kg/m	4.21	ka	12,167	34,354	16,966	63,487	23,155	0	3,494	3,494	30,143	93,630
Case F in 1990	Turnout	64	20	Set	1,400	6,200	4,760	12,360	33,000	0	200	5,000	38,200	50,560
Case G in 1990	Sub-total				147,617	130,491	145,833	423,941	96,735	0	16,596	16,552	129,883	553,814
	Indirect Cost							33,229					17,535	110,764
ļ	Total							457,170		· · · · · · · · · · · · · · · · · · ·			207,418	664,588

1.	Civil Horks	5)	Depot and	Maintenance	Shopi	A. Civil Work	(6)
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Appli-					1.0	cal Curre	ncy Portion	·	1	Foreig	a Currency	Portion		Grand
ippli- cable Case	Item	Specification	Q ¹ ty	Unit	Katerial	Labor	Equipment	Total	Hateriel	Labor	Equipment	Transport & Insurance	Total	Total
	Work Shop	sc 1F	8,190	ra ¹	73,326	64,160	91,658	229,144	92,642	0	16,347	18,637	127,626	356,770
	Track	40 kg/m	0.36	ku	1,040	2,938	1,451	5,429	1,980	0	299	299	2,578	8,007
150 -2 in 1993	Turnout	60	2	Set	140	620	476	1,236	3,300	0	20	500	3,820	5,056
1993 n 1993	Sub-total				74,506	67,718	93,585	235,809	97,922	0	16,666	19,436	134,024	369,833
	Indirect Cost							22,190					51,777	73,967
	Total		:					257,999					185,801	443,80
	Track	40 kg/m	1,32	ķ.a.	3,815	10,771	5,320	19,906	7,260	o	1,096	1,096	9,452	29,35
	Turnout	6#	9	Set	.630	2,790	2,142	5,562	14,850	0	90	2,250	17,190	22,75
Case C-2 in 1996	Sub-total				4,445	13,561	7,462	25,468	22,110	0	1,186	3,346	26,642	52,110
	Indirect Cost						_	3,127					7,295	10,42
	Total							28,595					33,937	62,53

1. Civil Work: 5) Depot and Maintenance Shop: A. Civil Work (7)

Appli-	Item			Unit	Lo	cal Curre	ncy Portion			Foreig	u Carteuch	Parties		Grand
cable Case		Specification	Q'ty		Material	Labor	Equipment	Total	Material	Labor	Equipment	Transport & Insurance	Total	Total
						-								
	Work Shop	SC IF	8,190	æ²	73,326	64,160	91,658	229,144	92,642	. 0	16,347	18;637	127,626	356,770
			-										·	
	Track	40 kg/m	0.35	ka	1,012	2,856	1,411	5,279	1,925	.0	291	291	2,507	7,786
Case P in 1993	Turnout	69	.2	Set	140	620	476	1,236	3,300	0	20	500	3,820	5,055
	Sub-total				74,478	67,636	93,545	235,659	97,867	0	16,658	19,428	133,953	369,612
	Indirect Cost			-				22,177			·		51,746	73,922
	Total							257,836	<u></u>				185,699	443,534
5-	Track	40 kg/m	0.23	km	665	1,877	927	3,469	1,265	. 0	191	191	1,647	5,116
	Turnout	61	2	Set	149	620	476	1,236	3,300		10	500	3,820	5,056
Casa-P in 2010	Sub-total				805	2,497	1,403	4,705	4,565	0	211	691	5,467	10,172
	Indirect Cost				i			610					1,424	2,034
	Total							5,315					6,891	12,206

1. Civil Work: 5) Depot and Maintenance Shop: A. Civil Nork (8)

1, 014	il work: 5) be		۳	1.	cal Curre	acy Portion		Foreign Currency Portion						
Appli- cable Case	Item	Specification	Q'ty	Valt	Haterial		Equipment		Material	Labor	Equipment	Transport & Insurança	Total	Grand Total
	Work Shop	SC 1F	8,190	78. ²	73,326	64,160	91,658	229,144	92,642	0	16,347	18'933	127,626	356,770
	Sub-total				73,326	64,160	91,658	229,144	92,642	0	16,347	18,637	127,626	356,770
Case-G in 1993	Indirect Cost							21,406					49,948	31,35
	Total							250,550					177,574	428,12
	Track	40 kg/m	0.35	km	1,012	2,856	1,411	5,279	1,925	0	291	91	2,507	7.7
	Turnout	6#	2	Set	140	620	476	1,236	3,300	0	20	500	3,820	5,0
Case-G in 2010	Sub-total				1,152	3,476	1,887	6,515	5,225	0	311	791	6,327	12,8
	Indirect Cost							771					1,798	2,5
	Total			:				7,285					8,125	15,4

1. Civl Work: 5) Depot & Haintenance Shop : B. Electrical Facilities (1)

	Description	thatt	Quantity	Loc	al Current	у		Foreign	Currency		Grand Total
Applicable Case				Material	Labor	Total	Katerial	Labor	Instrument & Transport	Total	Grana lotal
	1. Catenary	Lump sum		5,213	3,519	8,732	40,608	3,745	3,247	47,600	56,332
	2. Power Distribution	Lump sum		40,002	8,813	48,815	11,109	6,250	888	18,247	67,062
	3. Signalling	Lump sum		6,796	6,649	13,445	75,182	8,110	6,014	89,306	102,751
Basic Case in 1990	4. Telecommunication	Lump sum		7,398	2,799	10,197	35,385	3,896	2,829	42,110	52,307
	Sub-total			59,409	21,780	81,189	162,284	22,001	12,978	197,263	278,452
	Indirect Case					16,708				38,982	55,690
	Total					97,897		1. 14 1. 14		236,245	334,142
	1. Catenary	Lump sum		5,000	3,238	8,238	37,256	3,393	2,979	43,628	51,866
	2. Fower Distribution	Lump sum		40,002	8,813	48,815	11,109	6,250	888	18,247	67,062
	3. Signalling	Lump sum		5,869	5,256	11,125	65,468	6,425	5,237	77,130	88,255
Case A-1, A-2, C-1, C-2, E in	4. Telecommunication	Lump sum		7,398	2,799	10,197	34,645	3,896	2,769	41,310	51,507
1990	Sub-total			58,269	20,106	78,375	148,478	19,964	11,873	180,315	258,690
	Indirect Cost					15,522				36,216	51,738
	Total					93,897				216,531	310,428

1. Civil Work: 5) Depot & Maintenance Shop : B. Electrical Pacilities (2)

(Unit: 1,000 Sucres)

Applicable	Description	Unit	Quantity	Local Currency							
Case				Material	Labor	Total	Material	Labor	Instrument & Transport	Total	Grand Total
	1. Catenary	Lump sum		5,192	3,488	8,660	39,842	3,686	3,185	46,713	55,373
	2. Power Distribution	Luspaus		40,002	8,813	48,815	11,109	6,250	888	18,247	67,062
	3. Signalling	Lump sum		6 487	5,976	12,463	70,294	7,299	5,623	83,216	95,679
Case 8-1, D-1, g, G in 1990	4, Telecomounication	Lump sum		7,398	2,799	10,197	35,015	3,896	2,799	41,710	51,907
	Sub-total			59,079	21,056	80,135	156,260	21,131	12,495	189,886	270,021
	Indirect Cost			:		16,202				37,802	54,004
	Total					96,337				227,688	324,025
e de la companya de l	1. Catenary	Lump swa		294	232	525	2,663	243	213	3,119	3,645
	2. Power Distribution	Lump sum		26,325	914	27,239	0	635	0	635	27,874
1 2x 2 - 1 2 1 2 2 2	3. Signelling	Lump som		370	885	1,255	6,727	1,068	538	8,333	9,588
Basic Case in 1993	4. Telecommunication	Lump sum		3,218	700	3,918	4,797	167	383	5,347	9,265
	Sub-total			30,207	2,731	32,938	14,187	2,113	1,134	17,434	50,372
	Indirect Cost					3,023				7,051	10,074
	Total					35,961、				24,485	60,446

1. Civil Work: 5) Depot & Maintenance Shop : B. Electrical Facilities (3)

		Unic	Quantity	Loc	al Current	y	1	Grand Total			
Applicable Case	bescription			Material	Labor	Total	Material	Labor	Instrument & Transport	Total	Grand Total
	1. Catenary	Lump Sum		507	513	1.020	6,015	595	. 481	7,091	3,111
	2. Power Distribution	Lump Sum		26,325	914	27,239	0	635	0	635	27,874
	3. Signalling	Lump sum		1,297	2,278	3,375	16,441	2,753	1,315	20,509	24,084
Case A-1, C-1 in 1993	4. Telecommunication	Lump sum		3,218	760	3,918	5,537	167	443	6,1^7	10,065
	Sub-total			31,347	4,405	35,752	27,993	4,150	2,239	34,382	70,134
	Indirect Cost					4,208				9,818	14,026
	Total					39,960				44,200	84,160

1. Civil Work: 5) Depot & Maintenance Shop : B. Electrical Facilities (4)

	3) Depot a Matteriores single	Unit	Quantity	Loc	al Current	зу		Grand Total			
Applicable Case	Description			Material	Labor	Total	Haterial	1.abos	Instrument & Transport	Total	orano total
	1. Catenary	Lump sum		346	416	762	4,929	493	393	5,815	6,577
	2. Power Distribution	Lump sum		26,325	915	27,240	0	634	0	634	27,874
	3. Signalling	Lump sum		989	1,614	2,603	11,615	1,952	929	14,496	17,099
Case A-2 in 1993	4. Telecommunication	Lump sum		3,218	698	3,916	5,537	167	441	6,145	10,061
200	Sub-cotal			30,878	3,643	34,521	22,081	3,246	1,763	27,090	61,611
	Indirect Cost					3,697				8,625	12,322
	Total					38,218				35,715	73,933
<u></u>	1. Catenary	Lump sum		325	365	690	4,163	434	331	4,928	5,618
	2. Power Discribution	Lump sum		26,325	915	27,240	0	634	0	. 634	27,874
	3. Signalling	Lump sum		680	941	1,621	6,727	1,141	538	8,406	10,027
Case C-2, E in 1993	4. Telecommunication	Lump sun		3,218	698	3,916	5,167	167	411	5,745	9,661
	Sub-total			30,548	2,919	33,467	16,057	2,376	1,280	19,713	53,180
į	Indirect Cost					3,191				7,445	10,636
	Total					36,658				27,158	63,816

1. Civil Work: 5) Depot & Maintenance Shop : B. Electrical Facilities (5)

		Unit	Quantity	Loc	al Curren	2y		Grand Total			
Applicable Case	Description			Material	Labor	Total	Haterial	Labor	Instrument & Transport	Total	Grand lotal
	1. Catenary	Lump sum		315	283	598	3,429	392	275	4,005	4,604
	2. Power Distribution	Lump sum		26,325	914	27,239	0	635	0	635	27,874
	3. Signalling	្រែក្សា ទបធ		679	1,558	2,237	11,615	1,879	929	14,423	16,660
Case B-1, D-1 In 1993	4. Telecommunication	Lump sum		3,218	700	3,918	5,167	167	413	5,747	9,665
·	Sub-rotal			30,537	3,455	33,992	20,211	2,983	1,617	24,811	58,803
İ	Indirect Cost					3,528				8,232	11,760
	Total					37,520				33,043	70,563
	1. Catemary	Lump sum		596	371	967	4,190	390	333	4,913	5,880
	2. Power Distribution	Lump sum		7,009	2,747	9,756	1,851	1,955	148	3,954	13,710
Basic Case.	J. Signalling	Lump sum		927	1,345	2,272	9,587	1,622	766	11,975	14,247
Case A-1, C-1, B-1, D-1 in 1996	4. Telecommunication	Lump sum		54	31	85	398	0	31	429	514
7230 .	Sub-total			8,586	4,494	13,080	16,026	3,967		21,271	34,351
	Indirect Cost					2,061				4,809	6,870
	Total					15,141				26,080	41,221