APPENDIX 14-2

RESULTS OF ENGINEERING SURVEY

- Boring
- Analysis of Consolidation Settlement
- CBR
- Concrete Strength
- Deflection

FIGURE 1 LOCATION OF SLABS FOR DETERIORATION AND ENGINEERING SURVEY

TP; CBR
BH; Boring

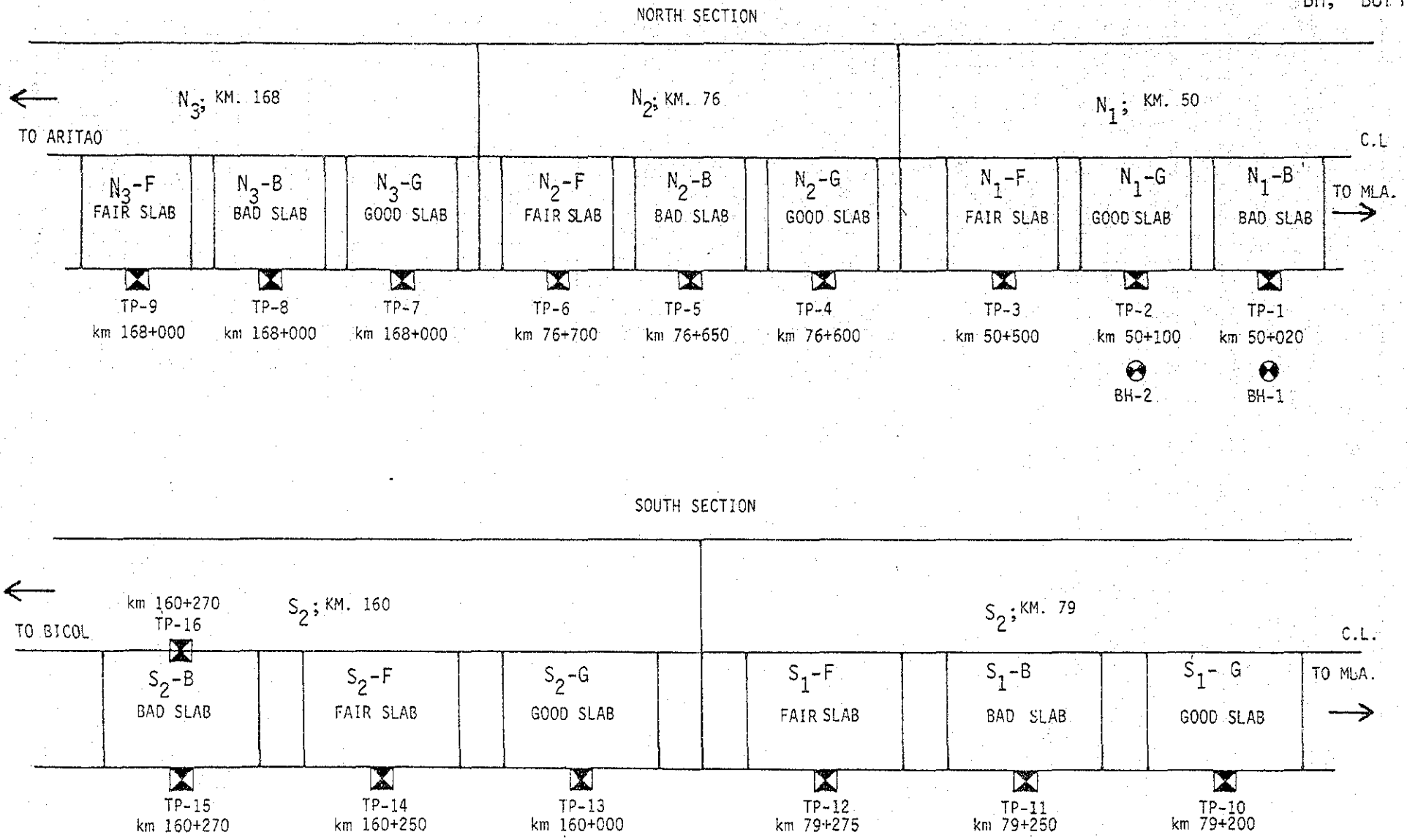


FIGURE 2

GEOTECHNICS PHILIPPINES, INCORPORATED
1184 BEN-LOR BLDG. QUEZON BLVD. EXT., Q.C.

FFeasibility Study For Road B O R I N G L O G

PROJECT Improvement Of Pan-Phil Highway JOB NO. 762 BORE HOLE NO. BH-1
LOCATION Km. 50 + 020, Baliwag Bulacan DATE STARTED 7-19-86 DATE COMPLETED 7-20-86
GROUND WATER ELEV. 1.48 m GROUND SURFACE ELEV.
DRILLING METHOD washboring SAMPLERS USED 5.0 cm. OD SS, Shelby Tube
WT. OF HAMMER 63.6 kg. HAMMER FALL 76.2 cm.

DEPTH IN M.	GRAPH	DESCRIPTION	CONSISTENCY	NMC PL—O—LL (20 40 60 80 100)	P.I.	O BLOW COUNT, N ● % RECOVERY (20 40 60 80 100)	OTHER TEST DATA
0	GW	Moist dark gray sandy GRAVEL with traces of silt	FIRM		NP		
1	SW SM	Moist brownish gray gravelly SAND with a little silt	LOOSE		NP		
	MH	Very moist brown clayey SILT with traces of fine sand	VERY SOFT		25	PRESSED	
5					21	PRESSED	
	SM	Moist dark gray silty fine to coarse SAND	DENSE		NP		
	SW SM				NP		
	GW	Moist dark gray to olive gray sandy GRAVEL with traces of silt	VERY DENSE		NP		
10		END OF BORING AT 10.50 m.					

SHEET 1 OF 1

FIGURE 3

GEOTECHNICS PHILIPPINES, INCORPORATED
1181 BEN-LOR BLDG. QUEZON BLVD. EXT., Q.C.

B O R I N G L O G

PROJECT Feasibility Study For Road Improvement Of Pan-Phil Highway JOB NO. 762 BORE HOLE NO. BH-2
LOCATION Km. 50 + 020 Baliwag, Bulacan DATE STARTED 7-21-86 DATE COMPLETED 7-22-86
GROUND WATER ELEV. 1.50 m GROUND SURFACE ELEV.
DRILLING METHOD washboring SAMPLERS USED 5.0 cm OD-SS, Shelby Tube
WT. OF HAMMER 63.6 kg HAMMER FALL 76.2 cm

DEPTH IN M.	GRAPH	DESCRIPTION	CONSISTENCY	NMC PL—O—LL (20 40 60 80 100)	P.I.	O BLOW COUNT, N ● % RECOVERY (20 40 60 80 100)	OTHER TEST DATA
0	GM	Moist reddish brown sandy GRAVEL with some silt	FIRM		NP		
	SM	Very moist reddish brown silty SAND with some gravel	LOOSE		19		
	MH	Very moist brown clayey SILT with traces of fine sand	VERY SOFT		23	PRESSED	
5					21	PRESSED	
	SW SM	Moist dark gray silty fine to coarse SAND	DENSE		NP		
	SW		FIRM		NP		
	GW	Moist olive gray sandy GRAVEL with traces of silt	DENSE		NP		
10		END OF BORING AT 10.50 M.					

SHEET 1 OF 1

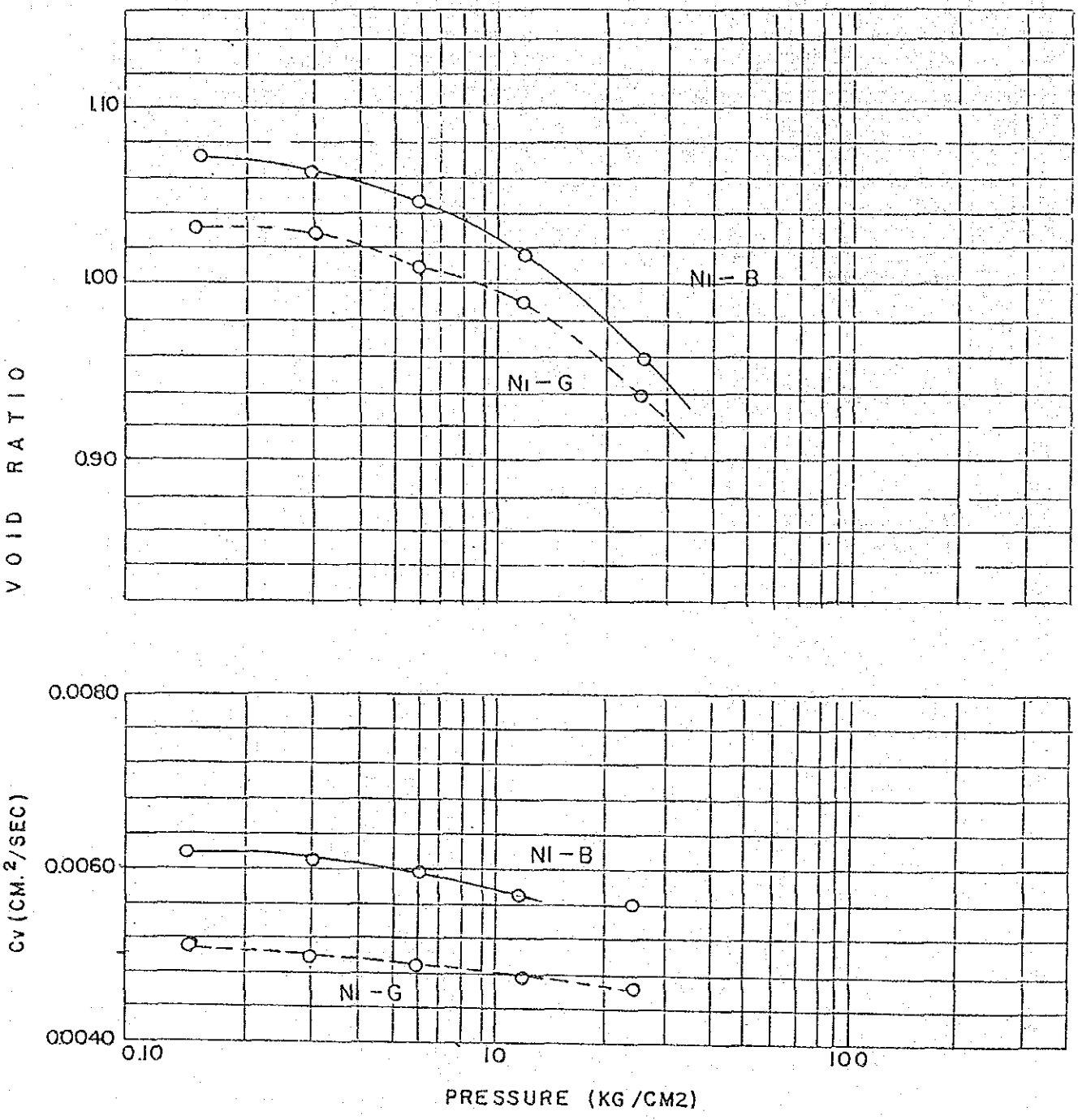


FIGURE 4 AVEPAGE E-LOP P AND C_v CURVES
(Very soft layer of silt at Boring NI – B and NI – G)

TABLE 1 SUMMARY OF LABORATORY TESTS

Bore Hole No.	Sample No.	Depth (m)	NMC	Atterberg Limit			Passing Sieve (%)		qu (kg/cm^2)	e-log P Curve and Cv
				LL	PL	PI	40	200		
N_1-B	1	1.05- 1.50	12	-	NP	-	7	1	-	-
	2	2.55- 3.00	16	-	NP	-	26	5	-	-
	3	4.05- 4.50	42	59	34	25	-	-	0.556	Figure 6.1-3
	4	5.55- 6.00	41	54	33	21	-	-	0.506	Figure 6.1-3
	5	7.05- 7.50	15	-	NP	-	39	13	-	-
	6	8.55- 9.00	16	-	NP	-	30	6	-	-
	7	10.05-10.50	10	-	NP	-	18	2	-	-
N_1-G	1	1.05- 1.50	13	-	NP	-	39	26	-	-
	2	2.55- 3.00	32	50	31	19	54	43	-	-
	3	4.05- 4.50	46	57	34	23	-	-	0.831	Figure 6.1-3
	4	5.55- 6.00	36	51	30	21	-	-	0.343	Figure 6.1-3
	5	7.05- 7.50	13	-	NP	-	37	10	-	-
	6	8.55- 9.00	12	-	NP	-	34	1	-	-
	7	10.05-10.50	7	-	NP	-	12	1	-	-

Analysis of Consolidated Settlement

(1) Conditions

. Refer to Boring Log of N_1-B and N_1-G

. Embankment Height h = 1.5 m
Unit Weight γw = 2.0 t/m^3

. Settlement Layer (Very Soft Layer of Silt)

Thickness H = 3.0 m
Unit Weight = γs = 1.8t/m^3 for Sand (obt. 3.0 m)
γc = 1.7 t/m^3 for settlement layer
Water Level = 1.5 m

. Load for Settlement

Original Load; Po = 1.8 x 1.5 + (1.8 - 1.0) x 1.5 + (1.7 - 1.0) x 1.5 = 4.95 t/m^2
Embankment Load; Δp = 2.0 x 1.5 = 3.0 t/m^2

(2) Settlement Height

$$Sc \doteqdot \frac{eo - e1}{1 + eo} \times H$$

Where:

Sc = Settlement Height
eo = Initial void ratio
ei = Void Ratio after settlement
H = Thickness of settlement layer

N_1-B Boring

eo = 1.05 Refer to 6.1-3
e1 = 1.035 Refer to 6.1-3
H = 3.0 m
Sc = 0.02 m

N_1-G Boring

eo = 1.017 Refer to Figure 6.1-3

e1 = 1.003 Refer to Figure 6.1-3

H = 3.0 m

Sc = 0.02 m

(3) Settlement Speed

$$f = \frac{(H/2)^2}{Cr} = Tv$$

Where:

t; Settlement Speed

Cr; Coefficient of consolidation $cm^2/sec.$

Tr; Coefficient of Time 0.848 for 90% consolidation

N_1-B Boring

Cv = 0.0059 $cm^2/sec.$ Refer to 6.1-3

H = 300 cm.

t = 3, 33,898 sec. = 37 days for 90%

N_1-G Boring

Cv = 0.0049 $cm^3/sec.$

H = 300 cm.

t = 3,893,877 sec. = 45 days for 90%

(4) Conclusion

Settlement height are estimated to be 2.0 cm and settlements are considered to be completed within 37 or 45 days for 90% consolidation. It is assumed that consolidation setttlement may have been completed before pavement have been constructed considering the time after the completion of embankment.

TABLE 2 RESULT OF CBR TEST

LOCATION STATION	SAMPLE NO.	DEPTH CM.	SOIL DESCRIPTION	AASHTO CLASS	GROUP INDEX	NATURAL MOISTURE CONTENT %	ATTERBERG LIMITS %			C. B. R. %				DRY DENSITY g/cc	SIEVE ANALYSIS % PASSING								REMARKS
							PL	LL	PI	1 TRIAL	2 TRIAL	3 TRIAL	AVERAGE		2"	1½"	1"	¾	⅜	NO. 4	NO. 10	NO. 40	NO. 200	
			(SOUTH SECTION)																				
KM-79																							
S_1-G																							
Subbase	1	25-50	Dark brown silty Gravel-Sand	A-1-b	0	18.81	-	NP	-	5.49	5.26	5.38	5.38	1.70	100	92	75	70	67	63	56	38	23	
Subgrade	2	50-80	Dark brown sandy SILT	A-7-5	4	27.14	31	46	15	1.14	1.14	2.29	1.52	1.50					100	98	94	57	43	
S_1-F																							
Subbase	1	25-50	Dark brown silty SAND	A-2-4	0	21.69	-	NP	-	5.95	8.24	8.63	7.61	1.64				100	98	91	76	47	32	
Subgrade	2	50-80	Dark brown silty SAND with some gravel	A-2-4	0	37.33	-	NP	-	4.68	7.21	4.92	5.60	1.26		100	87	85	83	79	70	50	34	
S_1-B																							
Subbase	1	25-50	Dark brown silty Gravel-Sand	A-2-4	0	26.08	-	NP	-	3.55	5.72	1.46	4.58	1.52		100	91	88	86	79	63	40	30	
Subgrade	2	50-80	Dark brown silty Gravel-Sand	A-2-4	0	32.83	-	NP	-	5.72	8.93	8.46	7.70	1.32	100	88	80	79	74	70	61	41	27	
KM-160																							
S_2-G																							
Subbase	1	25-50	Dark brown sandy GRAVEL	A-1-a	0	16.88	-	NP	-	19.68	16.14	31.70	22.51	1.82	100	83	75	68	51	35	24	14	10	
Subgrade	2	50-80	Dark brown sandy GRAVEL	A-1-a	0	19.81	-	NP	-	25.98	24.60	17.29	22.66	1.75	100	65	59	53	42	29	19	11	7	
S_2-F																							
Subbase	1	25-50	Grayish brown SANDY GRAVEL	A-1-b	0	19.97	-	NP	-	2.63	7.10	11.79	7.17	1.76	100	88	76	68	55	42	32	22	17	
Subgrade	2	50-75	Grayish brown SILT with sand	A-5	I	27.69	31	NP	10	2.29	1.37	2.40	2.02	1.55			100	93	78	68	59	48	38	
S_2-B																							
Subbase	1	25-50	Dark brown silty GRAVEL-SAND	A-a-b	0	20.15	-	NP	-	3.43	5.38	5.38	4.73	1.72	100	90	89	83	68	54	42	30	24	
Subgrade	2	50-75	Brown silty Gravel-Sand	A-2-4	0	31.48	28	34	6	1.37	2.17	1.83	1.79	1.48			95	87	74	64	52	41	35	
S_2-B																							
Subbase	1	25-50	Grayish Brown silty sandy GRAVEL	A-1-b	0	20.04	-	NP	-	7.78	3.66	4.92	5.45	1.63	100	93	79	74	64	50	35	25	19	
Subgrade	2	50-80	Dark brown silty CLAY	A-7-5	55	74.40	35	86	51	0.90	0.92	1.05	0.97	1.30				100	99	98	96	94	91	CBR values were taken at 67 blows with a natural moisture content

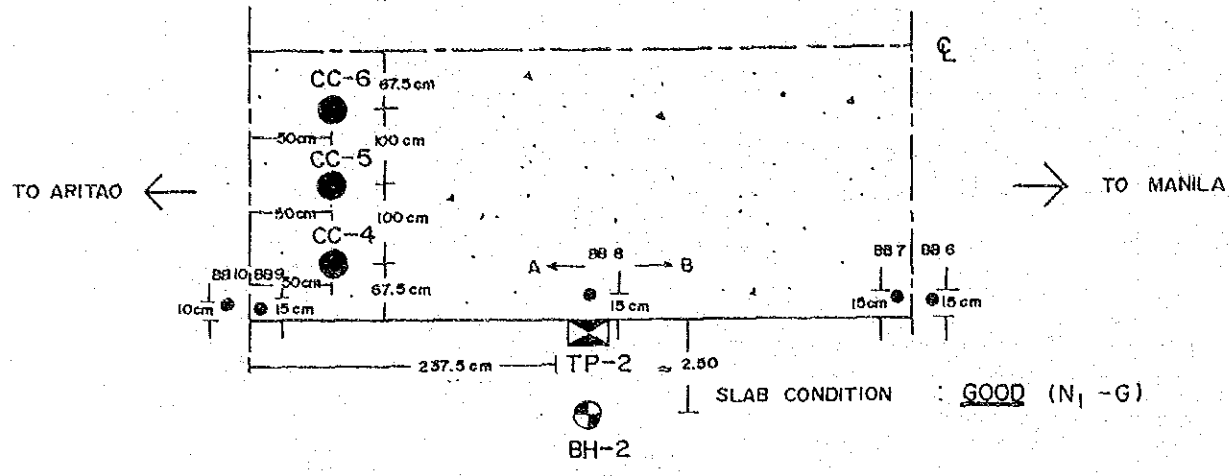
TABLE 3 RESULT OF CBR TEST

LOCATION STATION	SAMPLE NO.	DEPTH CM.	SOIL DESCRIPTION	AASHTO CLASS	GROUPINDEX	NATURAL MOISTURE CONTENT %	ATTERBERG LIMITS %			C. B. R.%				DRY DENSITY	SIEVE ANALYSIS % PASSING								REMARKS
							PL	LL	PI	1 TRIAL	2 TRIAL	3 TRIAL	AVERAGE	g/cc	2"	1½"	1"	¾	⅜	NO. 4	NO. 10	NO. 40	NO. 200	
			(NORTH SECTION)																				
KM-50																							
N1-G																							
Subbase	1	25-50	Brown sandy GRAVEL w/a little silt	A-1-a	0	8.26	-	NP	-	33.82	31.47	37.65	34.31	2.25			100	69	53	48	32	20	12	
Subgrade	2	50-80	Brown sand SILT with sore gravel	A-5	2	30.36	3	41	10	2.23	2.70	2.92	2.62	1.54				100	84	73	64	55	43	
N1-F																							
Subbase	1	25-50	Brown gravelly SAND with a little silt	A-1-b	0	7.34	-	NP	-	54.59	52.07	52.53	53.06	2.18				100	81	71	60	46	19	
Subgrade	2	50-80	Brown SAND with some silt and gravel	A-1-b	0	12.57	-	NP	-	9.50	9.83	9.50	9.61	2.04				100	99	82	74	59	22	
N1-B																							
Subbase	1	25-30	Brown silty Gravel-Sand	A-2-4	0	11.40	-	NP	-	2.86	3.09	3.55	3.17	2.07			100	79	69	57	48	37	23	
Subgrade	2	50-60	Brown silty Gravel-Sand	A-2-4	0	11.73	3	38	7	5.72	4.12	6.03	5.29	2.04			100	84	73	59	48	36	24	
KM-77																							
N2-G																							
Subbase	1	25-30	Dark brown silty SAND with a little gravel	A-2-4	0	18.29	-	NP	-	6.72	4.23	7.67	6.21	1.84			100	99	96	86	68	56	33	
Subgrade	2	50-60	Dark gray gravelly SAND with a little silt	A-1-a	0	7.75	-	NP	-	57.22	57.22	56.99	57.14	2.11			100	95	84	70	50	22	13	
N2-F																							
Subbase	1	25-30	Dark brown silty Gravel-Sand	A-1-b	0	15.78	-	NP	-	3.03	3.66	3.66	3.45	1.95		100	97	93	83	72	54	35	24	
Subgrade	2	50-70	Dark brown Gravel-Sand mixture	A-1-a	0	5.41	-	NP	-	24.60	42.34	62.03	42.99	2.08		100	91	86	66	53	39	15	9	
N2-B																							
Subbase	1	25-30	Brown sandy GRAVEL with a little silt	A-a-b	0	7.46	-	NP	-	51.11	43.94	56.31	53.79	2.19			100	85	68	52	39	25	19	
Subgrade	2	50-60	Brown sandy GRAVEL with a little silt	A-1-a	0	9.13	-	NP	-	40.05	48.06	42.32	43.48	2.17			100	68	58	46	37	27	13	
KM-168																							
N3-G																							
Subbase	1	25-30	Dark brown Gravel-Sand with a little silt	A-1-a	0	7.38	-	NP	-	27.92	26.26	26.55	26.91	2.25		100	96	90	71	53	36	19	14	
Subgrade	2	50-70	Dark brown silty Gravel-Sand	A-2-4	0	9.40	28	34	6	6.84	6.64	10.19	7.89	2.14				100	79	64	53	47	34	
N3-F																							
Subbase	1	40-45	Dark brown silty Gravel-Sand	A-1-b	0	4.59	-	NP	-	54.47	35.25	28.27	39.33	2.20			100	91	76	60	45	30	20	
Subgrade	2	50-70	Dark brown silty Gravel-Sand	A-1-b	0	6.00	-	NP	-	46.92	40.40	44.08	44.06	2.16			100	92	74	62	40	29	23	
N3-B																							
Subbase	1	25-30	Dark brown silty Gravel-Sand	A-1-b	0	6.51	-	NP	-	57.91	41.88	43.83	47.87	2.17			100	97	76	61	46	30	20	
Subgrade	2	50-70	Dark bworn silty Gravel-Sand	A-1-b	0	5.69	-	NP	-	22.54	48.87	67.18	46.20	2.22			100	95	78	64	51	34	23	

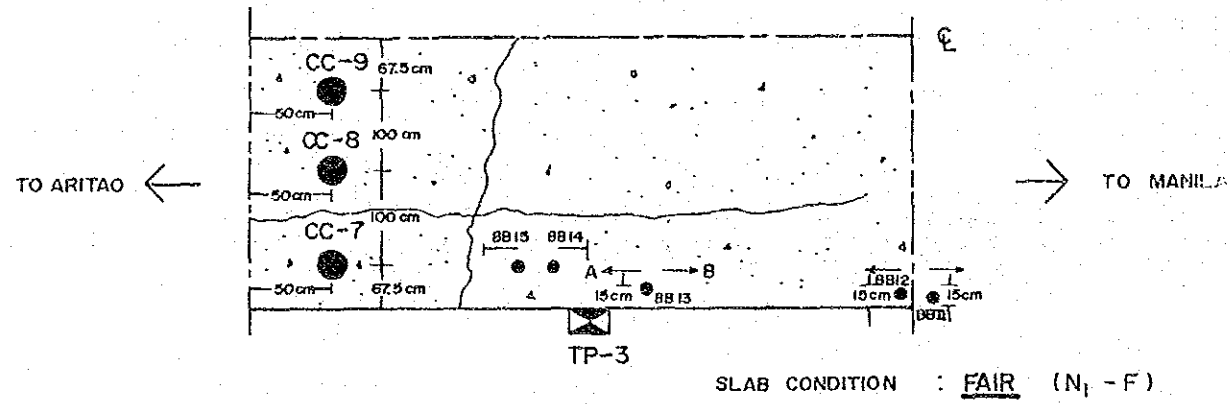
LOCATION OF CONCRETE CORING AND DEFLECTION TEST

CC; Concrete Coring
BB; Deflection Test

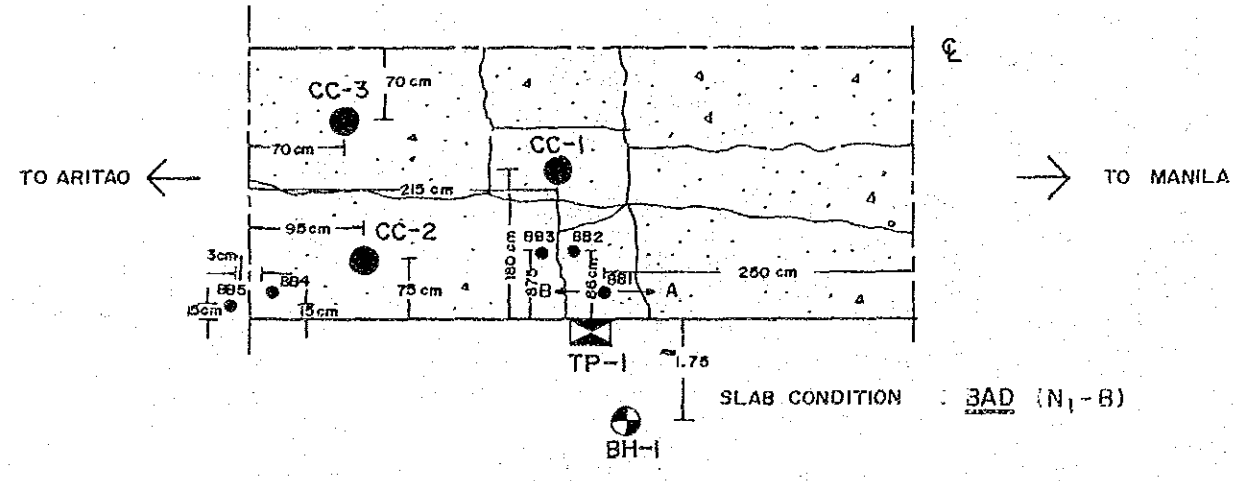
KM. 50 (NORTH SECTION)



50+100



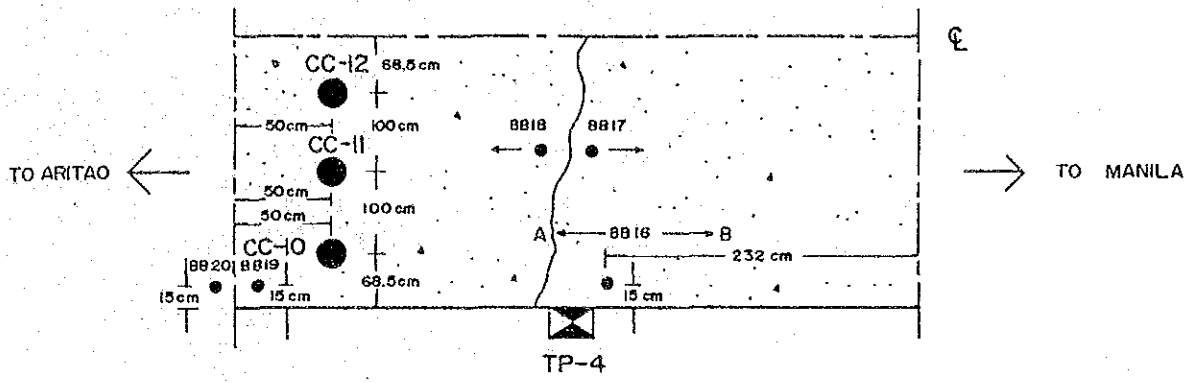
50+300



50+020

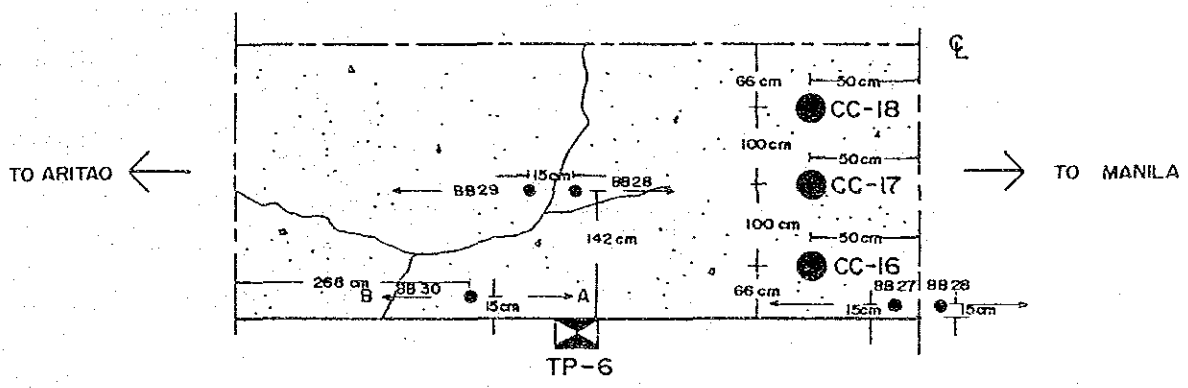
Figure 5

KM. 76 (NORTH SECTION)



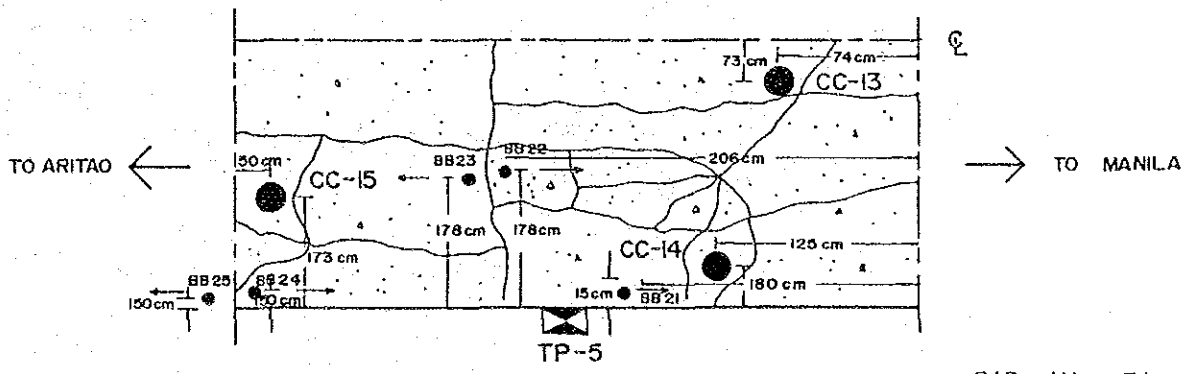
SLAB CONDITION : GOOD (N_2-G)

76+650



76+750

SLAB CONDITION : FAIR (N_2-F)

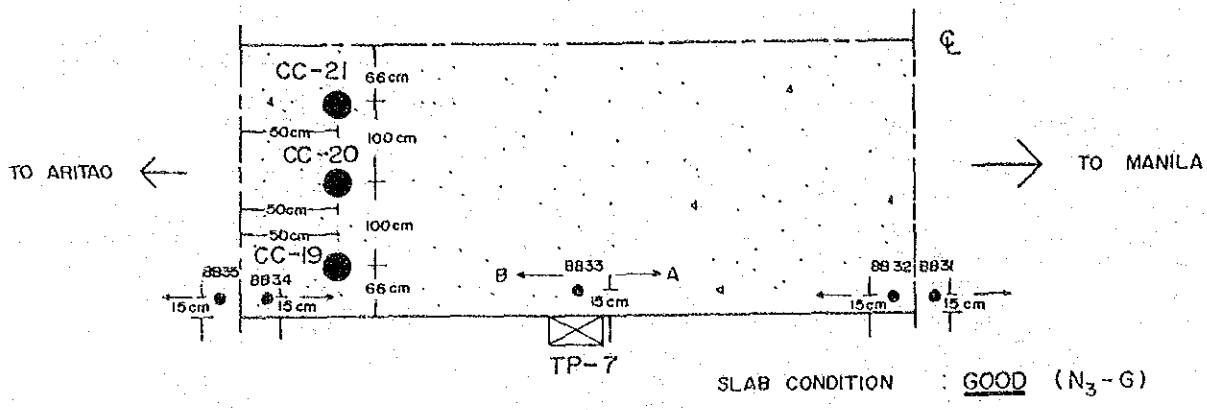


SLAB CONDITION : BAD (N_2-B)

76+700

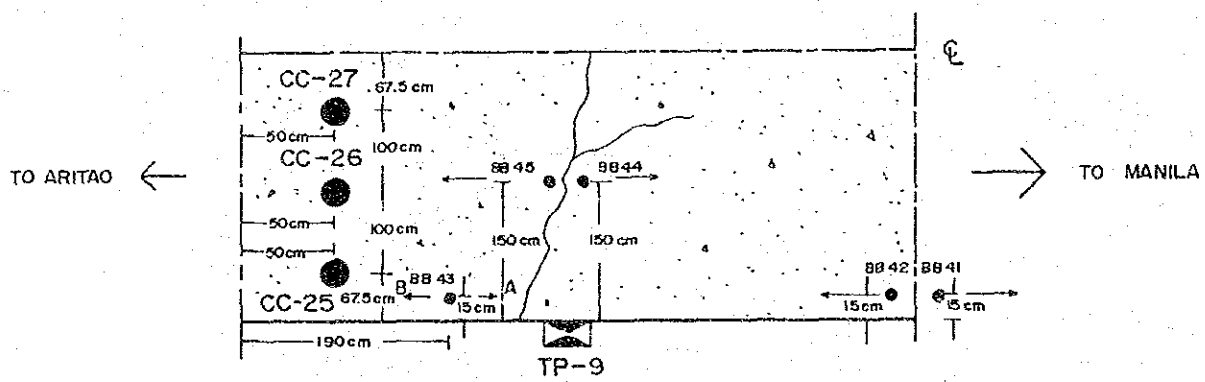
Figure 6

KM. 168 (NORTH SECTION)



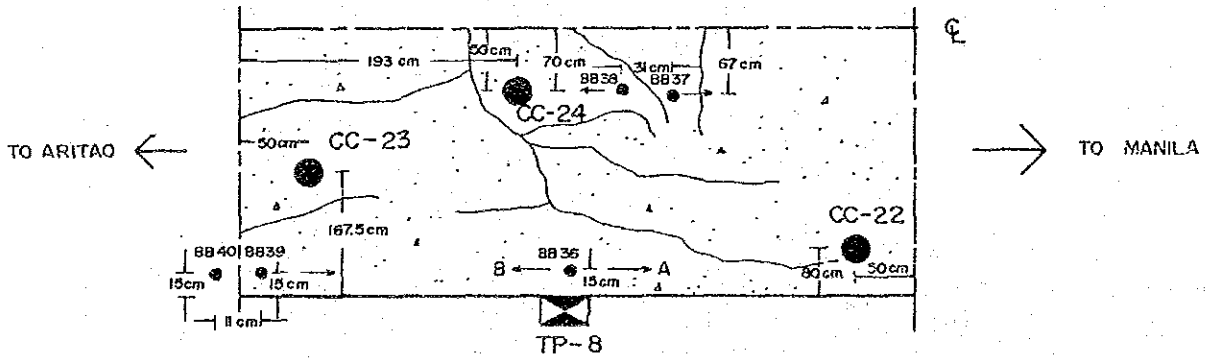
SLAB CONDITION : GOOD (N_3-G)

168+450



SLAB CONDITION : FAIR (N_3-F)

168+600

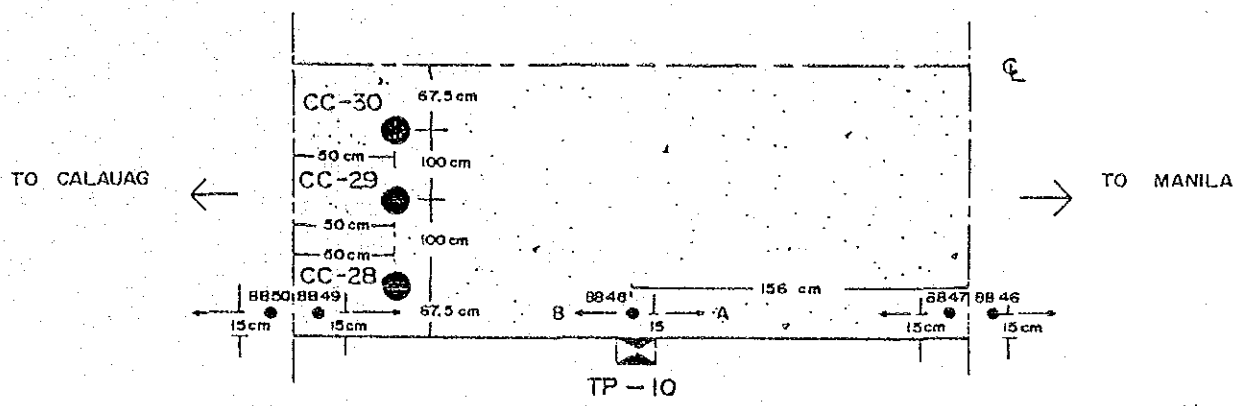


SLAB CONDITION : BAD (N_3-B)

168+550

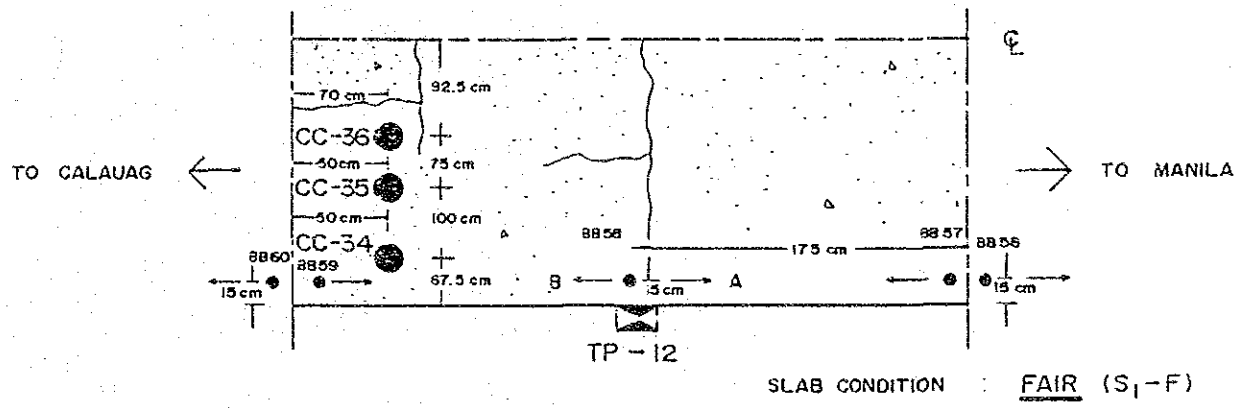
Figure 7

KM. 79 (SOUTH SECTION)



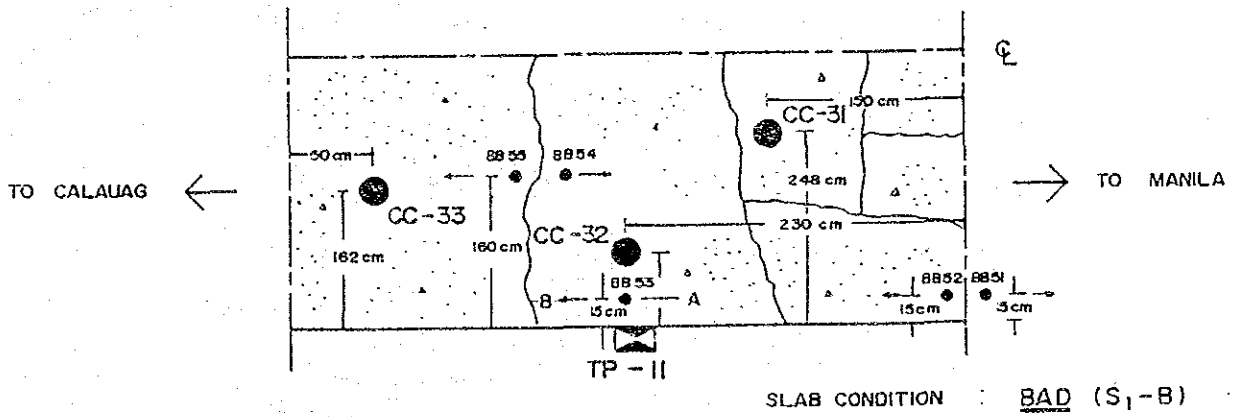
SLAB CONDITION : GOOD (S_1 - G)

79+200



SLAB CONDITION : FAIR (S_1 – F)

79+275



SLAB CONDITION : BAD (S_1 – B)

79+250

Figure 8

KM. 160 (SOUTH SECTION)

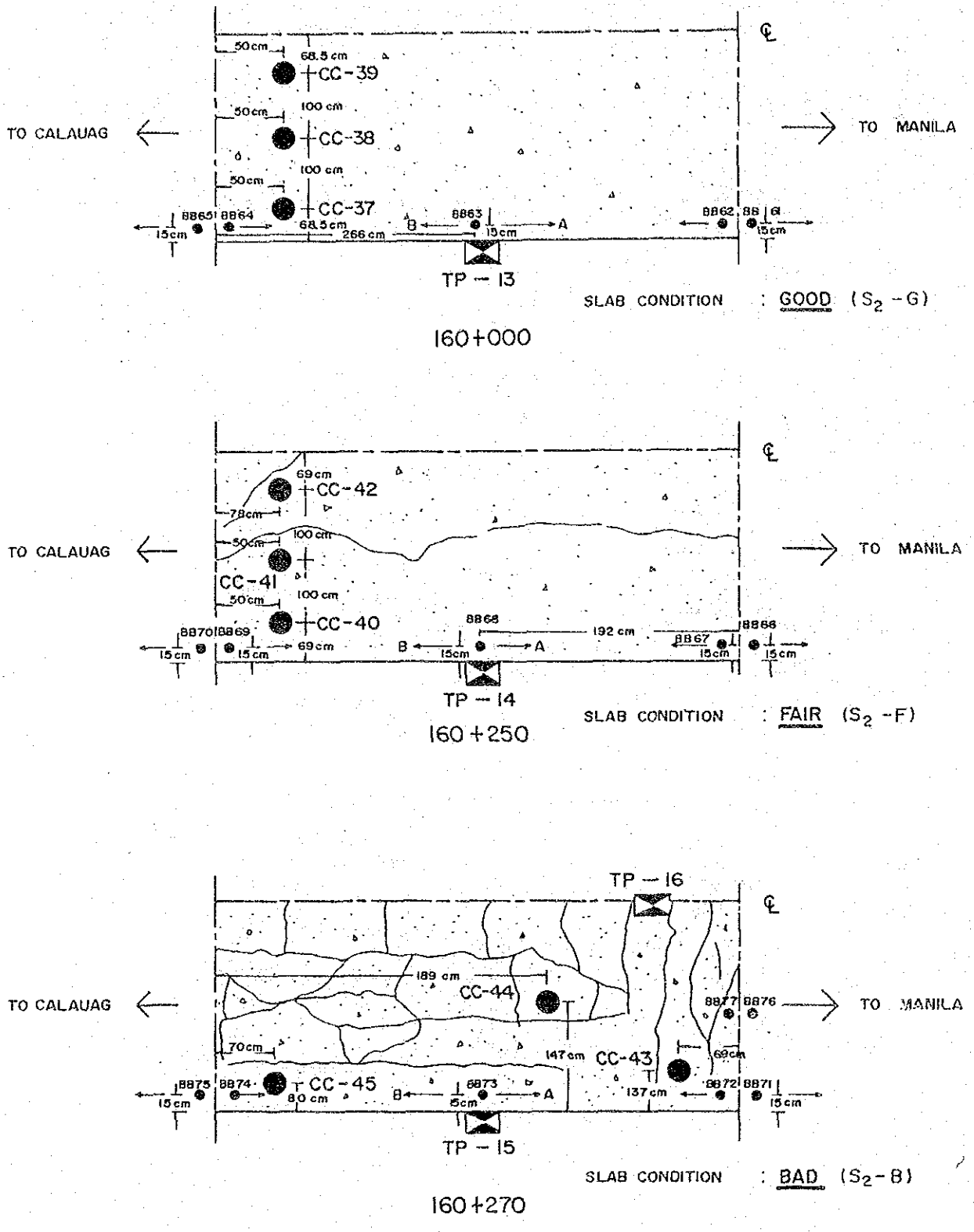


Figure 9

TABLE 4 TEST RESULT OF COMPRESSIVE STRENGTH OF CONCRETE
(NORTH STUDY SECTION)

Survey Slab	No. of Sample	Concrete Core Test			
		Length of Core (in.)	Compressive Strength		
			Psi	MPa	kg/cm^2
N_1-G	1	9.8750	4,241.1	29.24	298.12
	2	9.7500	3,703.5	25.53	260.34
	3	10.3125	4,464.8	30.78	313.85
	AV	9.9792	4,136.5	28.52	290.77
N_1-F	1	9.5625	5,082.0	35.04	357.24
	2	9.3125	5,040.8	34.76	354.34
	3	9.3125	4,176.7	28.80	293.60
	AV	9.3958	4,766.5	32.87	335.06
N_1-B	1	9.0625	5,020.6	34.62	359.92
	2	8.3125	5,085.7	35.06	357.50
	3	9.0625	4,780.4	32.96	336.04
	AV	8.8125	4,962.2	34.21	351.15
N_2-G	1	9.4375	3,431.0	23.66	241.18
	2	10.1875	3,708.3	25.57	260.67
	3	10.4375	3,469.3	23.92	243.87
	AV	10.0208	3,536.2	24.38	248.57
N_2-F	1	9.3125	3,558.3	24.53	250.17
	2	10.0625	3,782.0	26.08	265.86
	3	10.5000	3,417.1	23.56	240.20
	AV	9.9583	3,585.8	24.72	252.08
N_2-B	1	9.8125	3,087.9	21.29	217.06
	2	8.5625	4,063.0	28.01	285.61
	3	9.9375	3,322.5	22.91	233.55
	AV	9.4375	3,491.1	24.07	245.41
N_3-G	1	9.3750	3,809.4	26.26	267.78
	2	9.6875	4,529.1	31.23	318.37
	3	9.0625	3,711.4	25.59	260.89
	AV	9.3750	4,016.6	27.69	282.35
N_3-F	1	8.9375	4,503.7	31.05	316.59
	2	9.5000	4,177.9	28.39	293.69
	3	9.2500	4,276.8	29.49	300.64
	AV	9.2292	4,319.5	29.64	303.64
N_3-B	1	8.7500	3,544.3	24.44	249.75
	2	8.9375	3,281.7	22.63	239.69
	3	8.1250	3,316.7	22.87	233.15
	AV	8.6042	3,380.9	23.31	240.86

TABLE 5 TEST RESULT OF COMPRESSIVE STRENGTH OF CONCRETE
(SOUTH STUDY SECTION)

Survey Slab	No. of Sample	Concrete Core Test			
		Length of Core (in.)	Compressive Strength		
			Psi	MPa	kg/cm^2
S_1-G	1	11.1875	4,300.2	29.65	302.28
	2	11.5625	3,662.4	25.25	257.45
	3	11.0000	3,350.7	23.10	235.54
	AV	11.2500	3,771.1	26.00	265.09
S_1-F	1	9.0625	3,570.2	24.62	250.97
	2	8.5625	3,323.7	22.92	233.64
	3	8.2500	3,764.1	25.95	264.60
	AV	8.6250	3,552.7	24.50	249.74
S_1-B	1	7.8125	3,549.4	24.47	249.50
	2	8.8125	3,356.1	23.14	235.92
	3	9.5000	3,674.3	25.33	258.28
	AV	8.7083	3,526.6	24.31	247.90
S_2-G	1	10.0000	4,469.5	30.82	314.18
	2	9.3750	4,397.1	30.32	309.09
	3	9.9375	4,222.7	29.11	296.83
	AV	9.7708	4,363.1	30.08	306.70
S_2-F	1	9.5000	3,755.5	25.89	263.99
	2	10.0625	4,267.3	29.42	299.97
	3	9.2500	4,298.0	29.63	302.13
	AV	9.6042	4,106.9	28.31	288.70
S_2-B	1	9.5625	4,398.9	30.33	309.22
	2	9.2500	4,742.5	32.70	333.37
	3	9.0000	4,483.8	30.91	315.19
	AV	9.2708	4,541.7	31.31	319.26

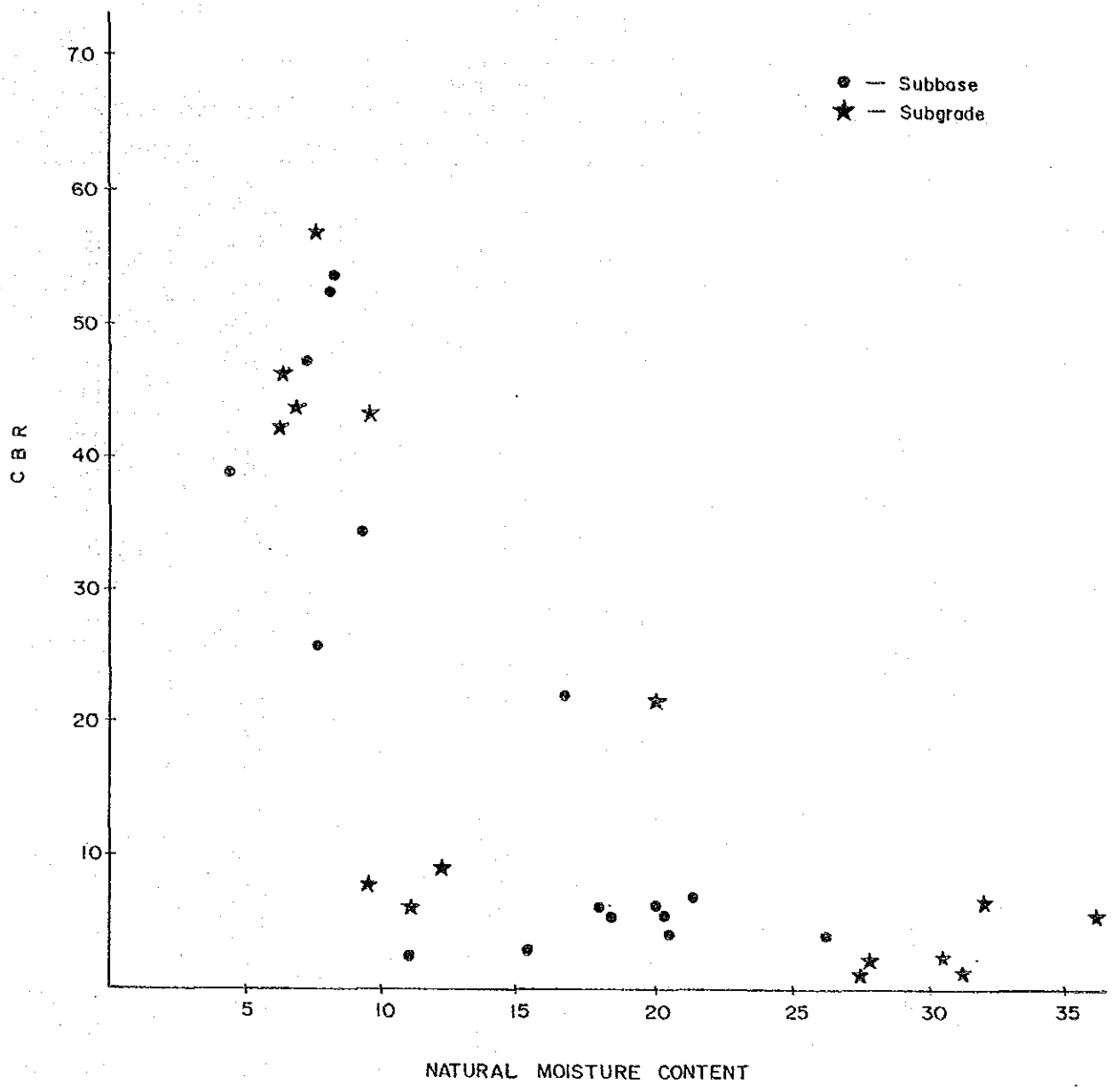


FIGURE 10 RELATIONSHIP BETWEEN CBR AND NATURAL MOISTURE CONTENT

TABLE 6 DEFLECTION

Station	Location	Slab Condition	Transverse Distance (m)	Longitudinal Distance (m)	Deflection (mm)	CBR %
Km. 50	BB - 6	G	.1	.1	.3048	12
N_1-G	BB - 7	G	.1	.1	.3090	12
	BB - 8A	G	.15	2.35	.3048	12
	BB - 8B	G	.15	2.35	.3051	12
	BB - 9	G	.10	4.55	.3641	12
	BB - 10	G	.10	4.70	.3514	12
N_1-F	BB - 11	F	.1	.1	.3006	16
	BB - 12	F	.1	.1	.2032	16
	BB - 13A	F	.1	2.2	.2244	16
	BB - 13B	F	.1	2.2	.2582	16
	BB - 14	F	.9	2.5	.2667	16
	BB - 15	F	.9	2.7	.1905	16
N_1-B	BB - 1A	B	.1	2.15	.207	5
	BB - 1B	B	.1	2.15	.198	5
	BB - 2	B	.9	2.4	.318	5
	BB - 3	B	.9	2.6	.228	5
	BB - 4	B	.1	4.5	.456	5
	BB - 5	B	.1	4.7	.313	5
Km. 76	BB - 16A	G	.1	2.0	.3515	38
N_2-G	BB - 16B	G	.1	2.0	.3090	38
	BB - 17	G	1.3	2.25	.2244	38
	BB - 18	G	1.3	2.45	.2032	38
	BB - 19	G	.1	4.5	.1905	38
	BB - 20	G	.1	4.7	.1058	38
N_2-F	BB - 26	F	.1	.1	.3048	27
	BB - 27	F	.1	.1	.3048	27
	BB - 28	F	1.7	2.8	.1990	27
	BB - 29	F	1.7	3.0	.1016	27
	BB - 30A	F	.1	3.7	.3090	27
	BB - 30B	F	.1	3.7	.3006	27
Km. 76	BB - 21	B	.1	1.9	.3048	46
N_2-B	BB - 22	B	1.3	2.2	.2032	46
	BB - 23	B	1.3	2.5	.2032	46

CONTINUED

Station	Location	Slab Condition	Transverse Distance (m)	Longitudinal Distance (m)	Deflection (mm)	CBR %
N_2-B	BB - 24	B	.1	.1	.3006	46
	BB - 25	B	.1	.1	.4064	46
Km. 168	BB - 31	G	.1	.1	.1016	12
N_3-G	BB - 32	G	.1	.1	.1312	12
	BB - 33A	G	.1	2.0	.1143	12
	BB - 33B	G	.1	2.0	.1397	12
	BB - 34	G	.1	4.2	.1312	12
	BB - 35	G	.1	4.4	.1820	12
N_3-F	BB - 41	F	.1	.1	.1016	40
	BB - 42	F	.1	.1	.1016	40
	BB - 43A	F	.1	2.5	.1016	40
	BB - 43B	F	.1	2.5	.2032	40
	BB - 44	F	1.3	2.1	.1016	40
	BB - 45	F	1.3	2.3	.1016	40
N_3-B	BB - 36A	B	.1	1.9	.1143	47
	BB - 36B	B	.1	1.9	.1058	47
	BB - 37	B	2.85	.93	.1693	47
	BB - 38	B	2.85	1.1	.2032	47
	BB - 39	B	.1	4.15	.1058	47
	BB - 40	B	.1	4.3	0	47
Km. 79	BB - 46	G	.1	.1	.2032	2
South	BB - 47	G	.1	.1	.2032	2
Section	BB - 48A	G	.1	2.2	.1016	2
S_1-G	BB - 48B	G	.1	2.2	.2032	2
	BB - 49	G	.1	4.45	.2032	2
	BB - 50	G	.1	4.60	.2032	2
Km. 79	BB - 56	F	.1	.1	.1312	6
S_1-F	BB - 57	F	.1	.1	.1185	6
	BB - 58A	F	.1	2.2	.2032	6
	BB - 58B	F	.1	2.2	.1016	6
	BB - 59	F	2.2	3.5	.0973	6
	BB - 60	F	2.2	3.7	.2159	6
S_1-B	BB - 51	B	.1	.1	.5080	7

CONTINUED

Station	Location	Slab Condition	Transverse Distance (m)	Longitudinal Distance (m)	Deflection (mm)	CBR %
S_1-B	BB - 52	B	.1	.1	.7112	7
	BB - 53A	B	.1	2.9	.2159	7
	BB - 53B	B	.1	2.9	.4064	7
	BB - 54	B	1.2	3.3	.3048	7
	BB - 55	B	1.2	3.55	.2625	7
Km. 160	BB - 61	G	.1	.1	.2032	23
S_2-G	BB - 62	G	.1	.1	.0279	23
	BB - 63A	G	.1	2.3	.2032	23
	BB - 63B	G	.1	2.3	.2032	23
	BB - 64	G	.1	4.55	.2032	23
	BB - 65	G	.1	4.70	.2032	23
S_2-F	BB - 66	F	.1	.1	.2074	3
	BB - 67	F	.1	.1	.2074	3
	BB - 68A	F	.1	2.3	.1379	3
	BB - 68B	F	.1	2.3	.2032	3
	BB - 69	F	.1	4.5	.2032	3
	BB - 70	F	.1	4.7	.3937	3
S_2-B	BB - 71	B	.1	.1	.1270	2
	BB - 72	B	.1	.1	.2032	2
	BB - 73A	B	.1	2.4	.2032	2
	BB - 73B	B	.1	2.4	.2032	2
	BB - 74A	B	.1	4.65	.1016	2
Km. 168	BB - 75	B	.1	4.8	.2032	2
	BB - 76	B	1.35	.1	1.7695	2
	BB - 77	B	1.55	.1	.4487	2
	BB - 78	B	.1	.1	1.0160	2
	BB - 79	B	.1	.1	1.4478	2

APPENDIX 14-3

TRAFFIC VOLUME AND AXLE LOAD DISTRIBUTION

TABLE 1 TRAFFIC VOLUME IN 1968, 1980 and 1986

	1968, ADT					1980, ADT					1986, ADT				
	Cars	Jeepneys	Buses	Trucks	Total	Cars	Jeepneys	Buses	Trucks	Total	Cars	Jeepneys	Buses	Trucks	To
North Section															
Sta. Rita-Gapan	970	400	480	780	2,630	2,410	1,220	740	1,280	5,650	2,760	1,660	830	1,530	6
Gapan-Cabanatuan	920	320	460	690	2,390	2,350	1,130	600	1,170	5,250	2,920	1,450	610	1,250	6
Cabanatuan-San Jose	350	120	260	280	1,010	1,070	1,020	270	940	3,300	1,130	1,730	280	1,020	4
San Jose-Aritao	180	70	120	240	610	500	300	200	650	1,650	600	750	210	810	2
South Section															
Calamba-Sto. Tomas	1,210	510	560	540	2,820	4,750	1,190	730	1,520	8,190	7,000	1,590	1,130	1,870	11
Sto. Tomas-Tiaong	560	370	290	380	1,600	2,330	940	450	670	4,390	3,466	980	480	940	5
Tiaong-Lucena	960	550	360	420	2,290	1,630	1,100	580	860	4,170	2,030	1,130	620	1,230	5
Lucena-Gumaca	190	70	140	220	620	730	330	360	570	1,990	740	400	380	640	2
Gumaca-Calauag	110	40	100	160	410	670	290	250	600	1,810	830	370	260	610	2

SOURCE: 1968 ADT: National Transport Development 1970, Philippine Trasnport Survey
1980 ADT: National Transportation Planning Project 1982
1986 ADT: This Study

TABLE 2 AVERAGE TRAFFIC GROWTH RATE PER ANNUM (%)

Section	1968 - 1980					1980 - 1986					1968 - 1986				
	Car	Jeepney	Bus	Truck	Total	Car	Jeepney	Bus	Truck	Total	Car	Jeepney	Bus	Truck	Total
Sta. Rita-Gapan	7.9	9.7	3.7	4.2	6.6	2.3	5.3	1.9	3.0	3.1	6.0	8.2	3.1	3.8	5.4
Gapan-Cabanatuan	8.1	11.1	2.2	4.5	6.3	3.7	4.2	0.3	1.1	2.9	6.6	8.0	1.6	3.4	5.5
Cabanatuan-San Jose	9.8	19.5	0.3	10.6	10.4	0.9	9.2	0.6	1.4	3.9	6.7	16.0	0.4	7.4	8.2
San Jose-Aritao	0.9	12.9	4.3	8.7	8.6	3.1	16.5	0.8	3.7	6.2	6.9	14.1	3.2	7.0	7.8
Calamba-Sto. Tomas	12.1	7.3	2.2	9.0	9.3	6.8	4.8	7.6	3.6	6.0	10.3	6.5	4.0	7.2	8.2
Sto. Tomas-Tiaong	12.6	8.1	3.7	4.8	8.8	6.8	0.7	1.1	5.8	4.9	10.6	5.6	2.8	5.2	7.5
Tiaong-Lucena	4.5	6.0	4.1	6.2	5.1	3.7	0.4	1.1	6.1	3.1	4.2	4.1	3.1	6.2	4.4
Lucena-Gumaca	11.9	13.8	8.2	8.2	10.2	0.2	3.2	0.9	1.9	1.4	7.8	10.2	5.7	6.1	7.2
Gumaca-Calauag	16.2	17.9	7.9	11.6	13.2	3.6	4.1	0.6	0.3	2.3	11.9	13.2	5.4	7.7	9.4

TABLE 3 SHARE OF LOADED (UNLOADED) TRUCKS AND TRUCK TRAFFIC COMPOSITION

	% of Loaded (Unloaded) Trucks				Truck Traffic Composition (%)			
	Manila Bound		Cagayan (Bicol) Bound					
	Loaded	Unloaded	Loaded	Unloaded	2-Axle	3-Axle	4-Axle	5-Axle
North Section								
Sta. Rita-Gapan	74	26	34	66	68.0	29.0	1.5	1.5
Gapan-Cabanatuan	75	25	35	65	57.0	39.0	2.0	2.0
Cabanatuan-San Jose	75	25	35	65	44.0	48.0	3.5	4.0
San Jose-Aritao	75	25	35	65	42.5	49.5	3.5	4.0
South Section								
Calamba-Sto. Tomas	54	46	50	50	66.0	25.5	4.0	4.5
Sto. Tomas-Tiaong	62	38	52	48	65.0	31.5	2.0	1.5
Tiaong-Lucena	62	38	52	48	65.0	31.5	2.0	1.5
Lucena-Gumaca	75	25	62	38	63.0	32.0	3.0	2.0
Gumaca-Calauag	75	25	62	38	63.0	32.0	3.0	2.0

SOURCE: Pavement and Axle Load Study

TABLE 4 AXLE LOAD DISTRIBUTION OF HEAVY TRUCKS PER 1000 VEHICLES

Axle Load Groups (kg)	Representative Axle Load (ton)	(lbs)	(KN)	SECTION: STA. RITA-GAPAN Manila Bound All Axles are Treated as A Single Axle	Manila Bound Single and Tandem Axles: Single Axle	Manila Bound Single and Tandem Axles: Tandem Axle	Cagayan Bound All Axles are Treated as A Single Axle	Cagayan Bound Single and Tandem Axles: Single Axle	Cagayan Bound Single and Tandem Axles: Tandem Axle
0.5 - 1.5	1.0	2,205	9.8	6	6	-	14	13	-
1.5 - 2.5	2.0	4,410	19.6	135	133	-	128	128	-
2.5 - 3.5	3.0	6,615	29.4	370	368	-	537	540	-
3.5 - 4.5	4.0	8,820	39.2	377	378	-	684	691	-
4.5 - 5.5	5.0	11,025	49.0	282	281	-	444	450	-
5.5 - 6.5	6.0	13,230	58.7	107	125	1	129	128	1
6.5 - 7.5	7.0	15,435	68.5	133	120	-	65	61	-
7.5 - 8.5	8.0	17,640	78.3	75	58	1	61	41	2
8.5 - 9.5	9.0	19,845	88.1	119	46	1	62	29	1
9.5 - 10.5	10.0	22,050	98.3	101	29	-	54	26	2
10.5 - 11.5	11.0	24,255	108.1	83	35	2	50	24	2
11.5 - 12.5	12.0	26,460	117.9	87	42	1	33	14	4
12.5 - 13.5	13.0	28,665	127.7	124	94	1	31	14	2
13.5 - 14.5	14.0	30,870	137.5	114	61	3	23	8	6
14.5 - 15.5	15.0	33,075	147.3	85	37	3	17	7	4
15.5 - 16.5	16.0	35,280	157.1	67	21	3	13	2	8
16.5 - 17.5	17.0	37,485	166.9	56	22	2	10	-	6
17.5 - 18.5	18.0	39,690	176.7	27	5	3	7	-	8
18.5 - 19.5	19.0	41,895	186.5	14	6	6	3	-	6
19.5 - 20.5	20.0	44,100	196.2	3	-	5	1	-	7
20.5 - 21.5	21.0	46,305	206.0	-	-	7	-	-	12
21.5 - 22.5	22.0	48,510	215.8	-	-	13	-	-	8
22.5 - 23.5	23.0	50,715	225.6	-	-	25	-	-	5
23.5 - 24.5	24.0	52,920	235.4	-	-	30	-	-	7
24.5 - 25.5	25.0	55,125	245.2	-	-	32	-	-	14
25.5 - 26.5	26.0	57,330	255.0	-	-	29	-	-	15
26.5 - 27.5	27.0	59,535	264.0	-	-	25	-	-	7
27.5 - 28.5	28.0	61,740	274.6	-	-	15	-	-	9
28.5 - 29.5	29.0	63,945	284.4	-	-	13	-	-	11
29.5 - 30.5	30.0	66,150	294.6	-	-	10	-	-	4
30.5 - 31.5	31.0	68,355	304.4	-	-	9	-	-	2
31.5 - 32.5	32.0	70,560	314.2	-	-	4	-	-	2
32.5 - 33.5	33.0	72,765	324.0	-	-	3	-	-	-
33.5 - 34.5	34.0	74,970	333.8	-	-	3	-	-	-
34.5 - 35.5	35.0	77,175	343.5	-	-	1	-	-	-
35.5 - 36.5	36.0	79,380	353.5	-	-	-	-	-	-
36.5 - 37.5	37.0	81,585	363.1	-	-	-	-	-	-
37.5 - 38.5	38.0	83,790	372.9	-	-	1	-	-	-

TABLE 5 AXLE LOAD DISTRIBUTION OF HEAVY TRUCKS PER 1000 VEHICLES

Axle Load Groups (kg)	Representative Axle Load (ton)	(lbs)	(KN)	SECTION: GAPAN-CABANATUAN Manila Bound: All Axles are Treated as A Single Axle	Manila Bound: Single and Tandem Axles: Single Axle	Manila Bound: Single and Tandem Axles: Tandem Axle	Cagayan Bound: All Axles are Treated as A Single Axle	Cagayan Bound: Single and Tandem Axles: Single Axle	Cagayan Bound: Single and Tandem Axles: Tandem Axle
0.5 - 1.5	1.0	2,205	9.8	5	5	-	13	13	-
1.5 - 2.5	2.0	4,410	19.6	120	119	-	127	128	-
2.5 - 3.5	3.0	6,615	29.4	343	343	-	543	540	-
3.5 - 4.5	4.0	8,820	39.2	368	371	-	705	691	-
4.5 - 5.5	5.0	11,025	49.0	285	286	-	464	450	-
5.5 - 6.5	6.0	13,230	58.7	157	148	1	139	128	1
6.5 - 7.5	7.0	15,435	68.5	157	141	-	77	61	-
7.5 - 8.5	8.0	17,640	78.3	82	59	1	74	41	2
8.5 - 9.5	9.0	19,845	88.1	137	40	1	70	29	1
9.5 - 10.5	10.0	22,050	98.3	119	25	-	59	26	2
10.5 - 11.5	11.0	24,255	108.1	92	30	2	55	24	2
11.5 - 12.5	12.0	26,460	117.9	93	36	1	38	14	4
12.5 - 13.5	13.0	28,665	127.7	118	80	1	35	14	2
13.5 - 14.5	14.0	30,870	137.5	121	52	3	27	8	6
14.5 - 15.5	15.0	33,075	147.3	94	32	3	19	7	4
15.5 - 16.5	16.0	35,280	157.1	80	18	3	17	2	8
16.5 - 17.5	17.0	37,485	166.9	65	19	2	14	-	6
17.5 - 18.5	18.0	39,690	176.7	34	4	3	9	-	8
18.5 - 19.5	19.0	41,895	186.5	16	5	8	4	-	6
19.5 - 20.5	20.0	44,100	196.2	35	-	7	2	-	7
20.5 - 21.5	21.0	46,305	206.0	-	-	9	-	-	12
21.5 - 22.5	22.0	48,510	215.8	-	-	18	-	-	8
22.5 - 23.5	23.0	50,715	225.6	-	-	34	-	-	5
23.5 - 24.5	24.0	52,920	235.4	-	-	41	-	-	7
24.5 - 25.5	25.0	55,125	245.2	-	-	43	-	-	14
25.5 - 26.5	26.0	57,330	255.0	-	-	40	-	-	15
26.5 - 27.5	27.0	59,535	264.8	-	-	34	-	-	7
27.5 - 28.5	28.0	61,740	274.6	-	-	20	-	-	9
28.5 - 29.5	29.0	63,945	284.4	-	-	18	-	-	11
29.5 - 30.5	30.0	66,150	294.6	-	-	14	-	-	4
30.5 - 31.5	31.0	68,355	304.4	-	-	12	-	-	2
31.5 - 32.5	32.0	70,560	314.2	-	-	6	-	-	2
32.5 - 33.5	33.0	72,765	324.0	-	-	5	-	-	-
33.5 - 34.5	34.0	74,970	333.8	-	-	3	-	-	-
34.5 - 35.5	35.0	77,175	343.5	-	-	1	-	-	-
35.5 - 36.5	36.0	79,380	353.3	-	-	-	-	-	-
36.5 - 37.5	37.0	81,585	363.1	-	-	-	-	-	-
37.5 - 38.5	38.0	83,790	372.9	-	-	1	-	-	-

TABLE 6 AXLE LOAD DISTRIBUTION OF HEAVY TRUCKS PER 1000 VEHICLES

Axle Load Groups (kg)	Representative Axle Load (ton)	(lbs)	(KN)	SECTION: CABANATUAN-SAN JOSE Manila Bound All Axles are Treated as A Single Axle	Manila Bound Single and Tandem Axles Single Axle	Manila Bound Single and Tandem Axles Tandem Axle	Cagayan Bound All Axles are Treated as A Single Axle	Cagayan Bound Single and Tandem Axles Single Axle	Cagayan Bound Single and Tandem Axles Tandem Axle
0.5 - 1.5	1.0	2,205	9.8	6	6	-	9	9	-
1.5 - 2.5	2.0	4,410	19.6	77	75	-	119	117	-
2.5 - 3.5	3.0	6,615	29.4	347	337	-	551	542	-
3.5 - 4.5	4.0	8,870	39.2	412	378	2	769	752	-
4.5 - 5.5	5.0	11,025	49.0	320	292	-	506	496	2
5.5 - 6.5	6.0	13,230	58.7	229	218	-	161	134	8
6.5 - 7.5	7.0	15,435	68.5	170	150	2	68	58	14
7.5 - 8.5	8.0	17,640	78.3	108	59	6	61	29	3
8.5 - 9.5	9.0	19,845	88.1	163	26	2	122	30	2
9.5 - 10.5	10.0	22,050	98.3	139	28	-	71	22	3
10.5 - 11.5	11.0	24,255	108.1	105	26	6	65	30	3
11.5 - 12.5	12.0	26,460	117.9	87	36	-	24	13	7
12.5 - 13.5	13.0	28,665	127.7	87	38	4	31	10	3
13.5 - 14.5	14.0	30,870	137.5	106	29	-	35	5	7
14.5 - 15.5	15.0	33,075	147.3	123	44	8	45	6	12
15.5 - 16.5	16.0	35,280	157.1	97	12	8	30	2	5
16.5 - 17.5	17.0	37,485	166.9	52	16	-	6	-	3
17.5 - 18.5	18.0	39,690	176.7	25	3	4		-	8
18.5 - 19.5	19.0	41,895	186.5	12	-	8	2	-	7
19.5 - 20.5	20.0	44,100	196.2	4	-	4	-	-	-
20.5 - 21.5	21.0	46,305	206.0	-	-	19	-	-	7
21.5 - 22.5	22.0	48,510	215.8	-	-	30	-	-	8
22.5 - 23.5	23.0	50,715	225.6	-	-	49	-	-	25
23.5 - 24.5	24.0	52,920	235.4	-	-	47	-	-	30
24.5 - 25.5	25.0	55,125	245.2	-	-	58	-	-	24
25.5 - 26.5	26.0	57,330	255.0	-	-	47	-	-	8
26.5 - 27.5	27.0	59,535	264.8	-	-	49	-	-	5
27.5 - 28.5	28.0	61,740	274.6	-	-	34	-	-	8
28.5 - 29.5	29.0	63,945	284.4	-	-	24	-	-	3
29.5 - 30.5	30.0	66,150	294.6	-	-	15	-	-	2
30.5 - 31.5	31.0	68,355	304.4	-	-	15	-	-	-
31.5 - 32.5	32.0	70,560	314.2	-	-	8	-	-	-
32.5 - 33.5	33.0	72,765	324.0	-	-	2	-	-	-
33.5 - 34.5	34.0	74,970	333.8	-	-	2	-	-	-
34.5 - 35.5	35.0	77,175	343.5	-	-	-	-	-	-
35.5 - 36.5	36.0	79,380	353.3	-	-	-	-	-	-
36.5 - 37.5	37.0	81,585	363.1	-	-	-	-	-	-
37.5 - 38.5	38.0	83,790	372.9	-	-	-	-	-	-

TABLE 7 AXLE LOAD DISTRIBUTION OF HEAVY TRUCKS PER 1000 VEHICLES

Axle Load Groups (kg)	Representative Axle Load (ton)	(lbs)	(KN)	SECTION: SAN JOSE-ARITAO Manila Bound: All Axles are Treated as A Single Axle	Manila Bound: Single and Tandem Axles: Single Axle	Manila Bound: Single and Tandem Axles: Tandem Axle	Cagayan Bound: All Axles are Treated as A Single Axle	Cagayan Bound: Single and Tandem Axles: Single Axle	Cagayan Bound: Single and Tandem Axles: Tandem Axle
0.5 - 1.5	1.0	2,205	9.8	6	6	-	9	9	-
1.5 - 2.5	2.0	4,410	19.6	76	74	-	118	117	-
2.5 - 3.5	3.0	6,615	29.4	343	332	-	550	540	-
3.5 - 4.5	4.0	8,820	39.2	411	376	2	767	750	-
4.5 - 5.5	5.0	11,025	49.0	321	292	-	505	495	2
5.5 - 6.5	6.0	13,230	58.7	229	219	-	162	134	9
6.5 - 7.5	7.0	15,435	68.5	172	151	2	69	59	14
7.5 - 8.5	8.0	17,640	78.3	109	58	6	62	29	3
8.5 - 9.5	9.0	19,845	88.1	165	26	2	123	29	2
9.5 - 10.5	10.0	22,050	98.3	140	27	-	72	21	3
10.5 - 11.5	11.0	24,255	108.1	106	26	6	64	29	3
11.5 - 12.5	12.0	26,460	117.9	87	35	-	23	12	7
12.5 - 13.5	13.0	28,665	127.7	87	37	4	32	10	3
13.5 - 14.5	14.0	30,870	137.5	106	28	-	35	5	7
14.5 - 15.5	15.0	33,075	147.3	124	42	8	45	6	12
15.5 - 16.5	16.0	35,280	157.1	99	11	8	29	2	5
16.5 - 17.5	17.0	37,485	166.9	52	15	-	6	-	3
17.5 - 18.5	18.0	39,690	176.7	26	3	4	-	-	9
18.5 - 19.5	19.0	41,895	186.5	12	-	8	2	-	7
19.5 - 20.5	20.0	44,100	196.2	4	-	4	-	-	-
20.5 - 21.5	21.0	46,305	206.0	-	-	19	-	-	7
21.5 - 22.5	22.0	48,510	215.8	-	-	31	-	-	9
22.5 - 23.5	23.0	50,715	225.6	-	-	50	-	-	26
23.5 - 24.5	24.0	52,920	235.4	-	-	48	-	-	31
24.5 - 25.5	25.0	55,125	245.2	-	-	59	-	-	24
25.5 - 26.5	26.0	57,330	255.0	-	-	48	-	-	9
26.5 - 27.5	27.0	59,535	264.8	-	-	50	-	-	5
27.5 - 28.5	28.0	61,740	274.6	-	-	34	-	-	9
28.5 - 29.5	29.0	63,945	284.4	-	-	25	-	-	3
29.5 - 30.5	30.0	66,150	294.6	-	-	15	-	-	2
30.5 - 31.5	31.0	68,355	304.4	-	-	15	-	-	-
31.5 - 32.5	32.0	70,560	314.2	-	-	8	-	-	-
32.5 - 33.5	33.0	72,765	324.0	-	-	2	-	-	-
33.5 - 34.5	34.0	74,970	333.8	-	-	2	-	-	-
34.5 - 35.5	35.0	77,175	343.5	-	-	-	-	-	-
35.5 - 36.5	36.0	79,380	353.3	-	-	-	-	-	-
36.5 - 37.5	37.0	81,585	363.1	-	-	-	-	-	-
37.5 - 38.5	38.0	83,790	372.9	-	-	-	-	-	-

TABLE 8 AXLE LOAD DISTRIBUTION OF HEAVY TRUCKS PER 1000 VEHICLES

Axle Load Groups (kg)	Representative Axle Load (ton)	(lbs)	(KN)	SECTION: LUCENA-GUMACA, GUMACA-CALAUAG Manila Bound: All Axles are Treated as A Single Axle	Manila Bound: Single and Tandem Axles: Single Axle	Manila Bound: Single and Tandem Axles: Tandem Axle	Cagayan Bound: All Axles are Treated as A Single Axle	Cagayan Bound: Single and Tandem Axles: Single Axle	Cagayan Bound: Single and Tandem Axles: Tandem Axle
0.5 - 1.5	1.0	2,205	9.8	21	21	-	39	40	-
1.5 - 2.5	2.0	4,410	19.6	137	137	-	202	212	-
2.5 - 3.5	3.0	6,615	29.4	386	373	-	438	441	-
3.5 - 4.5	4.0	8,820	39.2	437	412	-	481	474	-
4.5 - 5.5	5.0	11,025	49.0	294	289	-	418	377	6
5.5 - 6.5	6.0	13,230	58.7	246	192	-	180	155	6
6.5 - 7.5	7.0	15,435	68.5	141	104	-	115	84	13
7.5 - 8.5	8.0	17,640	78.3	119	50	-	83	29	-
8.5 - 9.5	9.0	19,845	88.1	111	27	9	100	40	-
9.5 - 10.5	10.0	22,050	98.3	118	41	-	92	22	6
10.5 - 11.5	11.0	24,255	108.1	125	60	-	86	31	6
11.5 - 12.5	12.0	26,460	117.9	48	36	-	67	40	-
12.5 - 13.5	13.0	28,665	127.7	36	36	-	50	13	6
13.5 - 14.5	14.0	30,870	137.5	81	36	19	23	5	-
14.5 - 15.5	15.0	33,075	147.3	58	23	28	48	5	19
15.5 - 16.5	16.0	35,280	157.1	45	18	19	17	5	13
16.5 - 17.5	17.0	37,485	166.9	35	-	9	-	-	13
17.5 - 18.5	18.0	39,690	176.7	-	-	9	-	-	19
18.5 - 19.5	19.0	41,895	186.5	-	-	19	-	-	13
19.5 - 20.5	20.0	44,100	196.2	-	-	9	-	-	6
20.5 - 21.5	21.0	46,305	206.0	-	-	-	-	-	32
21.5 - 22.5	22.0	48,510	215.8	-	-	-	-	-	6
22.5 - 23.5	23.0	50,715	225.6	-	-	38	-	-	6
23.5 - 24.5	24.0	52,920	235.4	-	-	28	-	-	13
24.5 - 25.5	25.0	55,125	245.2	-	-	57	-	-	52
25.5 - 26.5	26.0	57,330	255.0	-	-	19	-	-	6
26.5 - 27.5	27.0	59,535	264.8	-	-	19	-	-	-
27.5 - 28.5	28.0	61,740	274.6	-	-	9	-	-	-
28.5 - 29.5	29.0	63,945	284.4	-	-	-	-	-	-
29.5 - 30.5	30.0	66,150	294.6	-	-	-	-	-	-
30.5 - 31.5	31.0	68,355	304.4	-	-	-	-	-	-
31.5 - 32.5	32.0	70,560	314.2	-	-	-	-	-	-
32.5 - 33.5	33.0	72,765	324.0	-	-	-	-	-	-
33.5 - 34.5	34.0	74,970	333.8	-	-	-	-	-	-
34.5 - 35.5	35.0	77,175	343.5	-	-	-	-	-	-
35.5 - 36.5	36.0	79,380	353.3	-	-	-	-	-	-
36.5 - 37.5	37.0	81,585	363.1	-	-	-	-	-	-
37.5 - 38.5	38.0	83,790	372.9	-	-	-	-	-	-

TABLE 9 AXLE LOAD DISTRIBUTION OF HEAVY TRUCKS PER 1000 VEHICLES

Axle Load Groups (kg)	Representative Axle Load (ton)	(lbs)	(KN)	SECTION: CALAMBA-STO. TOMAS Manila Bound: All Axles are Treated as A Single Axle	Manila Bound: Single and Tandem Axles: Single Axle	Manila Bound: Single and Tandem Axles: Tandem Axle	Cagayan Bound: All Axles are Treated as A Single Axle	Cagayan Bound: Single and Tandem Axles: Single Axle	Cagayan Bound: Single and Tandem Axles: Tandem Axle
0.5 - 1.5	1.0	2,205	9.8	10	11	-	12	65	-
1.5 - 2.5	2.0	4,410	19.6	87	89	-	114	114	-
2.5 - 3.5	3.0	6,615	29.4	399	403	-	459	452	-
3.5 - 4.5	4.0	8,820	39.2	588	609	-	614	607	-
4.5 - 5.5	5.0	11,025	49.0	416	426	1	437	424	-
5.5 - 6.5	6.0	13,230	58.7	192	167	1	180	154	1
6.5 - 7.5	7.0	15,435	68.5	164	99	3	146	86	6
7.5 - 8.5	8.0	17,640	78.3	132	37	3	110	44	10
8.5 - 9.5	9.0	19,845	88.1	110	33	5	107	50	5
9.5 - 10.5	10.0	22,050	98.3	90	34	-	58	28	2
10.5 - 11.5	11.0	24,255	108.1	62	26	3	41	24	6
11.5 - 12.5	12.0	26,460	117.9	40	24	4	55	25	1
12.5 - 13.5	13.0	28,665	127.7	50	31	2	51	30	2
13.5 - 14.5	14.0	30,870	137.5	44	24	5	47	24	10
14.5 - 15.5	15.0	33,075	147.3	37	20	10	23	9	9
15.5 - 16.5	16.0	35,280	157.1	28	15	9	9	1	9
16.5 - 17.5	17.0	37,485	166.9	12	6	14	4	1	6
17.5 - 18.5	18.0	39,690	176.7	4	3	9	3	-	10
18.5 - 19.5	19.0	41,895	186.5	2	-	12	-	-	9
19.5 - 20.5	20.0	44,100	196.2	2	-	15	1	-	20
20.5 - 21.5	21.0	46,305	206.0	1	-	19	-	-	15
21.5 - 22.5	22.0	48,510	215.8	-	-	16	-	-	20
22.5 - 23.5	23.0	50,715	225.6	-	-	10	-	-	12
23.5 - 24.5	24.0	52,920	235.4	-	-	18	-	-	15
24.5 - 25.5	25.0	55,125	245.2	-	-	15	-	-	6
25.5 - 26.5	26.0	57,330	255.0	-	-	10	-	-	7
26.5 - 27.5	27.0	59,535	264.8	-	-	4	-	-	2
27.5 - 28.5	28.0	61,740	274.6	-	-	8	-	-	2
28.5 - 29.5	29.0	63,945	284.4	-	-	4	-	-	1
29.5 - 30.5	30.0	66,150	294.6	-	-	3	-	-	2
30.5 - 31.5	31.0	68,355	304.4	-	-	-	-	-	-
31.5 - 32.5	32.0	70,560	314.2	-	-	3	-	-	-
32.5 - 33.5	33.0	72,765	324.0	-	-	-	-	-	-
33.5 - 34.5	34.0	74,970	333.8	-	-	1	-	-	-
34.5 - 35.5	35.0	77,175	343.5	-	-	-	-	-	-
35.5 - 36.5	36.0	79,380	353.3	-	-	-	-	-	-
36.5 - 37.5	37.0	81,585	363.1	-	-	-	-	-	-
37.5 - 38.5	38.0	83,790	372.9	-	-	-	-	-	-

TABLE 10 AXLE LOAD DISTRIBUTION OF HEAVY TRUCKS PER 1000 VEHICLES

Axle Load Groups (kg)	Representative Axle Load (ton)	(lbs)	(KN)	SECTION: STO. TOMAS-TIAONG AND TIAONG-LUCENA Manila Bound: All Axles are Treated as A Single Axle	Manila Bound: Single and Tandem Axles: Single Axle	Manila Bound: Single and Tandem Axles: Tandem Axle	Cagayan Bound: All Axles are Treated as A Single Axle	Cagayan Bound: Single and Tandem Axles: Single Axle	Cagayan Bound: Single and Tandem Axles: Tandem Axle
0.5 - 1.5	1.0	2,205	9.8	19	19	-	36	36	-
1.5 - 2.5	2.0	4,410	19.6	140	140	-	196	201	-
2.5 - 3.5	3.0	6,615	29.4	439	429	-	478	477	-
3.5 - 4.5	4.0	8,820	39.2	514	497	-	550	542	-
4.5 - 5.5	5.0	11,025	49.0	334	331	-	433	400	5
5.5 - 6.5	6.0	13,230	58.7	214	168	-	162	137	5
6.5 - 7.5	7.0	15,435	68.5	109	82	-	95	67	10
7.5 - 8.5	8.0	17,640	78.3	91	42	-	67	23	-
8.5 - 9.5	9.0	19,845	88.1	90	23	7	76	34	-
9.5 - 10.5	10.0	22,050	98.3	93	35	-	71	19	5
10.5 - 11.5	11.0	24,255	108.1	103	51	-	67	26	5
11.5 - 12.5	12.0	26,460	117.9	40	31	-	55	34	-
12.5 - 13.5	13.0	28,665	127.7	31	31	-	40	11	5
13.5 - 14.5	14.0	30,870	137.5	67	31	15	19	4	-
14.5 - 15.5	15.0	33,075	147.3	48	19	22	40	4	15
15.5 - 16.5	16.0	35,280	157.1	37	15	15	14	4	10
16.5 - 17.5	17.0	37,485	166.9	29	-	7	-	-	10
17.5 - 18.5	18.0	39,690	176.7	-	-	7	-	-	15
18.5 - 19.5	19.0	41,895	186.5	-	-	15	-	-	10
19.5 - 20.5	20.0	44,100	196.2	-	-	7	-	-	5
20.5 - 21.5	21.0	46,305	206.0	-	-	-	-	-	25
21.5 - 22.5	22.0	48,510	215.8	-	-	-	-	-	5
22.5 - 23.5	23.0	50,715	225.6	-	-	29	-	-	5
23.5 - 24.5	24.0	52,920	235.4	-	-	22	-	-	10
24.5 - 25.5	25.0	55,125	245.2	-	-	44	-	-	40
25.5 - 26.5	26.0	57,330	255.0	-	-	15	-	-	5
26.5 - 27.5	27.0	59,535	264.8	-	-	15	-	-	-
27.5 - 28.5	28.0	61,740	274.6	-	-	7	-	-	-
28.5 - 29.5	29.0	63,945	284.4	-	-	-	-	-	-
29.5 - 30.5	30.0	66,150	294.6	-	-	-	-	-	-
30.5 - 31.5	31.0	68,355	304.4	-	-	-	-	-	-
31.5 - 32.5	32.0	70,560	314.2	-	-	-	-	-	-
32.5 - 33.5	33.0	72,765	324.0	-	-	-	-	-	-
33.5 - 34.5	34.0	74,970	333.8	-	-	-	-	-	-
34.5 - 35.5	35.0	77,175	343.5	-	-	-	-	-	-
35.5 - 36.5	36.0	79,380	353.3	-	-	-	-	-	-
36.5 - 37.5	37.0	81,585	363.1	-	-	-	-	-	-
37.5 - 38.5	38.0	83,790	372.9	-	-	-	-	-	-

TABLE 11 AXLE LOAD DISTRIBUTION OF BUSES PER 1000 VEHICLES

Axle Load Groups (ton)	Representative Axle Load (ton)	(lbs)	(KN)	Distribution
0.5 - 1.5	1.0	2,205	9.8	-
1.5 - 2.5	2.0	4,410	19.6	12
2.5 - 3.5	3.0	6,615	29.4	60
3.5 - 4.5	4.0	8,820	39.2	289
4.5 - 5.5	5.0	11,025	49.0	494
5.5 - 6.5	6.0	13,230	58.7	301
6.5 - 7.5	7.0	15,435	68.5	145
7.5 - 8.5	8.0	17,640	78.3	265
8.5 - 9.5	9.0	19,845	88.1	313
9.5 - 10.5	10.0	22,050	98.3	84
10.5 - 11.5	11.0	24,255	108.1	36

TABLE 12 AXLE LOAD DISTRIBUTION
(BUS)

Axle Load Range (M. ton)	Distribution (%)
0.5 - 1.5	0
1.5 - 2.5	0.6
2.5 - 3.5	3.01
3.5 - 4.5	14.46
4.5 - 5.5	24.70
5.5 - 6.5	15.06
6.5 - 7.5	7.23
7.5 - 8.5	13.25
8.5 - 9.5	15.66
9.5 - 10.5	4.22
10.5 - 11.5	1.81
T O T A L	100.00

APPENDIX 14-4
DISTRIBUTION OF NUMBER OF AXLE LOADS AND ESAL

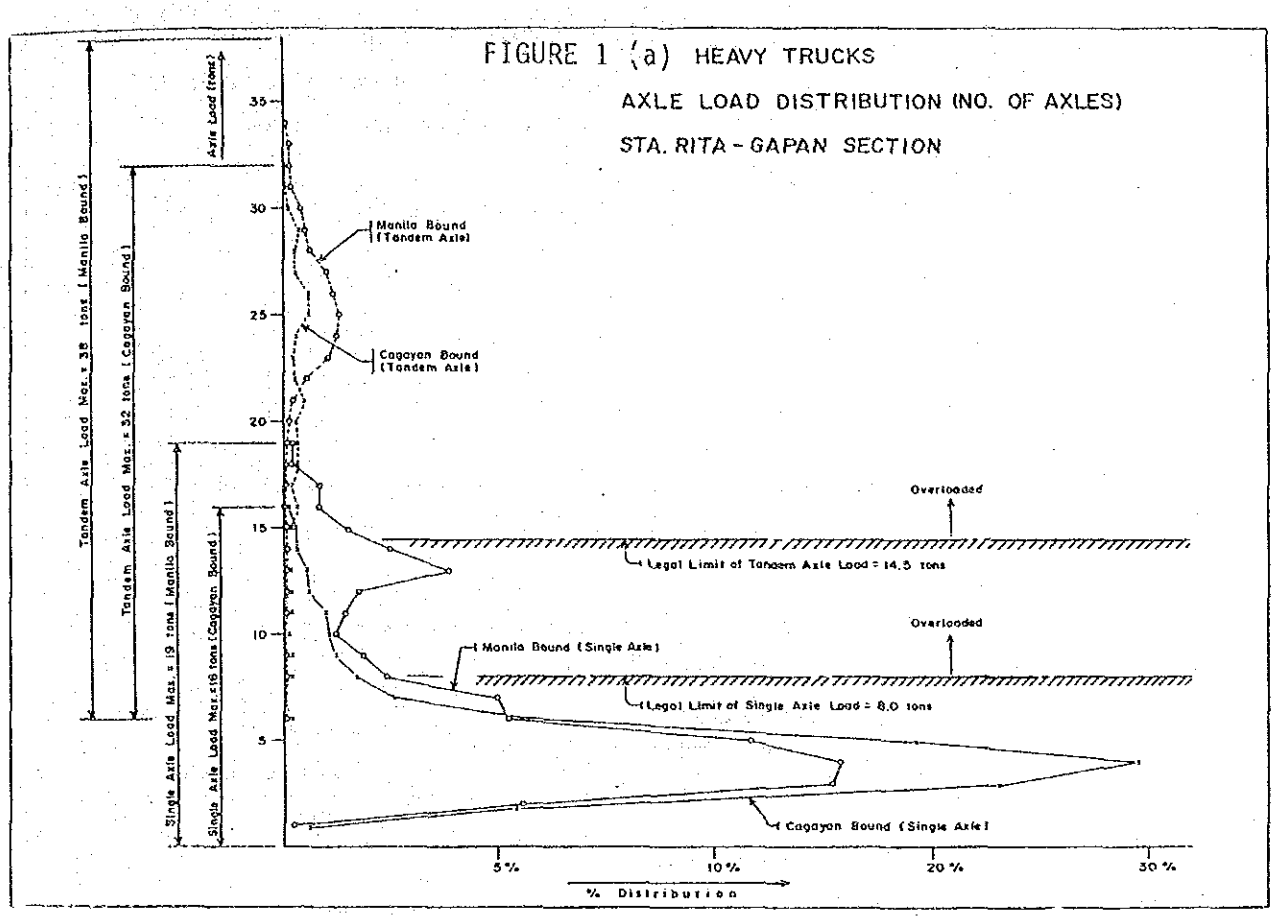


FIGURE 1 (a) HEAVY TRUCKS
AXLE LOAD DISTRIBUTION (NO. OF AXLES)
STA. RITA - GAPAN SECTION
Axle Load (tons)
Tandem Axle Load Max. = 36 tons (Manila Bound)
Tandem Axle Load Max. = 32 tons (Cagayan Bound)
Single Axle Load Max. = 19 tons (Manila Bound)
Single Axle Load Max. = 16 tons (Cagayan Bound)
Manila Bound (Tandem Axle)
Cagayan Bound (Tandem Axle)
Overloaded
Legal Limit of Tandem Axle Load = 14.5 tons
Manila Bound (Single Axle)
Overloaded
Legal Limit of Single Axle Load = 8.0 tons
Cagayan Bound (Single Axle)
35
30
25
20
15
10
5
5 %
10 %
20 %
30 %
% Distribution

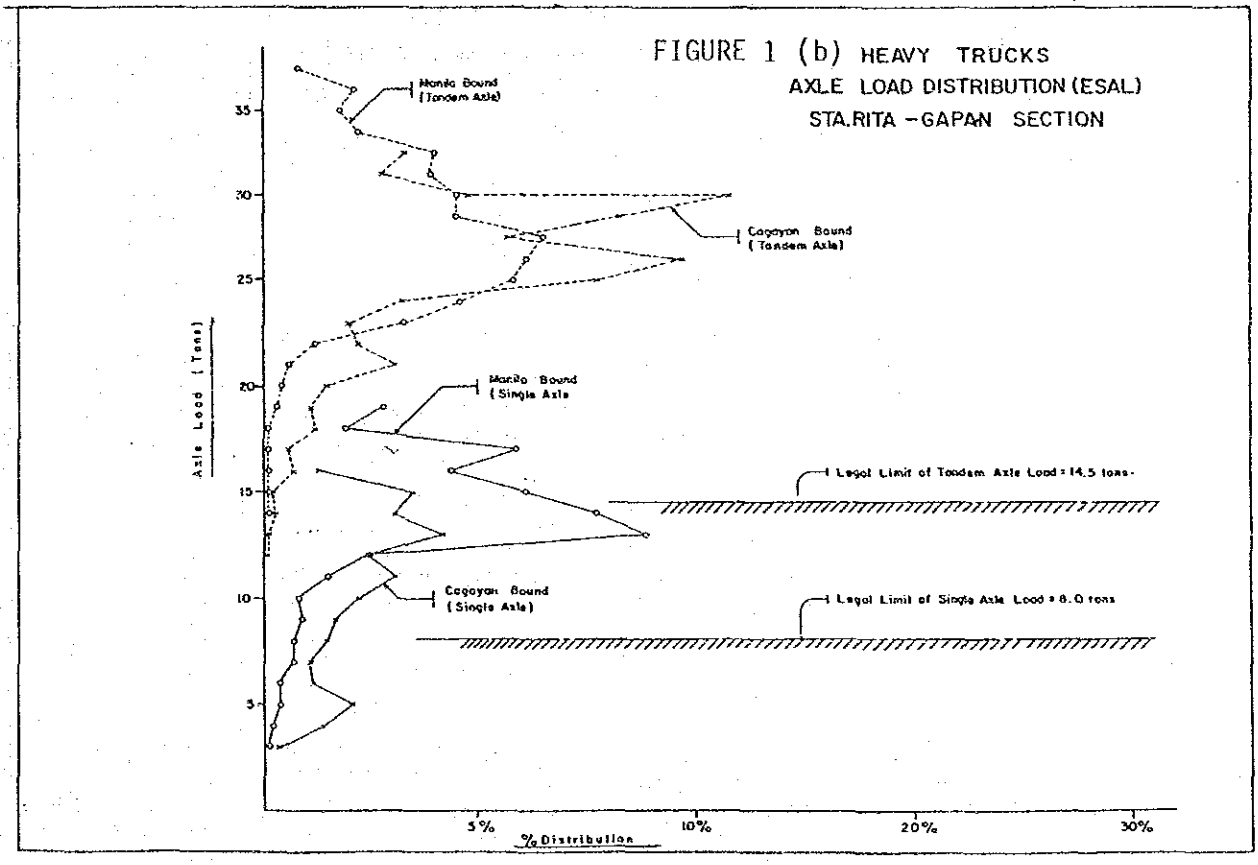


FIGURE 1 (b) HEAVY TRUCKS
AXLE LOAD DISTRIBUTION (ESAL)
STA. RITA - GAPAN SECTION
Manila Bound (Tandem Axle)
Cagayan Bound (Tandem Axle)
Manila Bound (Single Axle)
Legal Limit of Tandem Axle Load = 14.5 tons
Cagayan Bound (Single Axle)
Legal Limit of Single Axle Load = 8.0 tons
Axle Load (Tons)
35
30
25
20
15
10
5
5%
10%
20%
30%
% Distribution

FIGURE 1 (c) HEAVY TRUCKS

AXLE LOAD DISTRIBUTION (NO. OF AXLES)

SAN JOSE - ARITAO SECTION

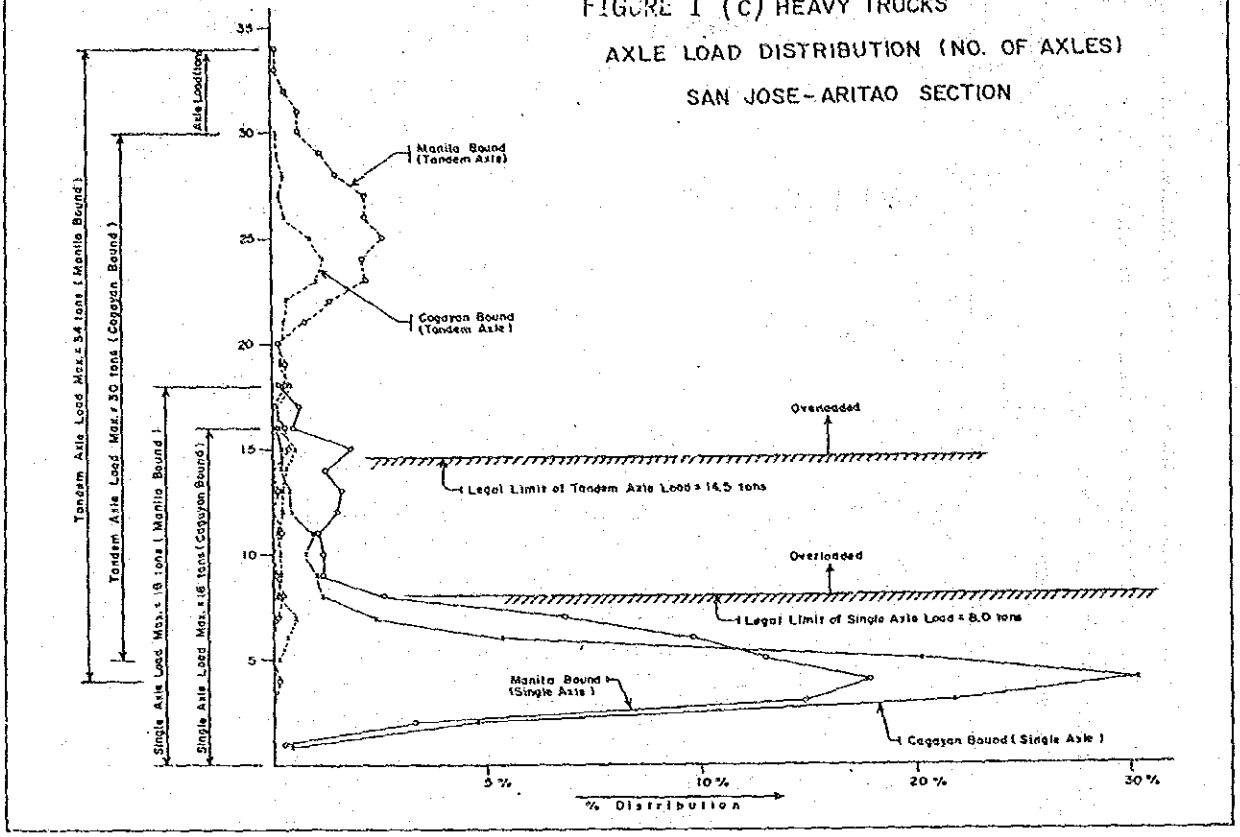
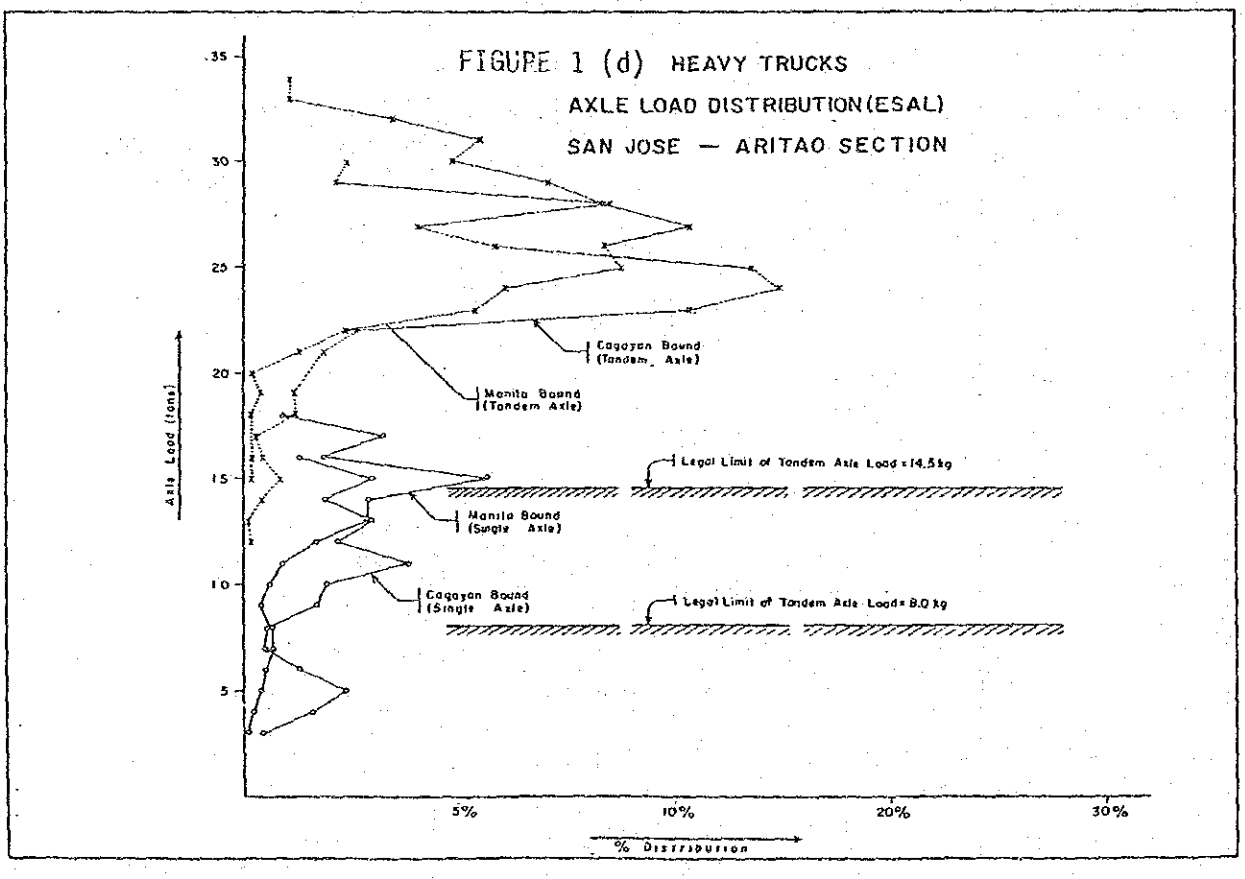


FIGURE 1 (d) HEAVY TRUCKS

AXLE LOAD DISTRIBUTION (ESAL)

SAN JOSE — ARITAO SECTION



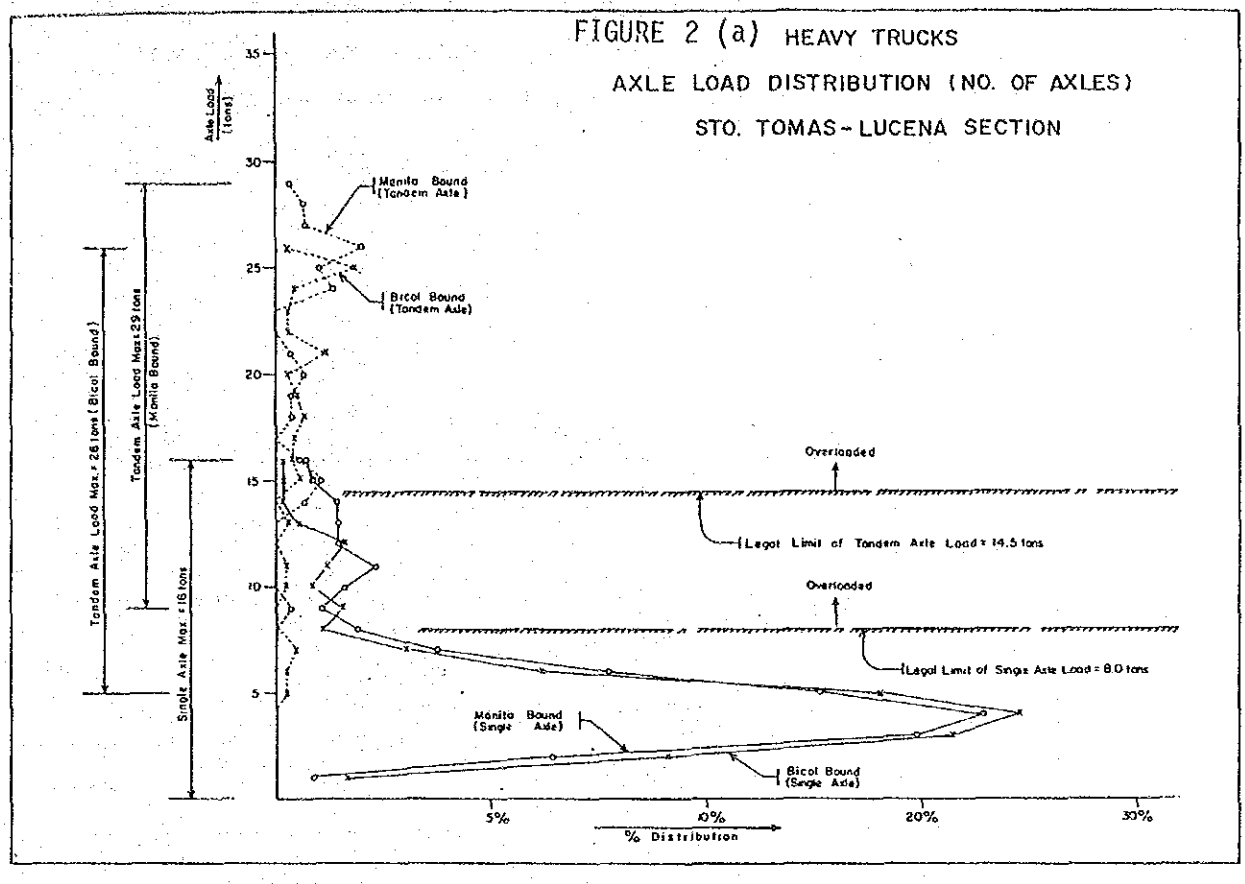


FIGURE 2 (a) HEAVY TRUCKS
AXLE LOAD DISTRIBUTION (NO. OF AXLES)
STO. TOMAS - LUCENA SECTION
Axle Load (Tons)
35
30
25
20
15
10
5
Manila Bound (Tandem Axle)
Bicol Bound (Tandem Axle)
Tandem Axle Load Max.= 26 tons (Bicol Bound)
Tandem Axle Load Max.=29 tons (Manila Bound)
Single Axle Max.=16 tons
Overloaded
Legal Limit of Tandem Axle Load = 14.5 tons
Overloaded
Legal Limit of Single Axle Load = 8.0 tons
Manila Bound (Single Axle)
Bicol Bound (Single Axle)
5%
10%
20%
30%
% Distribution

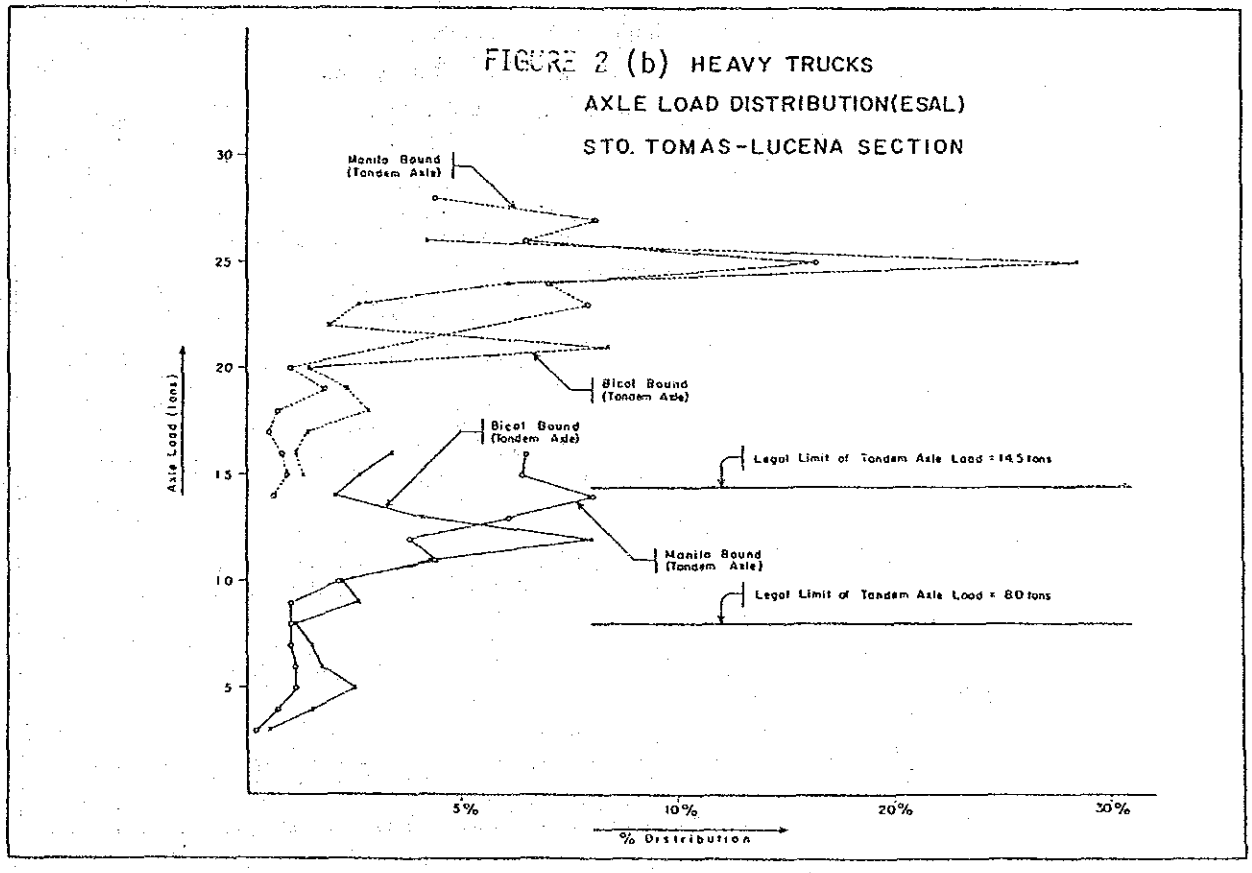


FIGURE 2 (b) HEAVY TRUCKS
AXLE LOAD DISTRIBUTION(ESAL)
STO. TOMAS-LUCENA SECTION
Axle Load (Tons)
30
25
20
15
10
5
Manila Bound (Tandem Axle)
Bicol Bound (Tandem Axle)
Bicol Bound (Tandem Axle)
Legal Limit of Tandem Axle Load = 14.5 tons
Manila Bound (Tandem Axle)
Legal Limit of Tandem Axle Load = 8.0 tons
5%
10%
20%
30%
% Distribution

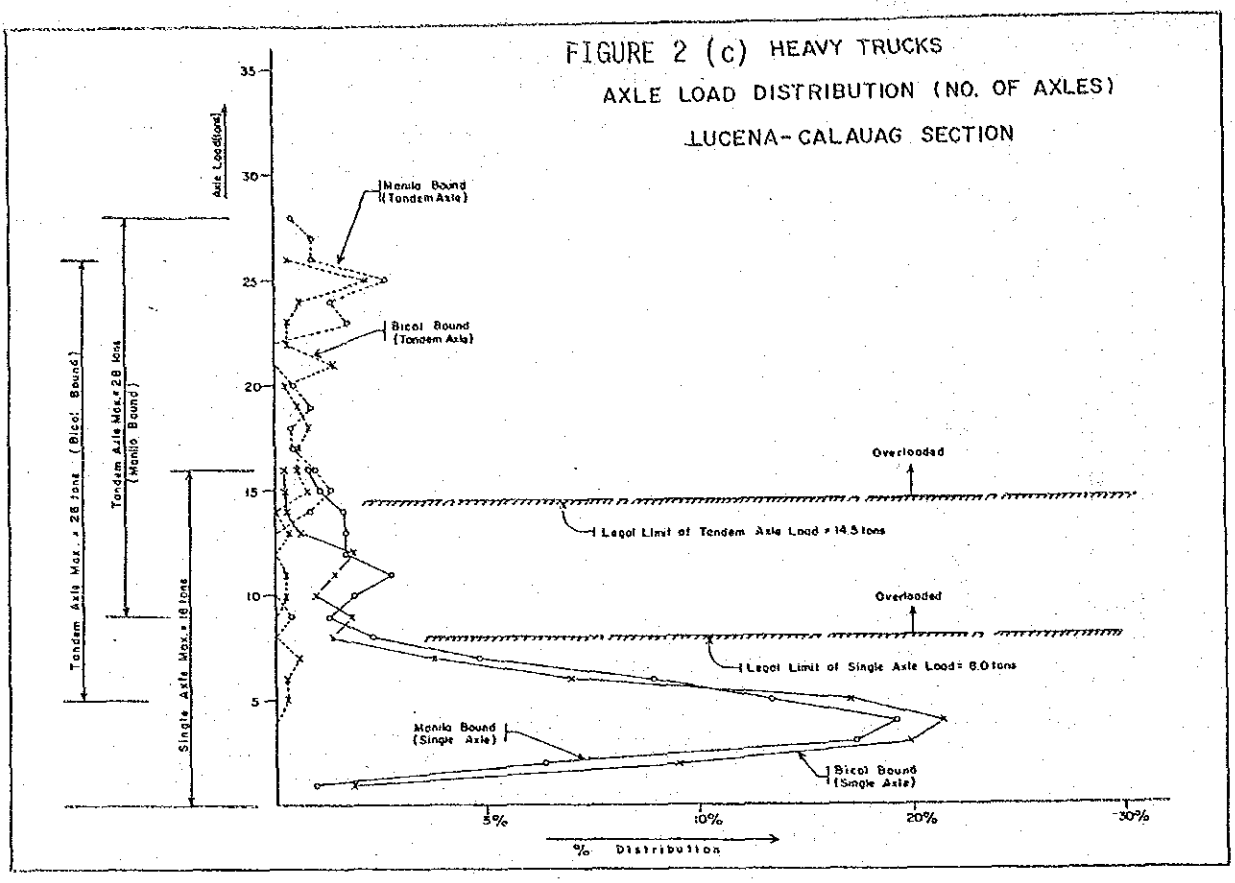


FIGURE 2 (c) HEAVY TRUCKS
AXLE LOAD DISTRIBUTION (NO. OF AXLES)
LUCENA-CALAUAG SECTION
Axle Load(tons)
Tandem Axle Max.= 28 tons (Bicol Bound)
Tandem Axle Max.= 28 tons (Manila Bound)
Single Axle Max.= 18 tons
Manila Bound (Tandem Axle)
Bicol Bound (Tandem Axle)
Overloaded
Legal Limit of Tandem Axle Load = 14.5 tons
Overloaded
Legal Limit of Single Axle Load = 8.0 tons
Manila Bound (Single Axle)
Bicol Bound (Single Axle)
5%
10%
20%
30%
% Distribution

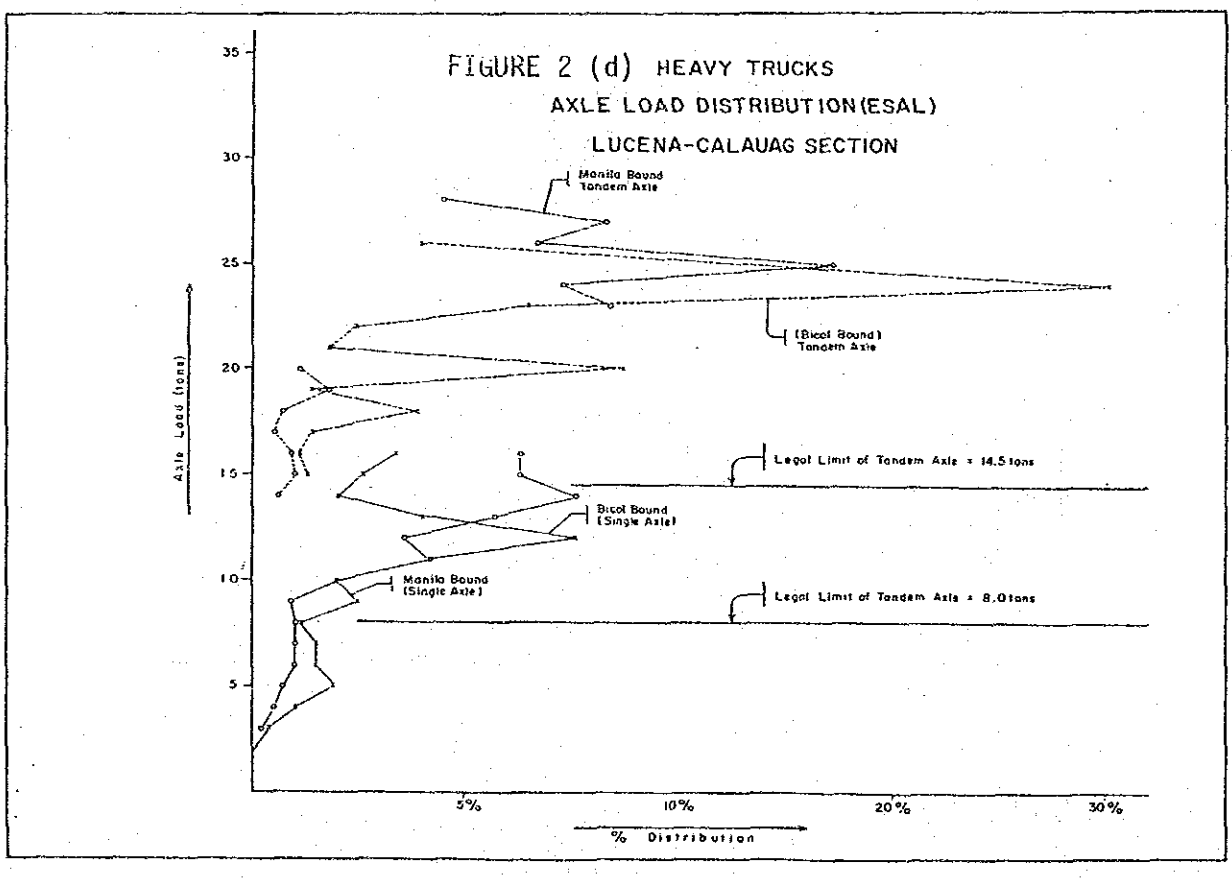


FIGURE 2 (d) HEAVY TRUCKS
AXLE LOAD DISTRIBUTION(ESAL)
LUCENA-CALAUAG SECTION
Axle Load (tons)
Manila Bound Tandem Axle
(Bicol Bound) Tandem Axle
Legal Limit of Tandem Axle = 14.5 tons
Bicol Bound (Single Axle)
Manila Bound (Single Axle)
Legal Limit of Tandem Axle = 8.0 tons
5%
10%
20%
30%
% Distribution

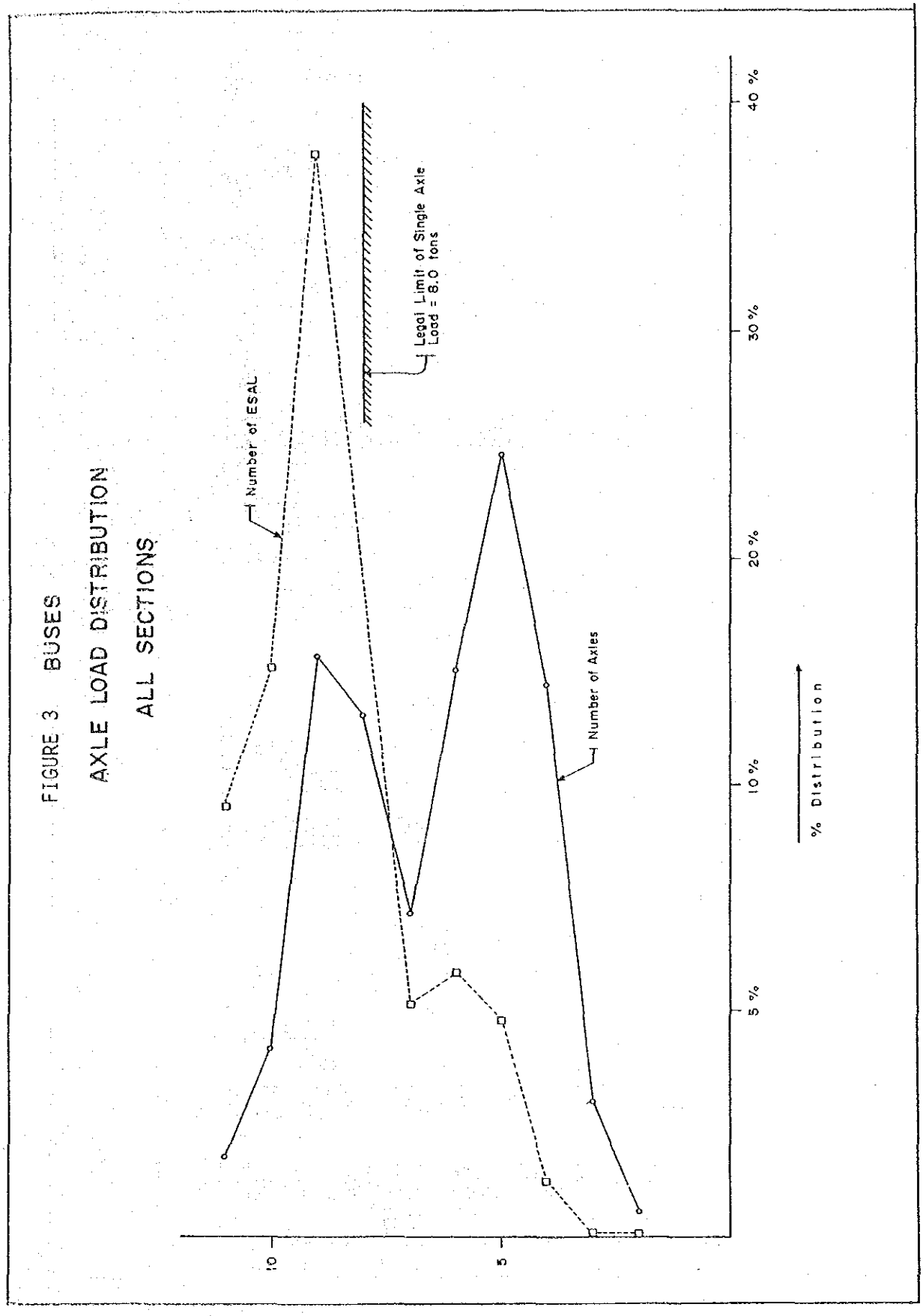


FIGURE 3 BUSES
AXLE LOAD DISTRIBUTION
ALL SECTIONS
Number of ESAL
Legal Limit of Single Axle Load = 8.0 tons
Number of Axles
% Distribution
40 %
30 %
20 %
10 %
5 %
10
5

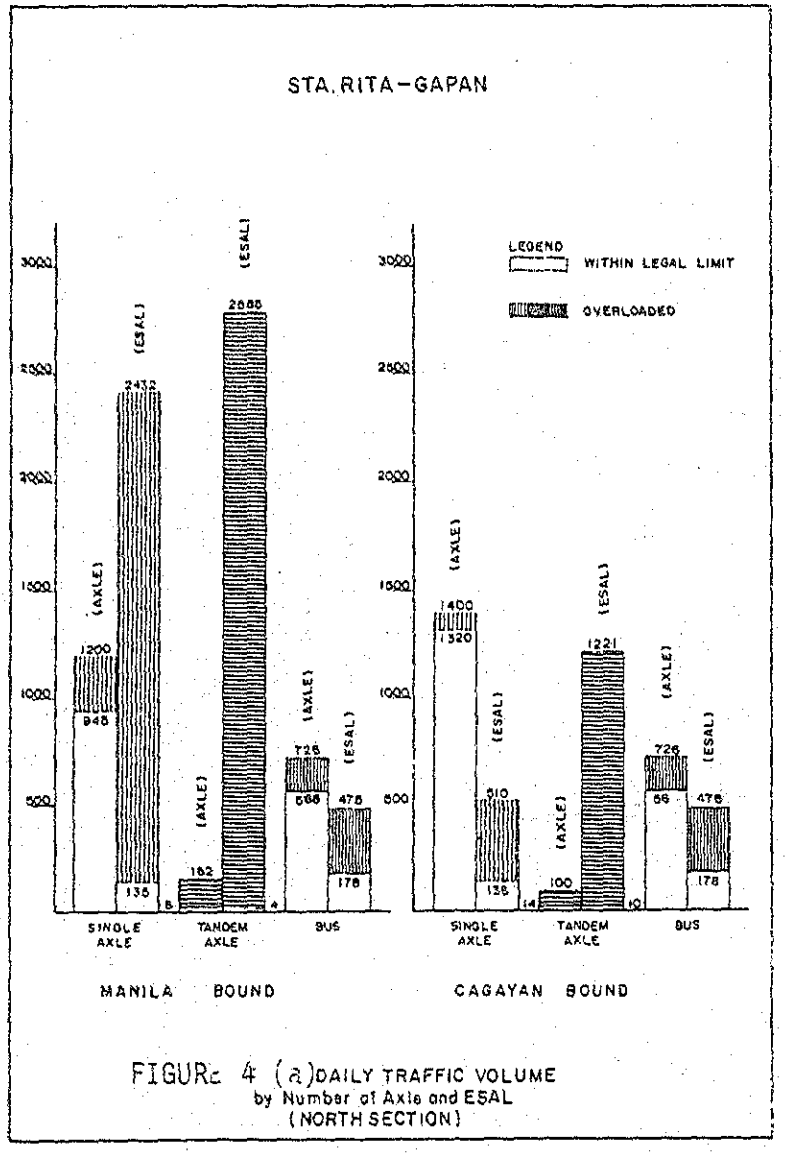


FIGURE 4 (a) DAILY TRAFFIC VOLUME
by Number of Axle and ESAL
(NORTH SECTION)

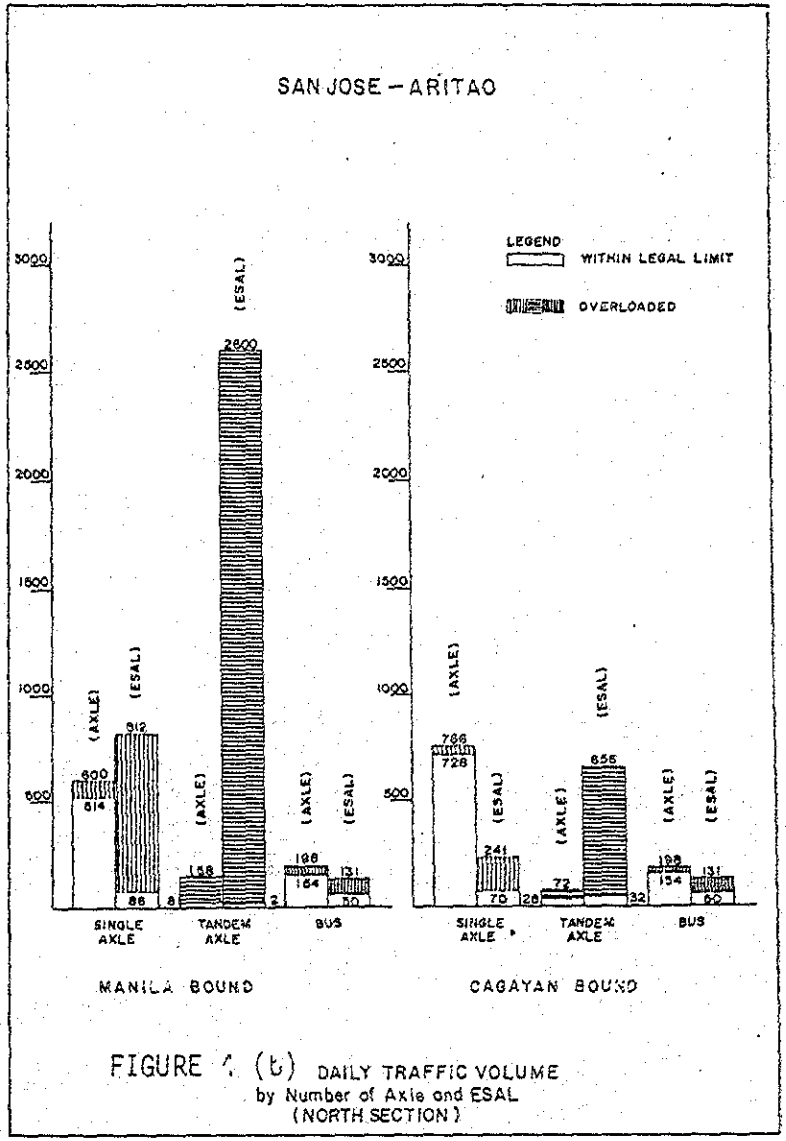


FIGURE 4 (b) DAILY TRAFFIC VOLUME
by Number of Axle and ESAL
(NORTH SECTION)

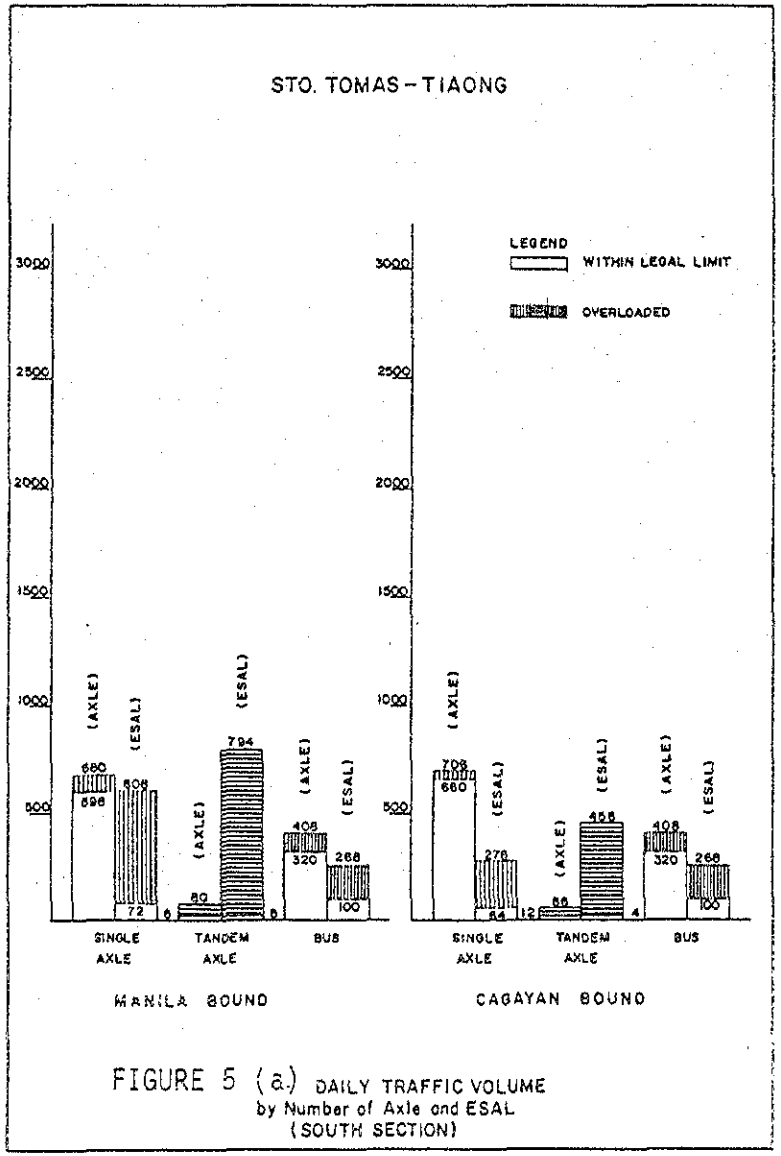


FIGURE 5 (a) DAILY TRAFFIC VOLUME
by Number of Axle and ESAL
(SOUTH SECTION)

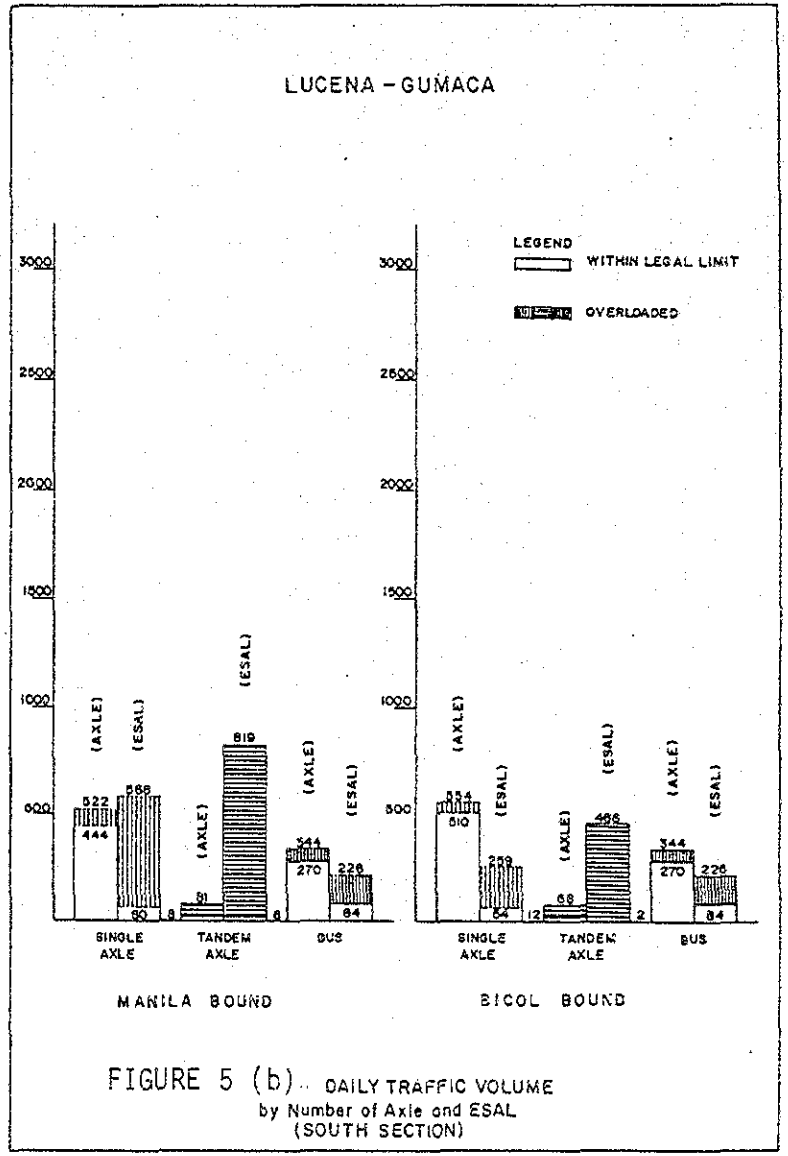
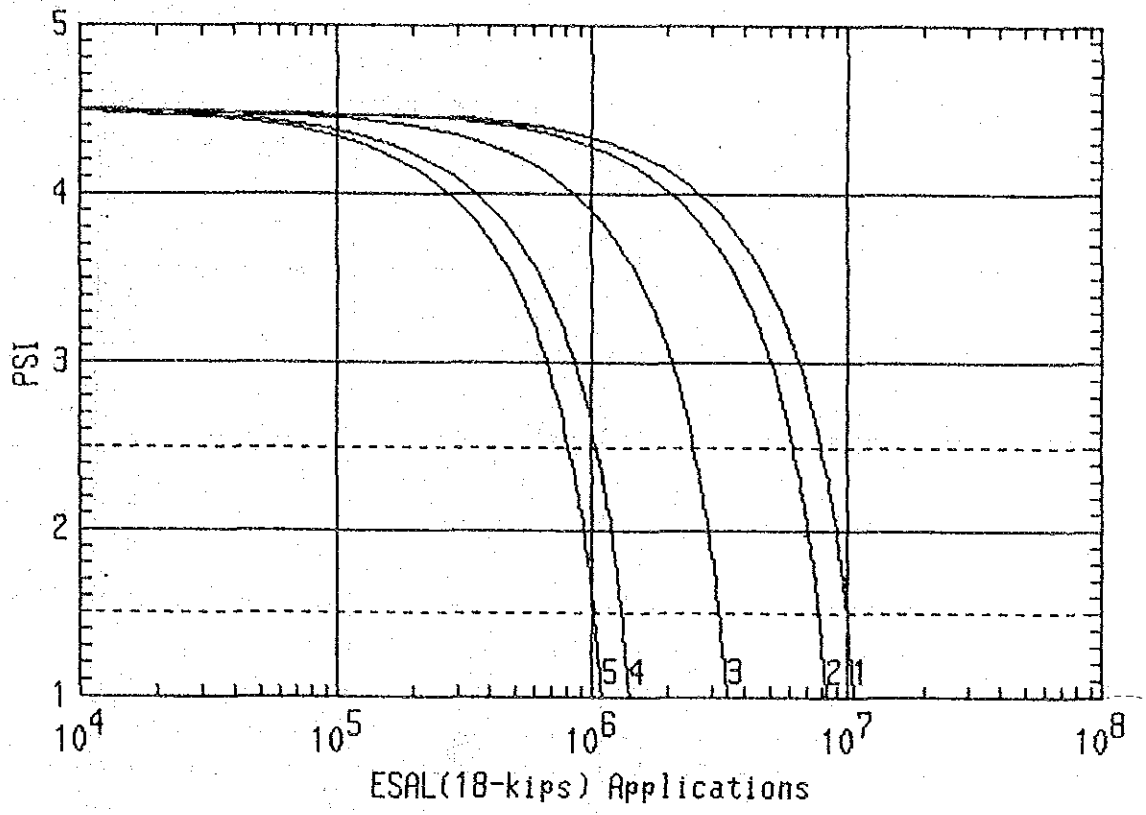


FIGURE 5 (b) DAILY TRAFFIC VOLUME
by Number of Axle and ESAL
(SOUTH SECTION)

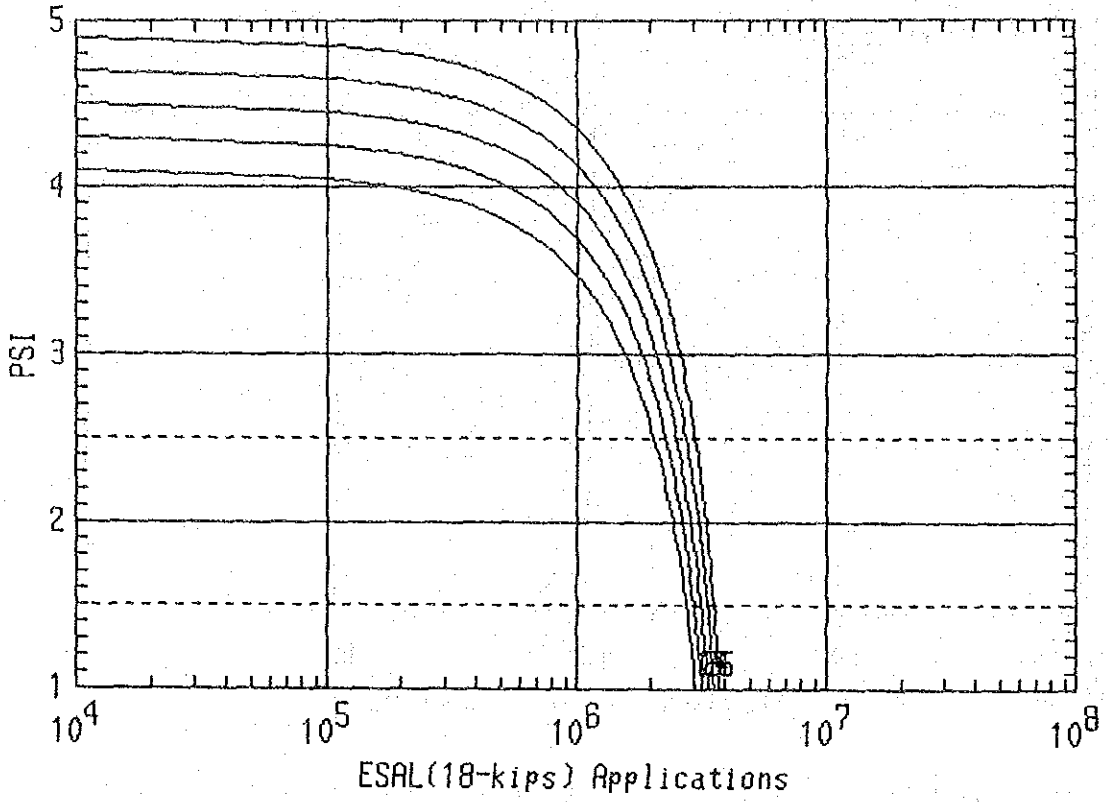
APPENDIX 14-5
ANALYSIS ON EFFECTS OF PAVEMENT VARIABLES

FIGURE 1
VARIABLE; ZR



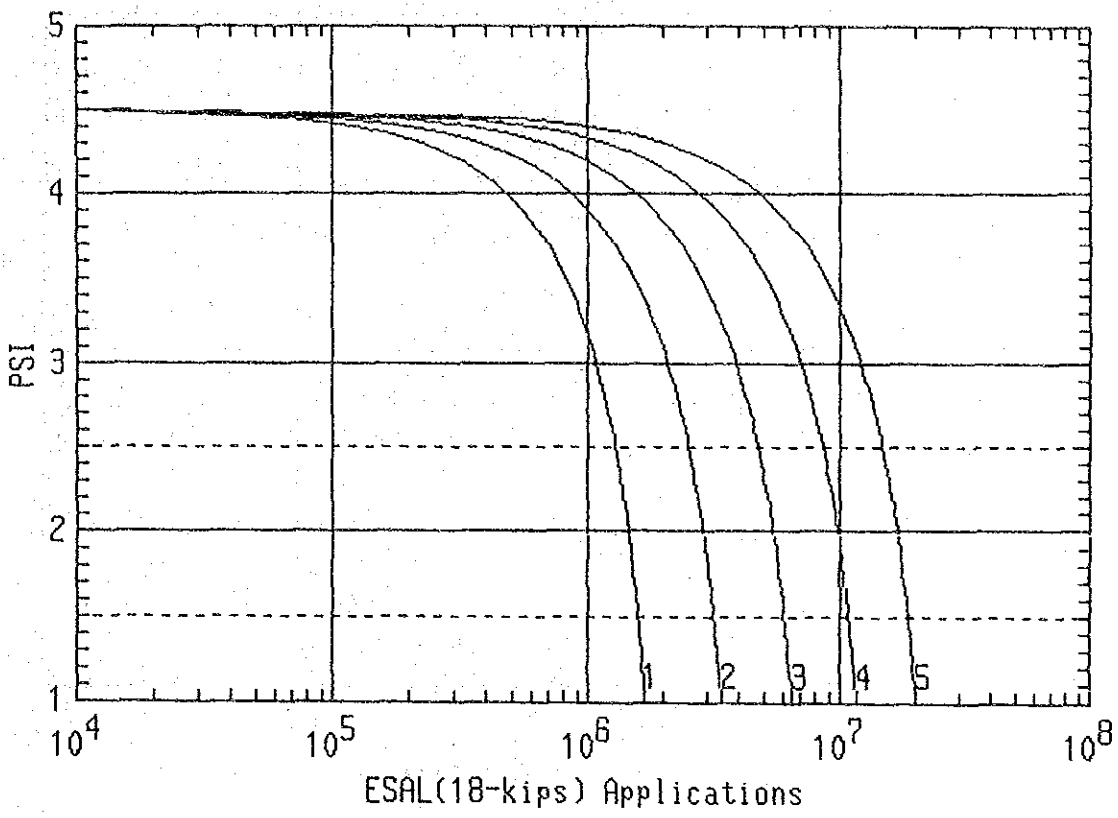
	Curve 1	Curve 2	Curve 3	Curve 4	Curve 5
ZR	1.645	1.282	0	-1.282	-1.645
So	.3	.3	.3	.3	.3
D	9in	9in	9in	9in	9in
S'c	500psi	500psi	500psi	500psi	500psi
J	4	4	4	4	4
Cd	.9	.9	.9	.9	.9
Ec	3050ksi	3050ksi	3050ksi	3050ksi	3050ksi
k	250pci	250pci	250pci	250pci	250pci
Po	4.5	4.5	4.5	4.5	4.5

FIGURE 2
VARIABLE; Po



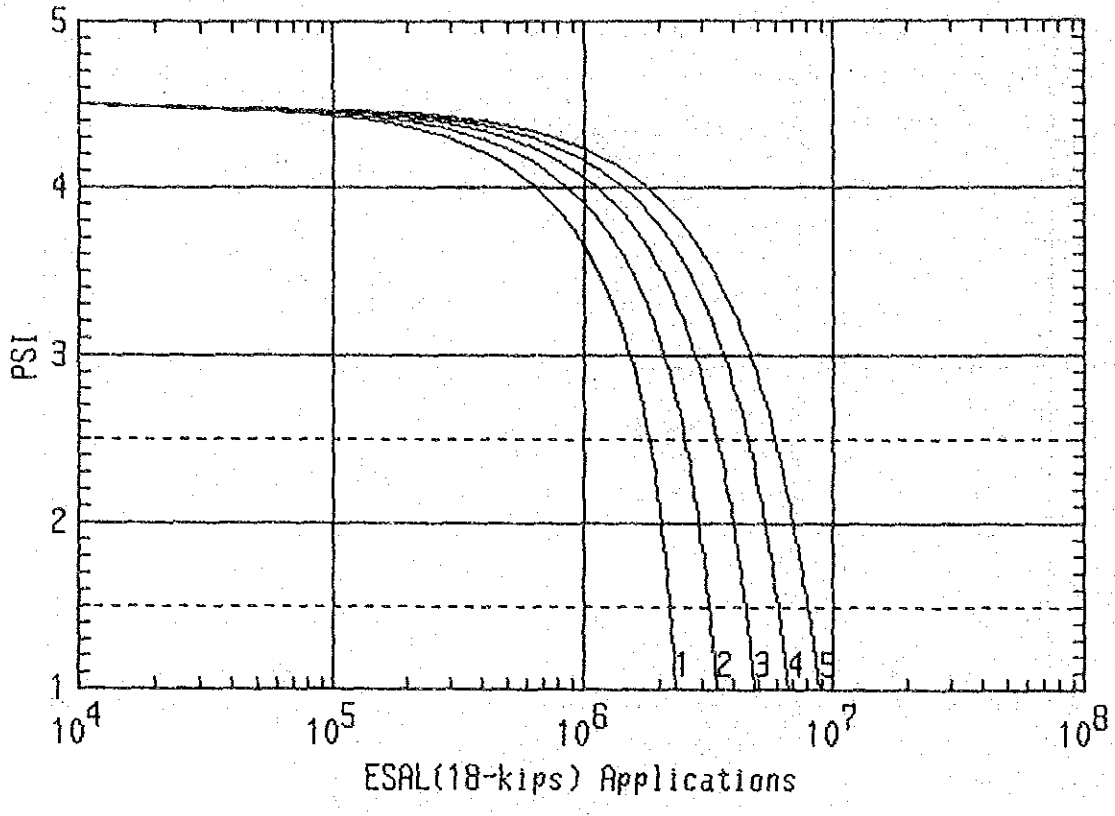
	Curve 1	Curve 2	Curve 3	Curve 4	Curve 5
ZR	0	0	0	0	0
So	0	0	0	0	0
D	9in	9in	9in	9in	9in
S'c	500psi	500psi	500psi	500psi	500psi
J	4	4	4	4	4
Cd	.9	.9	.9	.9	.9
Ec	3050ksi	3050ksi	3050ksi	3050ksi	3050ksi
k	250pci	250pci	250pci	250pci	250pci
Po	4.1	4.3	4.5	4.7	4.9

FIGURE 3
VARIABLE; D



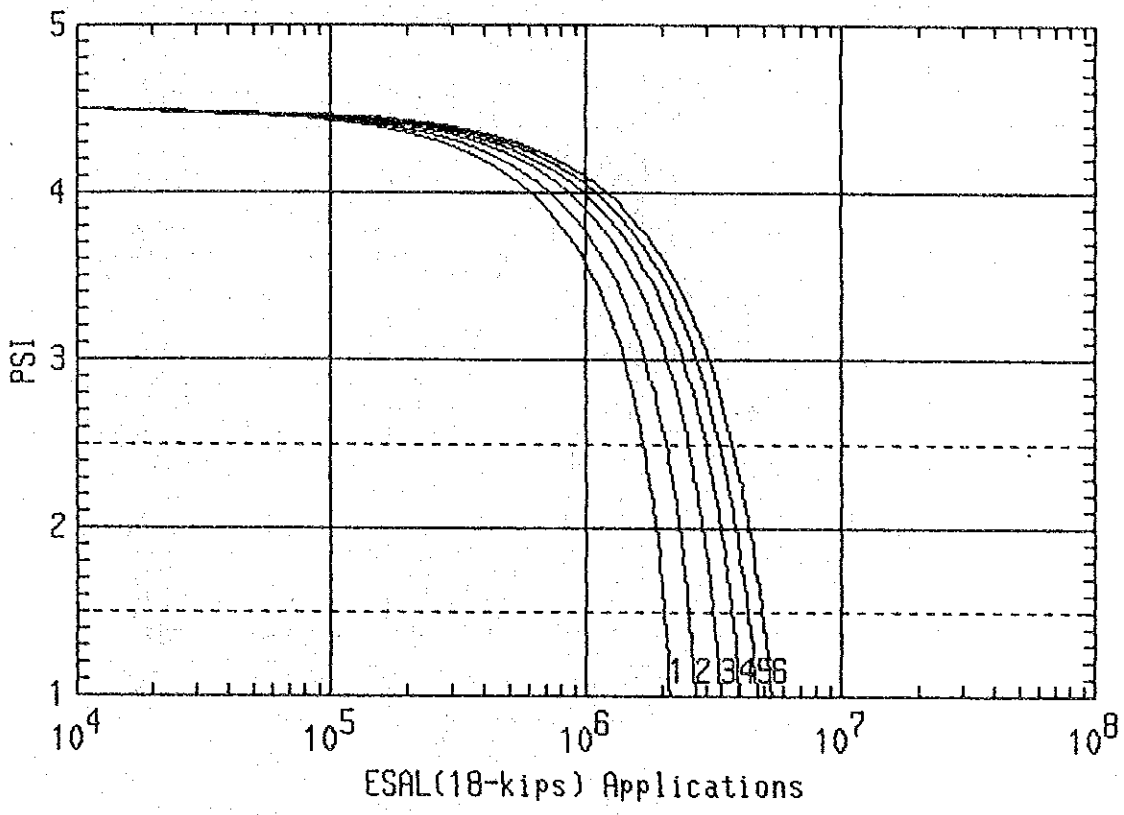
	Curve 1	Curve 2	Curve 3	Curve 4	Curve 5
ZR	0	0	0	0	0
So	0	0	0	0	0
D	8in	9in	10in	11in	12in
S'c	500psi	500psi	500psi	500psi	500psi
J	4	4	4	4	4
Cd	.9	.9	.9	.9	.9
Ec	3050ksi	3050ksi	3050ksi	3050ksi	3050ksi
k	250pci	250pci	250pci	250pci	250pci
Po	4.5	4.5	4.5	4.5	4.5

FIGURE 4
VARIABLE; S'c, Ec



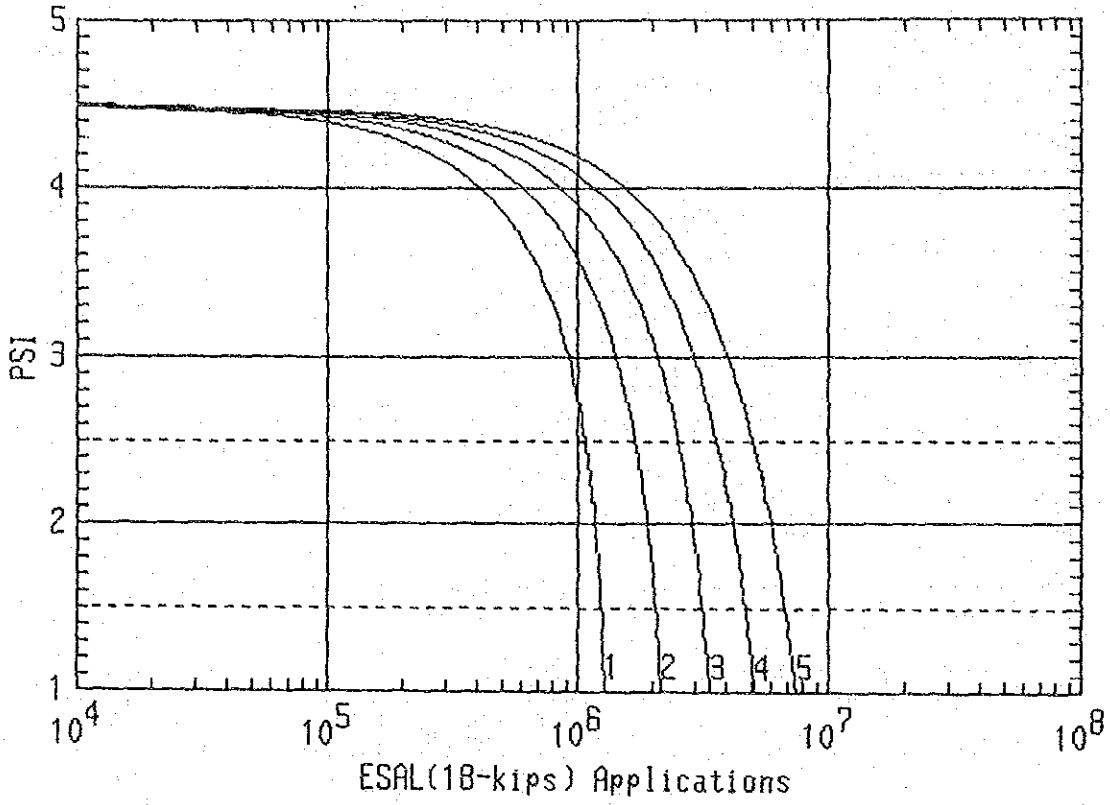
	Curve 1	Curve 2	Curve 3	Curve 4	Curve 5
ZR	0	0	0	0	0
So	0	0	0	0	0
D	9in	9in	9in	9in	9in
S'c	450psi	500psi	550psi	600psi	650psi
J	4	4	4	4	4
Cd	.9	.9	.9	.9	.9
Ec	2890ksi	3050ksi	3200ksi	3340ksi	3470ksi
k	250pci	250pci	250pci	250pci	250pci
Po	4.5	4.5	4.5	4.5	4.5

FIGURE 5
VARIABLE; K



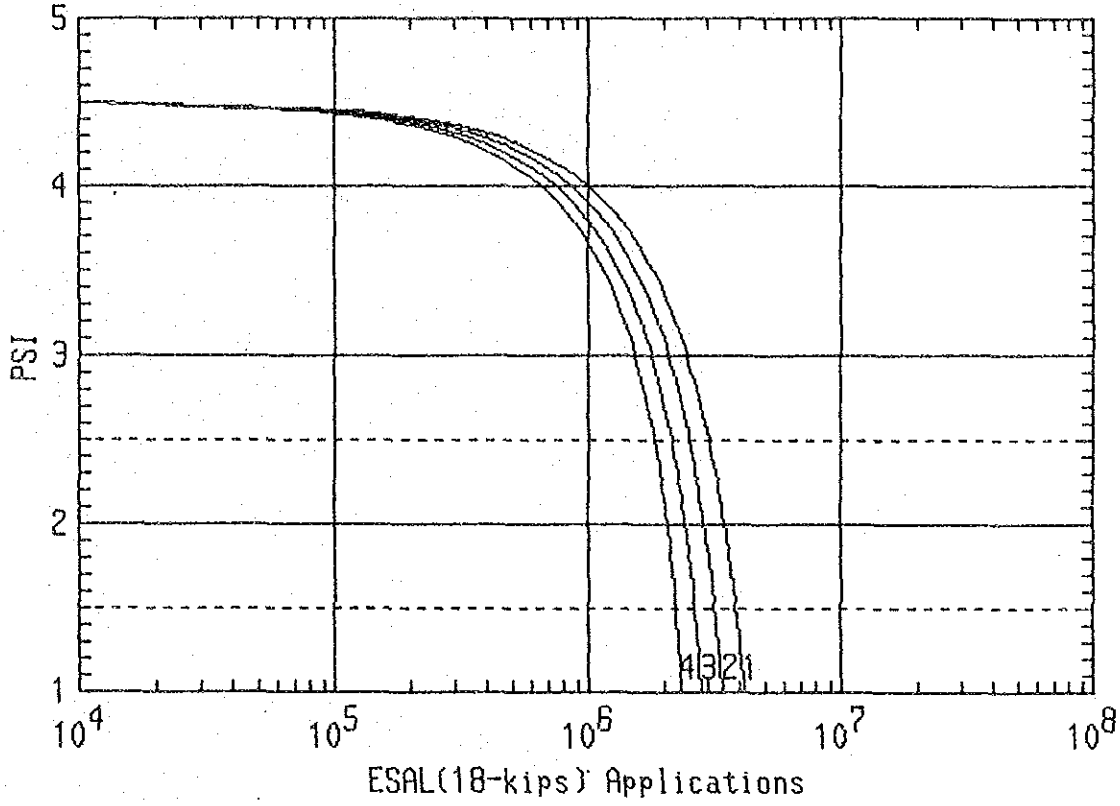
	Curve 1	Curve 2	Curve 3	Curve 4	Curve 5	Curve 6
ZR	0	0	0	0	0	0
So	0	0	0	0	0	0
D	9in	9in	9in	9in	9in	9in
S'c	500psi	500psi	500psi	500psi	500psi	500psi
J	4	4	4	4	4	4
Cd	.9	.9	.9	.9	.9	.9
Ec	3050ksi	3050ksi	3050ksi	3050ksi	3050ksi	3050ksi
k	80pci	150pci	250pci	350pci	450pci	550pci
Po	4.5	4.5	4.5	4.5	4.5	4.5

FIGURE 6
VARIABLE; Cd



	Curve 1	Curve 2	Curve 3	Curve 4	Curve 5
ZR	0	0	0	0	0
So	0	0	0	0	0
D	9in	9in	9in	9in	9in
S'c	500psi	500psi	500psi	500psi	500psi
J	4	4	4	4	4
Cd	.7	.8	.9	1	1.1
Ec	3050ksi	3050ksi	3050ksi	3050ksi	3050ksi
k	250pci	250pci	250pci	250pci	250pci
Po	4.5	4.5	4.5	4.5	4.5

FIGURE 7
VARIABLE; J



	Curve 1	Curve 2	Curve 3	Curve 4
ZR	0	0	0	0
So	0	0	0	0
D	9in	9in	9in	9in
S'c	500psi	500psi	500psi	500psi
J	3.8	4	4.2	4.4
Cd	.9	.9	.9	.9
Ec	3050ksi	3050ksi	3050ksi	3050ksi
k	250pci	250pci	250pci	250pci
Po	4.5	4.5	4.5	4.5

APPENDIX 14-6
ANALYSIS ON SLAB THICKNESS BY DESIGN STANDARDS

TABLE 1 ANALYSIS BY MPWH METHOD (AASHTO 1972)

Required Thickness of Concrete Slab

	ESAL Applications		Pavement Conditions						Required Thickness of Slab			
	To Date (million)	20 Years (million)	S'c (psi)	D (in)	J	Ec (million psi)	k (pci)	Po	To Date Pt=2.0	To Date Pt=2.5	20 Years Pt=2.0	20 Years Pt=2.5
N1-C	23.250	49.890	525	9.98	4.00	3.12	210	4.50	11.68	11.98	13.15	13.48
N1-F			605	9.40	4.00	3.35	230	4.50	10.77	11.09	12.15	12.49
N1-B			630	8.81	4.00	3.42	140	4.50	10.81	11.11	12.15	12.49
N2-C	19.750	47.580	449	10.02	4.00	2.89	400	4.50	11.94	12.22	13.75	14.06
N2-F			455	9.96	4.00	2.91	310	4.50	12.04	12.32	13.83	14.14
N2-B			443	9.44	4.00	2.87	470	4.50	11.90	12.19	13.72	14.04
N3-C	10.340	38.530	510	9.38	4.00	3.08	210	4.50	10.44	10.70	12.83	13.14
N3-F			548	9.23	4.00	3.19	440	4.50	9.50	9.80	11.85	12.20
N3-B			429	8.60	4.00	2.82	480	4.50	10.85	11.12	13.48	13.79
S1-C	8.530	14.030	478	11.25	4.00	2.98	80	4.50	10.98	11.20	11.83	12.07
S1-F			451	8.63	4.00	2.89	160	4.50	10.98	11.21	11.86	12.11
S1-B			447	8.71	4.00	2.88	170	4.50	11.00	11.23	11.89	12.13
S2-C	4.710	16.740	554	9.77	4.00	3.21	280	4.50	8.58	8.83	10.60	10.90
S2-F			521	9.60	4.00	3.11	100	4.50	9.48	9.69	11.52	11.79
S2-B			576	9.27	4.00	3.27	80	4.50	9.08	9.30	11.02	11.30

TABLE 2 ANALYSIS BY AASHTO 1986
RELIABILITY (ZR),; 95%

Required Thickness of Concrete Slab

	ESAL Applications		Pavement Conditions									Required Thickness of Slab			
	To Date (million)	20 Years (million)	ZR	So	S'c (psi)	D (in)	J	Cd	Ec (million psi)	k (pci)	Po	To Date Pt=2.0	To Date Pt=2.5	20 Years Pt=2.0	20 Years Pt=2.5
N1-G	23.250	49.890	-1.645	.30	525	9.98	4.00	1.00	3.12	210	4.50	13.92	14.26	15.63	16.01
N1-F			-1.645	.30	605	9.40	4.00	.90	3.35	230	4.50	13.64	13.98	15.32	15.70
N1-B			-1.645	.30	630	8.81	4.00	.80	3.42	140	4.50	14.50	14.82	16.24	16.59
N2-G	19.750	47.580	-1.645	.30	449	10.02	4.00	.90	2.89	400	4.50	15.19	15.49	17.40	17.72
N2-F			-1.645	.30	455	9.96	4.00	.80	2.91	310	4.50	16.28	16.54	18.60	18.88
N2-B			-1.645	.30	443	9.44	4.00	.80	2.87	470	4.50	16.21	16.47	18.56	18.85
N3-G	10.340	38.530	-1.645	.30	510	9.38	4.00	1.10	3.08	210	4.50	11.84	12.16	14.50	14.87
N3-F			-1.645	.30	548	9.23	4.00	.80	3.19	440	4.50	13.10	13.40	16.11	16.45
N3-B			-1.645	.30	429	8.60	4.00	.80	2.82	480	4.50	14.88	15.12	18.26	18.53
S1-G	8.530	14.030	-1.645	.30	478	11.25	4.00	.80	2.98	80	4.50	14.66	14.87	15.77	16.00
S1-F			-1.645	.30	451	8.63	4.00	.80	2.89	160	4.50	14.77	14.98	15.92	16.14
S1-B			-1.645	.30	447	8.71	4.00	.80	2.88	170	4.50	14.81	15.02	15.96	16.18
S2-G	4.710	16.740	-1.645	.30	554	9.77	4.00	.80	3.21	280	4.50	11.79	12.05	14.37	14.67
S2-F			-1.645	.30	521	9.60	4.00	.80	3.11	100	4.50	12.74	12.96	15.39	15.65
S2-B			-1.645	.30	576	9.27	4.00	.80	3.27	80	4.50	12.19	12.42	14.71	14.99

TABLE 3 ANALYSIS BY AASHTO 1986
RELIABILITY (ZR); NEGLECTED

Required Thickness of Concrete Slab

	ESAL Applications		Pavement Conditions									Required Thickness of Slab			
	To Date (million)	20 Years (million)	ZR	So	S'c (psi)	D (in)	J	Cd	Ec (million psi)	k (pci)	Po	To Date Pt=2.0	To Date Pt=2.5	20 Years Pt=2.0	20 Years Pt=2.5
N1-C			.000	.00	525	9.98	4.00	1.00	3.12	210	4.50	11.68	11.98	13.15	13.48
N1-F	23.250	49.890	.000	.00	605	9.40	4.00	.90	3.35	230	4.50	11.43	11.73	12.88	13.21
N1-B			.000	.00	630	8.81	4.00	.80	3.42	140	4.50	12.22	12.49	13.71	14.02
N2-C			.000	.00	449	10.02	4.00	.90	2.89	400	4.50	12.69	12.95	14.59	14.88
N2-F	19.750	47.580	.000	.00	455	9.96	4.00	.80	2.91	310	4.50	13.66	13.89	15.65	15.90
N2-B			.000	.00	443	9.44	4.00	.80	2.87	470	4.50	13.55	13.78	15.57	15.83
N3-C			.000	.00	510	9.38	4.00	1.10	3.08	210	4.50	9.88	10.16	12.17	12.50
N3-F	10.340	38.530	.000	.00	548	9.23	4.00	.80	3.19	440	4.50	10.89	11.15	13.48	13.78
N3-B			.000	.00	429	8.60	4.00	.80	2.82	480	4.50	12.40	12.61	15.31	15.55
S1-C			.000	.00	478	11.25	4.00	.80	2.98	80	4.50	12.38	12.56	13.33	13.53
S1-F	8.530	14.030	.000	.00	451	8.63	4.00	.80	2.89	160	4.50	12.43	12.61	13.41	13.61
S1-B			.000	.00	447	8.71	4.00	.80	2.88	170	4.50	12.45	12.64	13.44	13.64
S2-C			.000	.00	554	9.77	4.00	.80	3.21	280	4.50	9.81	10.04	12.04	12.30
S2-F	4.710	16.740	.000	.00	521	9.60	4.00	.80	3.11	100	4.50	10.73	10.91	13.00	13.22
S2-B			.000	.00	576	9.27	4.00	.80	3.27	80	4.50	10.27	10.46	12.43	12.67

TABLE 4 ANALYSIS OF PCA METHOD

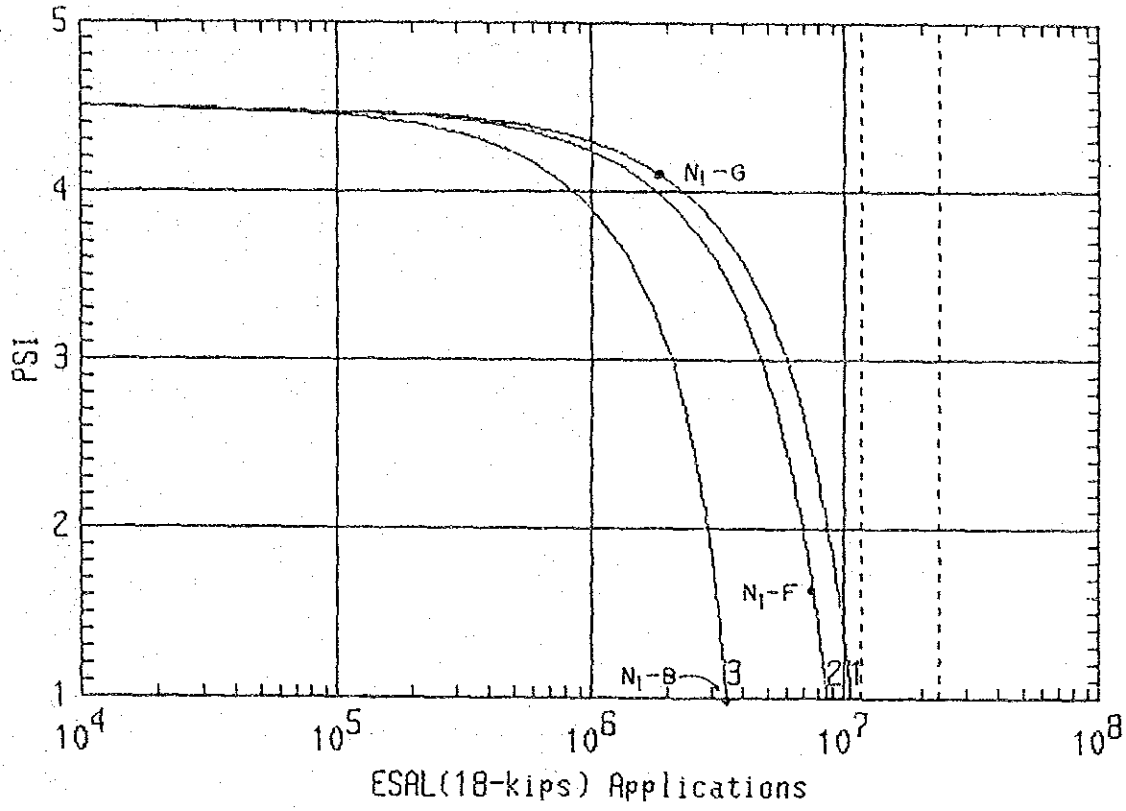
	Present Condition Case 1					Slab Thickness Required to Date Case 2					Slab Thickness Required for 20 Years Case 3				
	Thickness	k	MR	Fatigue	Erosion	Thickness	k	MR	Fatigue	Erosion	Thickness	k	MR	Fatigue	Erosion
N_1-G	10.00	160	525	12,672.28	297.08	12.00	160	525	1 .29	79.89	13.00	160	525	26.36	88.91
N_1-F	9.50	230	606	13,269.74	331.25	11.00	230	605	23.18	97.35	12.00	230	605	58.10	89.05
N_1-B	9.00	140	630	13,881.69	629.51	12.00	140	630	4.32	90.11	12.50	140	630	2.59	76.34
N_2-G	10.00	400	449	10,978.00	113.73	12.50	400	449	43.20	21.86	13.00	400	449	84.60	45.69
N_2-F	10.00	310	455	18,446.10	144.79	12.50	310	455	80.78	27.42	13.00	310	455	79.18	43.35
N_2-B	9.50	470	443	16,853.93	344.46	12.00	470	443	72.93	50.35	12.50	470	443	56.34	43.67
N_3-G	9.50	210	510	4,860.90	145.22	11.00	210	510	39.73	53.57	12.00	210	510	62.89	96.24
N_3-F	9.00	440	548	574.33	111.82	10.00	440	548	35.65	45.09	10.50	440	548	27.13	73.54
N_3-B	8.50	480	429	21,305.41	148.13	11.50	480	429	54.29	17.48	12.50	480	429	85.19	67.13
S_1-G	11.00	80	478	6,277.88	83.25	12.00	80	478	81.33	28.02	13.50	80	478	78.25	40.51
S_1-F	8.50	160	451	15,045.78	138.68	12.00	160	451	55.74	28.85	13.50	160	451	10.00	16.27
S_1-B	8.50	170	447	22,054.66	240.06	12.00	170	447	50.33	15.66	13.00	170	447	28.47	19.35
S_2-G	10.00	280	554	31.04	24.55	10.00	280	554	32.45	24.99	11.00	280	554	34.81	39.66
S_2-F	9.50	100	521	9,577.25	83.50	11.00	100	521	80.93	24.87	12.00	100	521	63.30	73.46
S_2-B	9.50	80	576	3,723.25	105.00	10.50	80	576	95.13	46.81	12.00	80	576	30.38	22.36

TABLE 5 ANALYSIS OF JRA METHOD (MODIFIED WESTERGAARD METHOD)

	Slab Thickness (in.)	Modulus of Rupture (Psi)	Modulus of Rupture (kg/cm^2)	Maximum Stress (kg/cm^2) Wheel (kg/cm^2)	Maximum Stress (kg/cm^2) Thermal (kg/cm^2)	Maximum Stress (kg/cm^2) Total (kg/cm^2)	Fatigue Ratio	Required Thickness To Date (in.)	Required Thickness For 20 Years (in.)
N_1-G	9.98	525	(36.91)	27.20	4.60	31.80	21.80	11.22	11.59
N_1-F	9.40	605	(42.53)	29.80	4.90	34.70	7.70	10.15	10.46
N_1-B	8.81	630	(44.29)	35.60	5.00	40.60	100.60	10.31	10.61
N_2-G	10.02	449	(31.56)	24.20	4.20	28.50	62.70	11.70	12.08
N_2-F	9.96	455	(31.99)	25.50	4.30	29.80	116.80	11.83	12.36
N_2-B	9.44	443	(31.14)	25.80	4.20	29.90	230.10	11.63	12.09
N_3-G	9.38	510	(35.85)	29.90	4.50	34.50	116.50	10.98	11.63
N_3-F	9.23	548	(38.52)	27.40	4.70	32.10	4.90	9.80	10.34
N_3-B	8.60	429	(30.16)	29.30	4.10	33.40	Max. S > MR	11.43	12.11
S_1-G	11.25	478	(33.60)	22.20	4.40	26.60	5.10	11.93	12.12
S_1-F	8.63	451	(31.71)	30.80	4.20	35.00	Max. S > MR	11.80	11.95
S_1-B	8.71	447	(31.42)	30.10	4.20	34.30	Max. S > MR	11.73	12.05
S_2-G	9.77	554	(38.95)	23.80	4.70	28.50	0.64	9.64	10.12
S_2-F	9.60	521	(36.63)	28.10	4.50	32.60	44.10	10.89	11.41
S_2-G	9.27	576	(40.49)	30.70	4.80	35.50	31.80	10.39	10.91

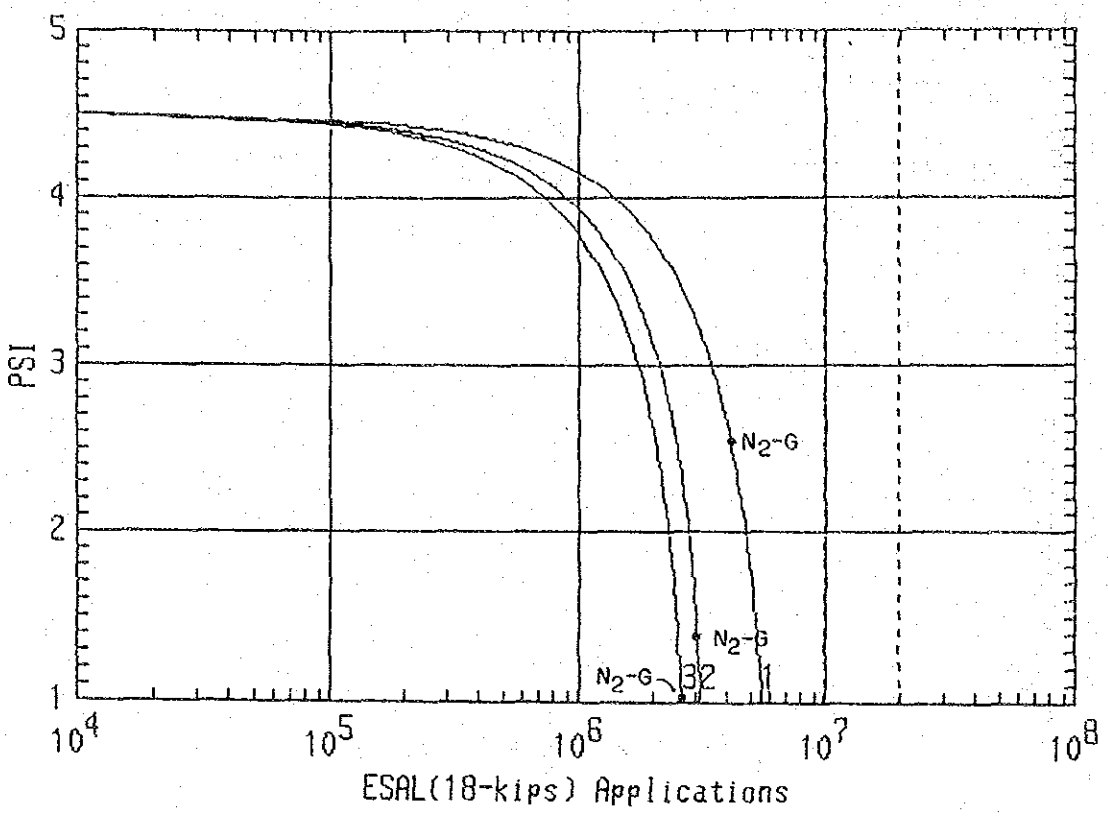
APPENDIX 14-7
ANALYSIS OF STRUCTURAL STRENGTH BY EMPIRICAL/THEORETICAL METHODS

FIGURE 1 (a) STA. RITA-GAPAN; N_1



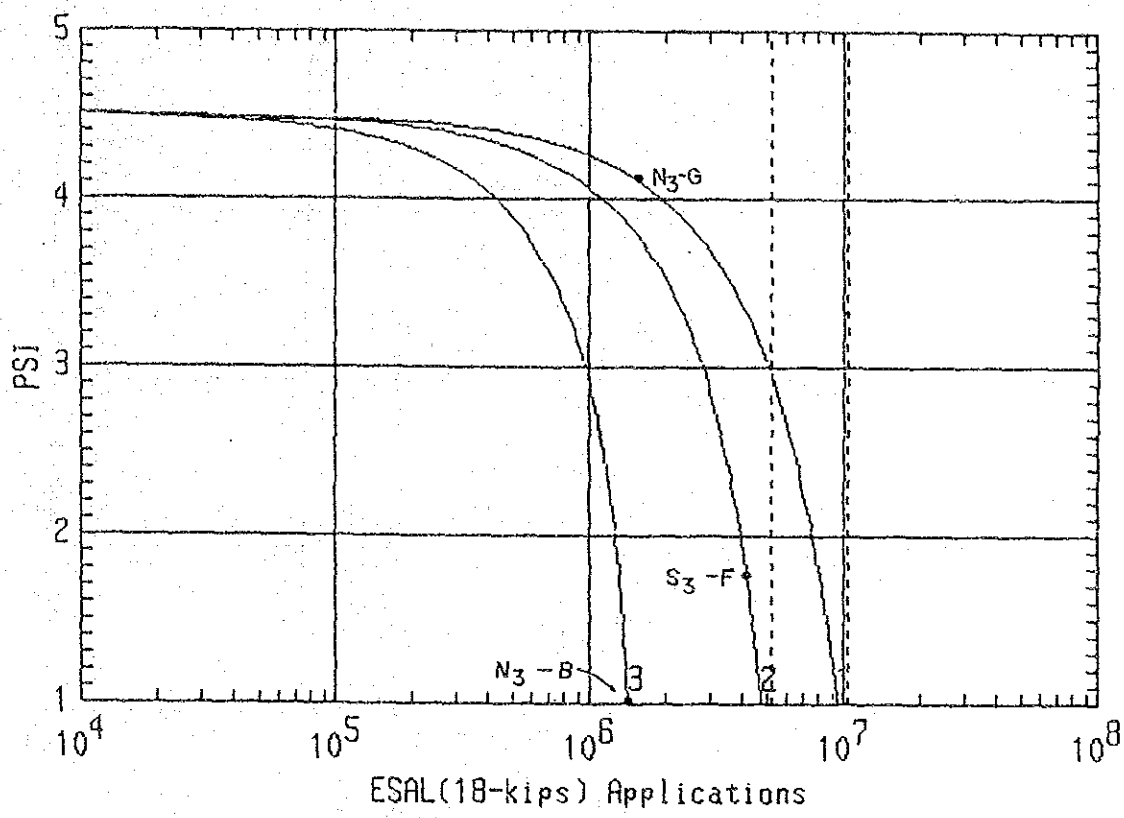
	Curve 1	Curve 2	Curve 3
ZR	0	0	0
So	0	0	0
D	9.98in	9.4in	8.81in
S'c	525psi	605psi	630psi
J	4	4	4
Cd	1	.9	.8
Ec	3120ksi	3350ksi	3420ksi
k	210pci	230pci	140pci
Po	4.5	4.5	4.5

FIGURE 1 (b) STA. RITA-GAPAN; N_2



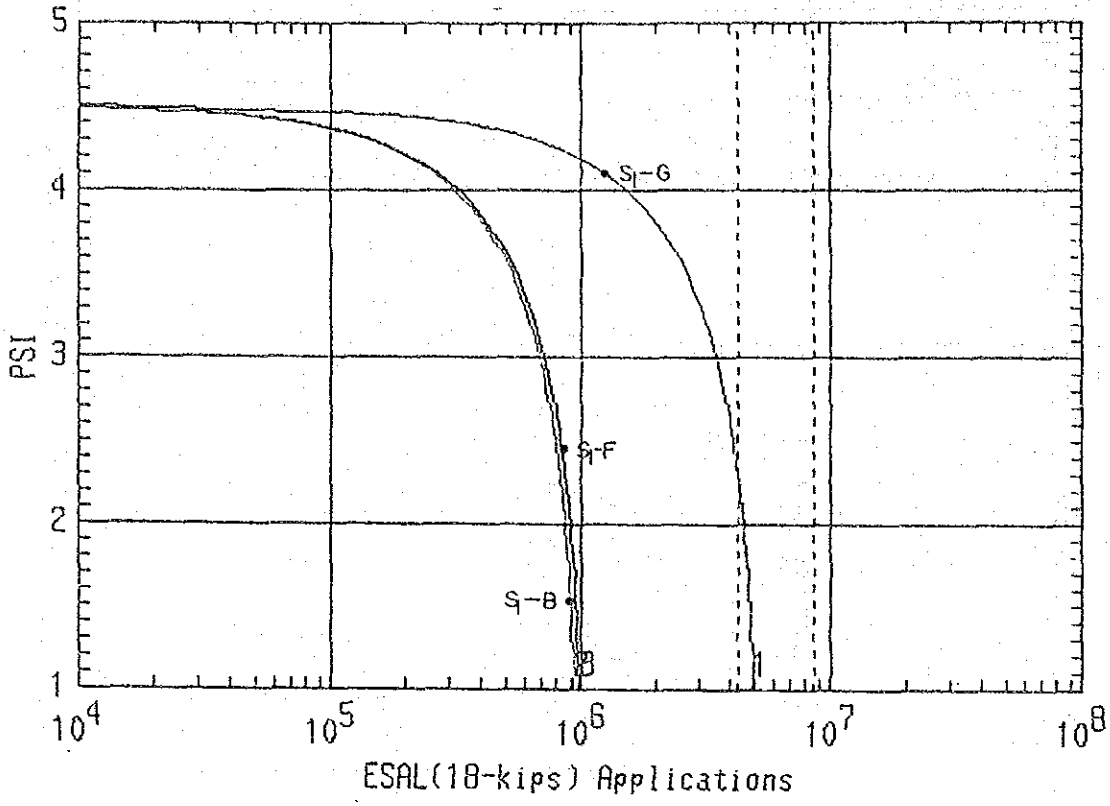
	Curve 1	Curve 2	Curve 3
ZR	0	0	0
So	0	0	0
D	10.02in	9.96in	9.44in
S'c	449psi	455psi	443psi
J	4	4	4
Cd	.9	.8	.8
Ec	2890ksi	2910ksi	2870ksi
k	400pci	310pci	470pci
Po	4.5	4.5	4.5

FIGURE 1 (c) SAN JOSE-ARITAO; N_3



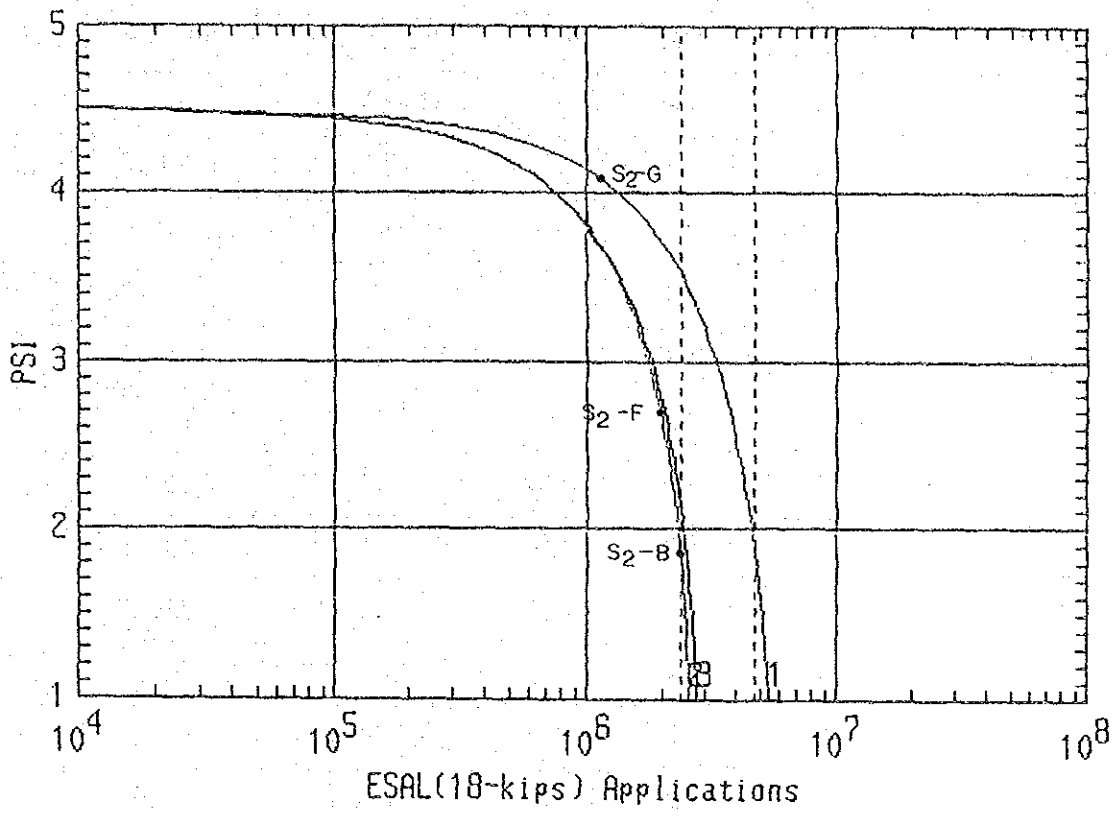
	Curve 1	Curve 2	Curve 3
ZR	0	0	0
So	0	0	0
D	9.38in	9.23in	8.6in
S'c	510psi	548psi	429psi
J	4	4	4
Cd	1.1	.8	.8
Ec	3080ksi	3190ksi	2820ksi
k	210pci	440pci	480pci
Po	4.5	4.5	4.5

FIGURE 2 (a) STO. TOMAS-TIAONG; S_1



	Curve 1	Curve 2	Curve 3
ZR	0	0	0
So	0	0	0
D	11.25in	8.63in	8.71in
S'c	478psi	451psi	447psi
J	4	4	4
Cd	.8	.8	.8
Ec	2980ksi	2890ksi	2880ksi
k	80pci	160pci	170pci
Po	4.5	4.5	4.5

FIGURE 2 (b) LUCENA-GUMACA; S_2



	Curve 1	Curve 2	Curve 3
ZR	0	0	0
So	0	0	0
D	9.77in	9.6in	9.27in
S'c	554psi	521psi	576psi
J	4	4	4
Cd	.8	.8	.8
Ec	3210ksi	3110ksi	3270ksi
k	280pci	100pci	80pci
Po	4.5	4.5	4.5

TABLE 1 ANALYSIS OF PCA METHOD

	Present Condition				
	Thickness	k	MR	Fatigue	Erosion
N_1-G	10.00	160	525	12,672.28	297.08
N_1-F	9.50	230	606	13,269.74	331.25
N_1-B	9.00	140	630	13,881.69	629.51
N_2-G	10.00	400	449	10,978.00	113.73
N_2-F	10.00	310	455	18,446.10	144.79
N_2-B	9.50	470	443	16,853.93	344.46
N_3-G	9.50	210	510	4,860.90	145.22
N_3-F	9.00	440	548	574.33	111.82
N_3-B	8.50	480	429	21,305.41	148.13
S_1-G	11.00	80	478	6,277.88	83.25
S_1-F	8.50	160	451	15,045.78	138.68
S_1-B	8.50	170	447	22,054.66	240.06
S_2-G	10.00	280	554	31.04	24.55
S_2-F	9.50	100	521	9,577.25	83.50
S_2-B	9.50	80	576	3,723.25	105.00

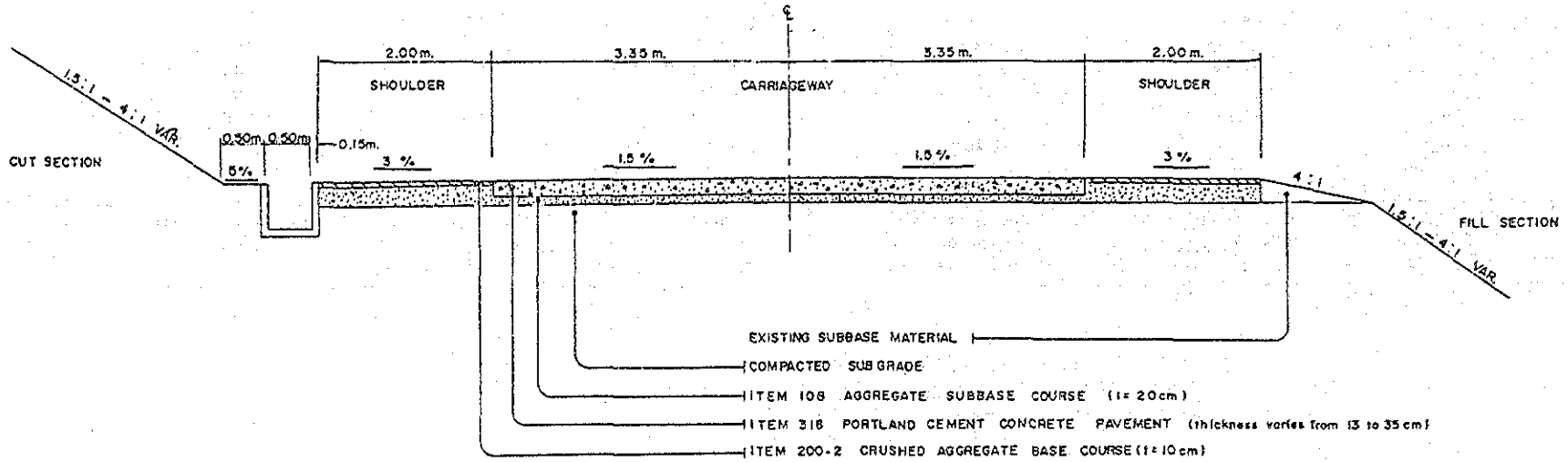
TABLE 2 ANALYSIS OF MODIFIED WESTERGAARD METHOD

	Slab Thickness (in.)	Modulus of Rupture (Psi)	Modulus of Rupture (kg/cm^2)	Maximum Stress (kg/cm^2) Wheel (kg/cm^2)	Maximum Stress (kg/cm^2) Thermal (kg/cm^2)	Maximum Stress (kg/cm^2) Total (Kg/cm^2)	Fatigue Ratio
N_1-G	9.98	525	(36.91)	27.20	4.60	31.80	21.80
N_1-F	9.40	605	(42.53)	29.80	4.90	34.70	7.70
N_1-B	8.81	630	(44.29)	35.60	5.00	40.60	100.60
N_2-G	10.02	449	(31.56)	24.20	4.20	28.50	62.70
N_2-F	9.96	455	(31.99)	25.50	4.30	29.80	116.80
N_2-B	9.44	443	(31.14)	25.80	4.20	29.90	230.10
N_3-G	9.38	510	(35.85)	29.90	4.50	34.50	116.50
N_3-F	9.23	548	(38.52)	27.40	4.70	32.10	4.90
N_3-B	8.60	429	(30.16)	29.30	4.10	33.40	Max. S>MR
S_1-G	11.25	478	(33.60)	22.20	4.40	26.60	5.10
S_1-F	8.63	451	(31.71)	30.80	4.20	35.00	Max. S>MR
S_1-B	8.71	447	(31.42)	30.10	4.20	34.30	Max. S>MR
S_2-G	9.77	554	(38.95)	23.80	4.70	28.50	0.64
S_2-F	9.60	521	(36.63)	28.10	4.50	32.60	44.10
S_2-G	9.27	576	(40.49)	30.70	4.80	35.50	31.80

APPENDICES FOR CHAPTER 16

APPENDIX 16-1
TYPICAL CROSS SECTIONS OF PROPOSED REHABILITATION WORKS

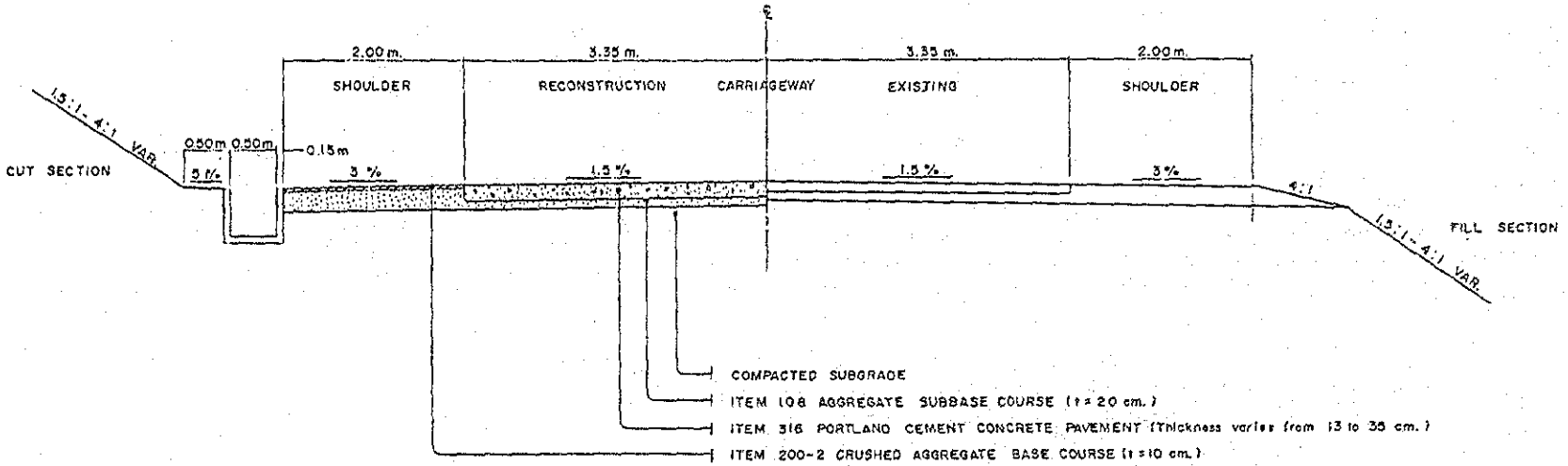
FIGURE 1 TYPICAL CROSS - SECTION
PCC RECONSTRUCTION (2-LANES)



Unit : Peso per meter

Slab Thickness (cm.)	ITEM 104: Removal of Miscellaneous Structures	ITEM 105 Roadway Excavation	ITEM 108 Aggregate Subbase	ITEM 316: Portland Cement Concrete Pavement	ITEM 200-2: Crushed Aggregate Base	Total Cost (₱/m)
13	176.01	96.12	471.32	1042.33	110.66	1896.44
15	176.01	106.45	488.01	1202.68	110.66	2083.81
18	176.01	121.96	513.03	1443.22	110.66	2364.88
20	176.01	132.29	529.72	1603.58	110.66	2552.26
23	176.01	147.80	554.74	1844.11	110.66	2833.32
25	176.01	158.13	571.43	2004.47	110.66	3020.70
28	176.01	173.64	596.45	2245.01	110.66	3301.77
30	176.01	183.97	613.14	2405.37	110.66	3489.15
33	176.01	199.48	638.16	2645.90	110.66	3770.21
35	176.01	209.82	654.85	2806.26	110.66	3957.60

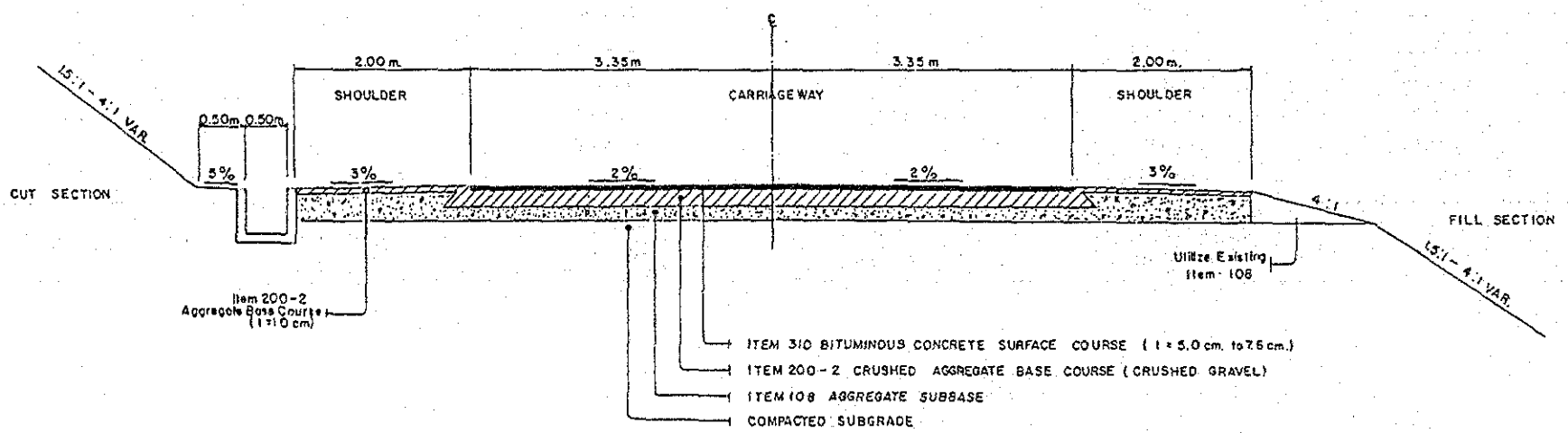
FIGURE 2 TYPICAL CROSS-SECTION
PCC RECONSTRUCTION (1-LANE)



Unit: Peso per meter

Slab Thickness (cm.)	Item 104 Removal of Miscellaneous Structures	Item 105 Roadway Excavation	Item 108 Aggregate Subbase	Item 316 Portland Cement Concrete Pavement	Item 200-2 Crushed Aggregate Base	Total Cost (₱/m)
13	88.01	48.06	235.66	521.16	55.33	948.22
15	88.01	53.23	244.00	601.34	55.33	1041.91
18	88.01	60.98	256.52	721.61	55.33	1182.45
20	88.01	66.15	264.86	801.79	55.33	1276.14
23	88.01	73.90	277.37	922.06	55.33	1416.67
25	88.01	79.07	285.71	1002.24	55.33	1510.36
28	88.01	86.82	298.23	1122.50	55.33	1650.89
30	88.01	91.99	306.57	1202.68	55.33	1744.58
33	88.01	99.74	319.09	1322.95	55.33	1855.11
35	88.01	104.91	327.42	1403.13	55.33	1978.80

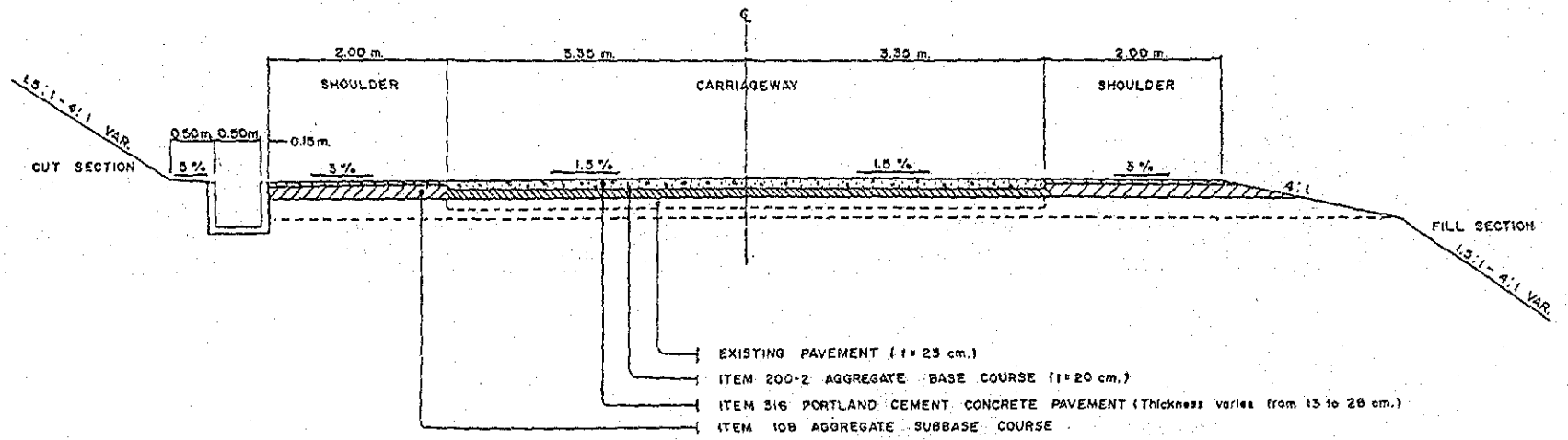
FIGURE 3 TYPICAL CROSS-SECTION
AC RECONSTRUCTION (2-LANES)



SN	Item 104 Removal of Miscelleneous Structure	Item 105 Roadway and Drainage Excavation	Item 108 Aggregate Subbase	Item 200-1 Mechanically Stabilized Aggregate Base Course (Crushed Stone)	Item 202-2 Aggregate Base Course Crushed Gravel	Item 205 Bituminous Plant Mix Base Course	Item 10; Bituminous Concrete Surface Course Including Prime Coat and Tack Coat (Thickness = 10 cm)	Total Cost (₱/m)
1.3	176.01	38.64	70.91	—	405.29	—	840.78	1531.63
1.7	176.01	106.45	405.63	—	405.29	—	840.78	1934.16
2.1	176.01	119.88	423.98	—	409.72	—	1270.05	2399.64
2.5	176.01	171.56	571.01	—	510.70	—	1270.05	2699.33
3.0	176.01	209.82	699.69	—	514.57	—	1645.72	3245.81
3.6	176.01	287.34	882.17	—	716.52	—	1645.72	3707.76
4.0	176.01	339.02	953.07	448.04	547.77	—	1645.72	4109.63
4.5	176.01	416.54	1059.43	560.05	758.02	—	1645.72	4615.77
5.0	176.01	416.54	1059.43	560.05	572.67	1278.01	1645.72	5708.43
5.5	176.01	494.06	1165.79	672.06	782.92	1278.01	1645.72	6214.57

NOTE: SN 1.7 and 2.0 have no Tack Coat

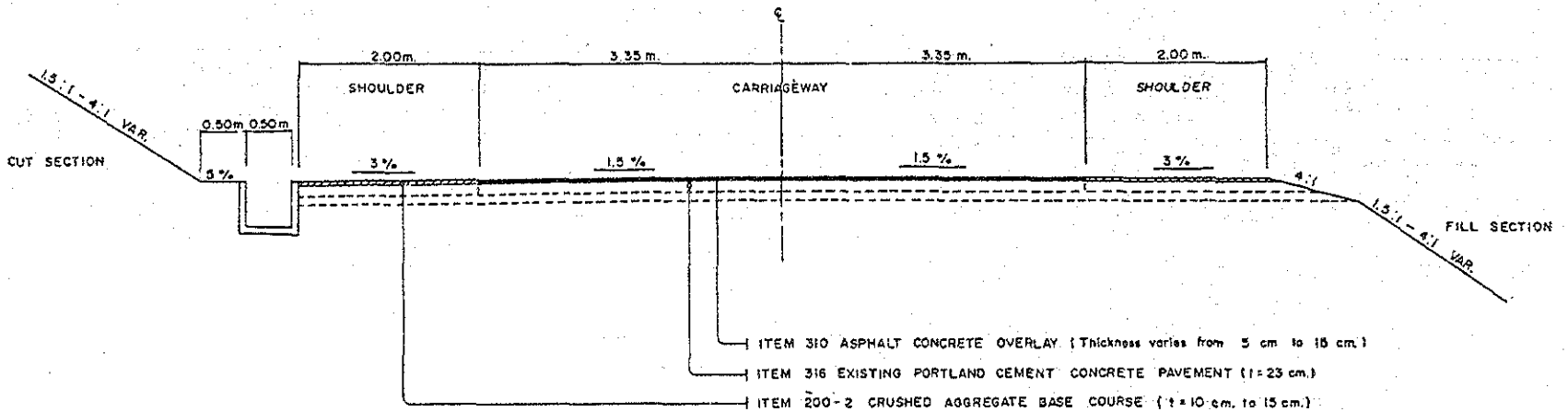
FIGURE 4 TYPICAL CROSS-SECTION
RIGID OVERLAY - RIGID EXISTING (2 - LANES)



Slab Thickness (cm)	Item 118 Repreparation of Previously Constructed Road	Item 108 Aggregate Subbase	Item 200-2 Aggregate Base Course Crushed Gravel	Item 316 Portland Cement Concrete Pavement	Total Cost (₱/m)
13	141.67	191.87	481.37	1042.33	1857.24
15	141.67	208.55	481.37	1202.68	2034.27
18	141.67	233.58	481.37	1443.22	2299.84
20	141.67	250.26	481.37	1603.58	2476.88
23	141.67	275.29	481.37	1844.11	2742.44
25	141.67	291.97	481.37	2004.47	2919.48
28	141.67	317.00	481.37	2245.01	3185.05
30	141.67	333.68	481.37	2405.37	3362.09
33	141.67	358.71	481.37	2645.90	3627.65

FIGURE 5 TYPICAL CROSS-SECTION

FLEXIBLE OVERLAY RIGID EXISTING (2-LANES)

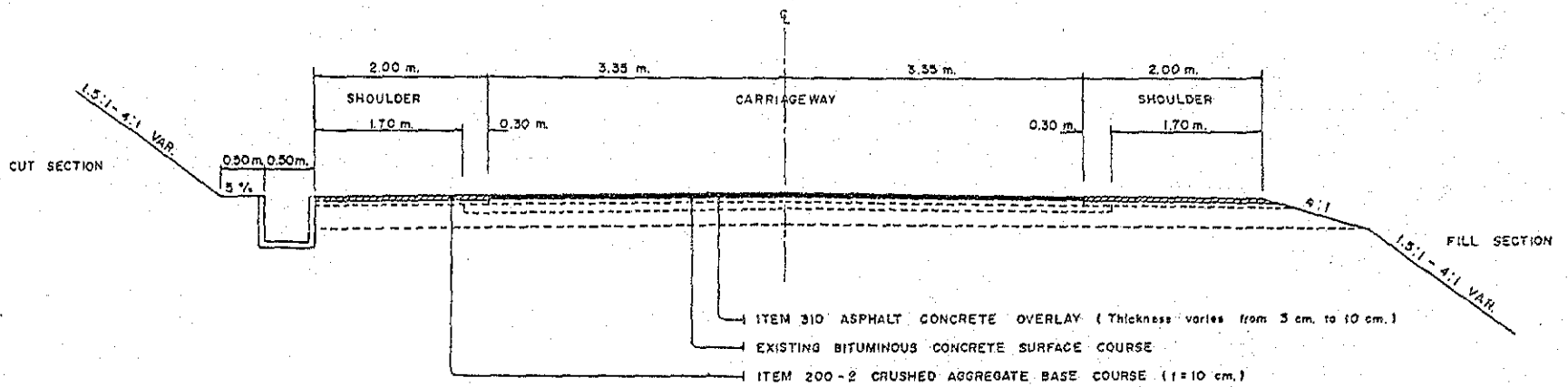


Unit: Peso per meter

AC Thickness (cm)	Item 119 - 1 Repreparation of Previously Constructed Road	Item 200-2 Crushed Aggregate Base Course	Item 302 Bituminous Prime Coat	Item 303 Bituminous Tack Coat	Item 310 Bituminous Concrete Surface Course	Total Cost (₱/m)
5	141.67	110.66	58.16	—	782.66	1,093.15
8	141.67	110.66	58.16	22.24	1252.25	1584.98
10	141.67	110.66	58.16	22.24	1565.31	1898.04
13	141.67	143.86	58.16	22.24	2034.91	2400.84
15	141.67	165.99	58.16	22.24	2347.97	2736.03

FIGURE 6 TYPICAL CROSS-SECTION

FLEXIBLE OVERLAY - FLEXIBLE EXISTING (2-LANES)



Unit : Peso per meter

AC Thickness (cm.)	ITEM 118-2 Repreporation of Previously Constructed Road	ITEM 200-2 Aggregate Base Course	ITEM 302 Bituminous Prime Course	ITEM 303 Bituminous Tack Coat	ITEM 310 Bituminous Concrete Surface Course	Total Cost (₱/m.)
3	96.71	110.66	58.16	—	469.59	735.12
5	96.71	110.66	56.16	—	782.66	1048.19
8	96.71	110.66	58.16	22.24	1252.25	1540.02
10	96.71	110.66	58.16	22.24	1565.31	1853.08

APPENDIX 16-2
ANALYSIS ON MOST ECONOMICAL PERFORMANCE PERIOD OF INITIAL PAVEMENT STRUCTURE

TABLE 1

Economic Design

Rehabilitation Method	Traffic Loading Class	CBR= 3 k =130 Mr= 4000	CBR= 6 k =210 Mr= 6000	CBR=10 k =250 Mr= 8000
PCC Reconstruction	L-1	x = 19.2 D = 13.0 C1= 1896 C2= 2179	x = 24.2 D = 13.0 C1= 1896 C2= 2121	x = 26.5 D = 13.0 C1= 1896 C2= 2115
	L-2	x = 17.3 D = 14.4 C1= 2028 C2= 2349	x = 15.2 D = 13.0 C1= 1896 C2= 2244	x = 16.9 D = 13.0 C1= 1896 C2= 2214
	L-3	x = 19.0 D = 18.0 C1= 2365 C2= 2660	x = 14.1 D = 15.9 C1= 2168 C2= 2547	x = 13.3 D = 15.3 C1= 2112 C2= 2505
	A	x = 18.6 D = 22.4 C1= 3273 C2= 3630	x = 14.0 D = 20.3 C1= 3076 C2= 3550	x = 14.0 D = 20.0 C1= 3048 C2= 3507
	B	x = 17.2 D = 24.6 C1= 3479 C2= 3883	x = 16.1 D = 23.6 C1= 3385 C2= 3788	x = 15.2 D = 23.0 C1= 3329 C2= 3752
	C	x = 20.1 D = 28.4 C1= 3835 C2= 4161	x = 18.1 D = 27.1 C1= 3714 C2= 4062	x = 17.1 D = 26.5 C1= 3658 C2= 4020
	D	x = 19.1 D = 30.6 C1= 4041 C2= 4403	x = 17.0 D = 29.2 C1= 3910 C2= 4295	x = 15.1 D = 28.2 C1= 3817 C2= 4250
	E	x = 17.1 D = 31.5 C1= 4126 C2= 4572	x = 17.1 D = 30.9 C1= 4069 C2= 4459	x = 15.0 D = 29.8 C1= 3966 C2= 4403
	F	x = 18.3 D = 34.0 C1= 4360 C2= 4768	x = 15.2 D = 32.1 C1= 4182 C2= 4645	x = 15.1 D = 31.8 C1= 4154 C2= 4592
	G	x = 17.1 D = 35.0 C1= 4454 C2= 4908	x = 14.1 D = 33.0 C1= 4266 C2= 4788	x = 15.0 D = 33.2 C1= 4285 C2= 4727
	H	x = 14.2 D = 34.8 C1= 4435 C2= 5063	x = 15.0 D = 34.6 C1= 4416 C2= 4893	x = 13.1 D = 33.4 C1= 4304 C2= 4837
	I	x = 12.7 D = 35.0 C1= 4454 C2= 5216	x = 13.1 D = 34.6 C1= 4416 C2= 5007	x = 12.1 D = 33.8 C1= 4341 C2= 4930
	J	x = 11.3 D = 35.0 C1= 4454 C2= 5349	x = 12.3 D = 35.0 C1= 4454 C2= 5109	x = 12.1 D = 34.6 C1= 4416 C2= 5013

Analysis Period : 25 years
x : Initial Performance Period (years)
D : Thickness of Slab (cm)
C1 : Initial Construction Cost (pesos/meter)
C2 : Total Discounted Cost including Maintenance Cost (pesos/meter)

TABLE 2

Economic Design

Rehabilitation Method	Traffic Loading Class	CBR= 3 k =130 Mr= 4000	CBR= 6 k =210 Mr= 6000	CBR=10 k =250 Mr= 8000
AC Reconstruction	L-1	x = 18.2 SN= 2.5 C1= 2699 C2= 3093	x = 15.0 SN= 2.1 C1= 2353 C2= 2816	x = 14.2 SN= 1.8 C1= 2074 C2= 2553
	L-2	x = 14.5 SN= 2.7 C1= 2863 C2= 3395	x = 20.1 SN= 2.5 C1= 2669 C2= 3012	x = 20.4 SN= 2.2 C1= 2490 C2= 2828
	L-3	x = 16.0 SN= 3.2 C1= 3431 C2= 3917	x = 15.4 SN= 2.8 C1= 2972 C2= 3464	x = 16.0 SN= 2.5 C1= 2699 C2= 3152
	A	x = 13.5 SN= 3.9 C1= 4525 C2= 5053	x = 14.4 SN= 3.4 C1= 4112 C2= 4618	x = 14.5 SN= 3.0 C1= 3788 C2= 4297
	B	x = 10.0 SN= 4.1 C1= 4706 C2= 5435	x = 14.3 SN= 3.8 C1= 4445 C2= 4936	x = 14.2 SN= 3.4 C1= 4112 C2= 4620
	C	x = 8.3 SN= 4.4 C1= 5011 C2= 5902	x = 10.1 SN= 4.0 C1= 4565 C2= 5295	x = 14.1 SN= 3.8 C1= 4445 C2= 4949
	D	x = 6.2 SN= 4.6 C1= 5221 C2= 6427	x = 11.3 SN= 4.4 C1= 5011 C2= 5635	x = 11.0 SN= 4.0 C1= 4565 C2= 5227
	E	x = 4.2 SN= 4.5 C1= 5112 C2= 6812	x = 8.4 SN= 4.4 C1= 5011 C2= 5901	x = 10.0 SN= 4.1 C1= 4706 C2= 5435
	F	x = 9.5 SN= 5.4 C1= 6659 C2= 7424	x = 6.8 SN= 4.5 C1= 5112 C2= 6240	x = 11.1 SN= 4.4 C1= 5061 C2= 5711
	G	x = 7.4 SN= 5.4 C1= 6659 C2= 7648	x = 5.3 SN= 4.5 C1= 5112 C2= 6558	x = 9.3 SN= 4.5 C1= 5112 C2= 5913
	H	x = 6.1 SN= 5.4 C1= 6659 C2= 7855	x = 4.3 SN= 4.5 C1= 5112 C2= 6811	x = 7.8 SN= 4.5 C1= 5112 C2= 6102
	I	x = 5.2 SN= 5.4 C1= 6659 C2= 8052	x = 4.2 SN= 4.6 C1= 5330 C2= 7030	x = 6.2 SN= 4.4 C1= 5061 C2= 6267
	J	x = 4.5 SN= 5.4 C1= 6659 C2= 8244	x = 4.1 SN= 4.7 C1= 5549 C2= 7246	x = 6.2 SN= 4.6 C1= 5221 C2= 6427

Analysis Period : 25 years
x : Initial Performance Period (years)
SN : Structural Number
C1 : Initial Construction Cost (pesos/meter)
C2 : Total Discounted Cost including Maintenance Cost (pesos/meter)

TABLE 3

Economic Design

Rehabilitation Method	Traffic Loading Class	CBR= 3 k =130 Mr= 4000	CBR= 6 k =210 Mr= 6000	CBR=10 k =250 Mr= 8000
Rigid Ol -Rigid Ex	L-1	x = 49.1 h = 13.0 C1= 1857 C2= 2048	x = 53.9 h = 13.0 C1= 1857 C2= 2045	x = 56.0 h = 13.0 C1= 1857 C2= 2044
	L-2	x = 35.8 h = 13.0 C1= 1857 C2= 2060	x = 40.2 h = 13.0 C1= 1857 C2= 2055	x = 42.1 h = 13.0 C1= 1857 C2= 2054
	L-3	x = 19.3 h = 13.2 C1= 1875 C2= 2190	x = 21.9 h = 13.0 C1= 1857 C2= 2127	x = 23.3 h = 13.0 C1= 1857 C2= 2097
	A	x = 20.1 h = 19.6 C1= 2938 C2= 3249	x = 18.2 h = 18.2 C1= 2814 C2= 3178	x = 19.0 h = 18.2 C1= 2814 C2= 3149
	B	x = 20.2 h = 22.7 C1= 3212 C2= 3531	x = 17.0 h = 20.9 C1= 3052 C2= 3468	x = 17.1 h = 20.6 C1= 3026 C2= 3440
	C	x = 20.0 h = 25.9 C1= 3495 C2= 3825	x = 21.1 h = 25.6 C1= 3468 C2= 3767	x = 19.1 h = 24.6 C1= 3380 C2= 3738
	D	x = 22.0 h = 29.4 C1= 3805 C2= 4083	x = 20.0 h = 28.0 C1= 3681 C2= 4017	x = 19.2 h = 27.4 C1= 3628 C2= 3996
	E	x = 21.0 h = 30.9 C1= 3938 C2= 4248	x = 21.2 h = 30.3 C1= 3885 C2= 4193	x = 20.1 h = 29.6 C1= 3823 C2= 4163
	F	x = 20.0 h = 32.7 C1= 4097 C2= 4447	x = 20.1 h = 32.1 C1= 4044 C2= 4391	x = 20.0 h = 31.8 C1= 4018 C2= 4365
	G	x = 17.1 h = 33.0 C1= 4124 C2= 4614	x = 17.2 h = 32.4 C1= 4071 C2= 4556	x = 19.1 h = 33.0 C1= 4124 C2= 4515
	H	x = 14.5 h = 33.0 C1= 4124 C2= 4813	x = 15.2 h = 32.7 C1= 4097 C2= 4710	x = 16.3 h = 33.0 C1= 4124 C2= 4671
	I	x = 12.2 h = 32.7 C1= 4097 C2= 4975	x = 13.3 h = 32.7 C1= 4097 C2= 4873	x = 14.3 h = 33.0 C1= 4124 C2= 4816
	J	x = 11.2 h = 33.0 C1= 4124 C2= 5121	x = 12.3 h = 33.0 C1= 4124 C2= 5004	x = 12.2 h = 32.7 C1= 4097 C2= 4974

Analysis Period : 25 years
x : Initial Performance Period (years)
h : Thickness of PCC Overlay (cm)
C1 : Initial Construction Cost (pesos/meter)
C2 : Total Discounted Cost including Maintenance Cost (pesos/meter)

TABLE 4

Economic Design

Rehabilitation Method	Traffic Loading Class	CBR= 3 k =130 Mr= 4000	CBR= 6 k =210 Mr= 6000	CBR=10 k =250 Mr= 8000
Flexible OL -Rigid Ex	L-1	x = 62.8 h = 5.0 C1= 1093 C2= 1345	x = 83.3 h = 5.0 C1= 1093 C2= 1341	x = 98.2 h = 5.0 C1= 1093 C2= 1340
	L-2	x = 48.4 h = 5.0 C1= 1093 C2= 1350	x = 68.1 h = 5.0 C1= 1093 C2= 1344	x = 82.7 h = 5.0 C1= 1093 C2= 1341
	L-3	x = 28.3 h = 5.0 C1= 1093 C2= 1364	x = 45.3 h = 5.0 C1= 1093 C2= 1351	x = 58.9 h = 5.0 C1= 1093 C2= 1346
	A	x = 16.8 h = 10.0 C1= 2394 C2= 2777	x = 30.4 h = 10.0 C1= 2394 C2= 2654	x = 42.4 h = 10.0 C1= 2394 C2= 2635
	B	x = 11.1 h = 10.6 C1= 2495 C2= 3064	x = 19.9 h = 10.0 C1= 2394 C2= 2724	x = 29.9 h = 10.0 C1= 2394 C2= 2655
	C	x = 7.1 h = 11.2 C1= 2595 C2= 3529	x = 12.1 h = 10.0 C1= 2394 C2= 2907	x = 19.6 h = 10.0 C1= 2394 C2= 2725
	D	x = 7.0 h = 13.4 C1= 2964 C2= 3912	x = 8.1 h = 10.3 C1= 2444 C2= 3240	x = 13.1 h = 10.0 C1= 2394 C2= 2867
	E	x = 6.0 h = 14.2 C1= 3098 C2= 4211	x = 8.1 h = 11.8 C1= 2696 C2= 3502	x = 11.1 h = 10.6 C1= 2495 C2= 3064
	F	x = 4.0 h = 14.0 C1= 3064 C2= 4627	x = 9.1 h = 14.0 C1= 3064 C2= 3794	x = 7.1 h = 10.0 C1= 2394 C2= 3288
	G	x = 3.6 h = 14.8 C1= 3198 C2= 4977	x = 8.0 h = 14.6 C1= 3165 C2= 4009	x = 7.0 h = 11.2 C1= 2595 C2= 3530
	H	x = 3.1 h = 15.0 C1= 3232 C2= 5215	x = 7.2 h = 15.0 C1= 3232 C2= 4183	x = 9.3 h = 13.4 C1= 2964 C2= 3686
	I	x = 2.2 h = 14.2 C1= 3098 C2= 5487	x = 6.1 h = 15.0 C1= 3232 C2= 4346	x = 8.3 h = 13.6 C1= 2998 C2= 3805
	J	x = 2.2 h = 15.0 C1= 3232 C2= 5632	x = 5.3 h = 15.0 C1= 3232 C2= 4505	x = 7.0 h = 13.4 C1= 2964 C2= 3912

Analysis Period : 25 years
x : Initial Performance Period (years)
h : Thickness of AC Overlay (cm)
C1 : Initial Construction Cost (pesos/meter)
C2 : Total Discounted Cost including Maintenance Cost (pesos/meter)

TABLE 5

Economic Design

Rehabilitation Method	Traffic Loading Class	CBR= 3 k =130 Mr= 4000	CBR= 6 k =210 Mr= 6000	CBR=10 k =250 Mr= 8000
Flexible Ol -Flexible Ex	L-1	x = 5.0 h = 3.0 C1= 735 C2= 1536	x = 11.1 h = 3.0 C1= 735 C2= 1175	x = 18.2 h = 3.0 C1= 735 C2= 1055
	L-2	x = 10.2 h = 6.5 C1= 1294 C2= 1857	x = 6.2 h = 3.0 C1= 735 C2= 1433	x = 10.9 h = 3.0 C1= 735 C2= 1199
	L-3	x = 11.1 h = 9.8 C1= 1822 C2= 2410	x = 8.1 h = 6.2 C1= 1245 C2= 1930	x = 8.1 h = 4.6 C1= 985 C2= 1620
	A	x = 3.2 h = 10.0 C1= 2349 C2= 4263	x = 7.4 h = 10.0 C1= 2349 C2= 3272	x = 11.0 h = 9.4 C1= 2255 C2= 2844
	B	x = 1.5 h = 9.8 C1= 2318 C2= 5255	x = 3.4 h = 9.4 C1= 2255 C2= 4023	x = 7.2 h = 10.0 C1= 2349 C2= 3303
	C	x = .5 h = 8.6 C1= 2130 C2= 6391	x = 2.1 h = 10.0 C1= 2349 C2= 4858	x = 3.7 h = 9.8 C1= 2318 C2= 4035
	D	x = .5 h = 10.0 C1= 2349 C2= 7253	x = 1.2 h = 10.0 C1= 2349 C2= 5574	x = 2.3 h = 10.0 C1= 2349 C2= 4662
	E	x = .3 h = 10.0 C1= 2349 C2= 7663	x = .9 h = 10.0 C1= 2349 C2= 6333	x = 1.5 h = 9.8 C1= 2318 C2= 5255
	F	x = .2 h = 10.0 C1= 2349 C2= 8482	x = .6 h = 10.0 C1= 2349 C2= 6936	x = 1.1 h = 10.0 C1= 2349 C2= 5769
	G	x = .2 h = 10.0 C1= 2349 C2= 8816	x = .3 h = 8.6 C1= 2130 C2= 7443	x = .5 h = 8.6 C1= 2130 C2= 6391
	H	x = .1 h = 10.0 C1= 2349 C2= 9315	x = .3 h = 10.0 C1= 2349 C2= 7661	x = .6 h = 9.8 C1= 2318 C2= 6589
	I	x = .1 h = 8.8 C1= 2161 C2= 9577	x = .3 h = 10.0 C1= 2349 C2= 8024	x = .6 h = 10.0 C1= 2349 C2= 6971
	J	x = .1 h = 9.6 C1= 2286 C2= 9703	x = .2 h = 10.0 C1= 2349 C2= 8306	x = .5 h = 10.0 C1= 2349 C2= 7253

Analysis Period : 25 years
x : Initial Performance Period (years)
h : Thickness of AC Overlay (cm)
C1 : Initial Construction Cost (pesos/meter)
C2 : Total Discounted Cost including Maintenance Cost (pesos/meter)

APPENDIX 16-3
BASIC STRUCTURAL DESIGN OF PAVEMENT REHABILITATION METHODS

TABLE 1

Basic Design

Rehabilitation Method	Traffic Loading Class	CBR k Mr	2 80 2500	3 130 4000	4 170 5000	6 210 6000	8 230 7000	10 250 8000	15 280 12000	20 300 15000	Design Performance Period
	L-1	D	15.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	
		x	26.5	19.2	21.7	24.2	25.4	26.5	28.2	29.3	
		C1	2734	1896	1896	1896	1896	1896	1896	1896	
		C2	2952	2179	2148	2121	2118	2115	2111	2109	
	L-2	D	18.0	15.0	15.0	15.0	15.0	15.0	15.0	13.0	
		x	32.6	20.1	22.3	24.3	25.2	26.2	27.6	19.1	20 Years
		C1	3015	2084	2084	2084	2084	2084	2084	1896	
		C2	3213	2357	2328	2309	2306	2304	2300	2165	
	L-3	D	20.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	
		x	25.2	19.0	20.7	22.2	23.0	23.7	24.7	25.3	
		C1	3202	2365	2365	2365	2365	2365	2365	2365	
		C2	3424	2660	2634	2609	2605	2596	2588	2587	
	A	D	23.0	23.0	23.0	23.0	23.0	23.0	20.0	20.0	
		x	18.7	20.7	22.0	23.1	23.7	24.2	14.6	15.0	
		C1	3979	3329	3329	3329	3329	3329	3048	3048	
		C2	4393	3633	3589	3569	3566	3554	3495	3456	
	B	D	25.0	25.0	25.0	23.0	23.0	23.0	23.0	23.0	
		x	16.8	18.5	19.6	14.4	14.8	15.2	15.7	16.1	15 Years
		C1	4167	3517	3517	3329	3329	3329	3329	3329	
		C2	4692	3886	3841	3809	3796	3752	3739	3705	
	C	D	28.0	28.0	28.0	28.0	28.0	28.0	28.0	28.0	
		x	17.4	18.9	19.9	20.8	21.2	21.5	22.1	22.4	
		C1	4448	3798	3798	3798	3798	3798	3798	3798	
		C2	4961	4174	4125	4094	4072	4068	4049	4047	
PCC Reconstruction	D	D	30.0	30.0	30.0	30.0	28.0	28.0	28.0	28.0	
		x	16.1	17.5	18.4	19.2	14.3	14.6	15.1	15.3	
		C1	4635	3985	3985	3985	3798	3798	3798	3798	
		C2	5221	4415	4352	4312	4280	4269	4215	4209	
	E	D	33.0	33.0	33.0	30.0	30.0	30.0	30.0	30.0	
		x	19.6	21.0	21.9	14.9	15.2	15.5	15.9	16.2	
		C1	4916	4266	4266	3985	3985	3985	3985	3985	
		C2	5350	4576	4551	4483	4431	4419	4400	4364	
	F	D	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	15 Years
		x	14.7	15.9	16.7	17.3	17.6	17.9	18.3	18.6	
		C1	4916	4266	4266	4266	4266	4266	4266	4266	
		C2	5663	4792	4710	4656	4642	4632	4594	4590	
	G	D	35.0	35.0	35.0	35.0	33.0	33.0	33.0	33.0	
		x	16.0	17.1	17.9	18.5	14.3	14.6	15.0	15.2	
		C1	5104	4454	4454	4454	4266	4266	4266	4266	
		C2	5771	4908	4861	4815	4760	4746	4722	4680	
	H	D	35.0	35.0	35.0	35.0	33.0	33.0	33.0	33.0	
		x	13.5	14.6	15.3	15.8	12.1	12.3	12.6	12.9	
		C1	5104	4454	4454	4454	4266	4266	4266	4266	
		C2	5993	5066	4960	4925	4877	4852	4819	4810	
	I	D	35.0	35.0	35.0	35.0	35.0	35.0	35.0	35.0	
		x	11.8	12.7	13.3	13.9	14.1	14.3	14.7	14.9	12 Years
		C1	5104	4454	4454	4454	4454	4454	4454	4454	
		C2	6216	5216	5084	5030	4955	4940	4913	4905	
	J	D	(35.0)	(35.0)	35.0	35.0	35.0	35.0	35.0	35.0	
		x	(10.4)	(11.3)	11.8	12.3	12.6	12.8	13.1	13.3	
		C1	(5104)	(4454)	4454	4454	4454	4454	4454	4454	
		C2	(6426)	(5349)	5237	5109	5073	5041	4961	4951	

Analysis Period : 25 years
D : Thickness of Slab (cm)
x : Initial Performance Period (years)
C1 : Initial Construction Cost (pesos/meter)
C2 : Total Discounted Cost including Maintenance Cost (pesos/meter)
() : Initial Performance Period less than Design

TABLE 2

Basic Design

Rehabilitation Method	Traffic Loading Class	CBR k Mr	2 80 2500	3 130 4000	4 170 5000	6 210 6000	8 230 7000	10 250 8000	15 280 12000	20 300 15000	Design Performance Period
AC Reconstruction	L-1	SN	2.5	2.5	2.5	2.1	2.1	2.1	1.7	1.7	
		x	18.2	18.2	25.4	16.4	20.9	25.4	20.7	28.4	
		C1	3799	2699	2699	2400	2400	2400	1934	1934	
		C2	4193	3093	2972	2831	2731	2674	2258	2201	
	L-2	SN	3.0	3.0	2.5	2.5	2.5	2.1	2.1	1.7	
		x	25.0	25.0	16.1	21.5	26.8	16.1	29.3	18.4	15 Years
		C1	4346	3246	2699	2699	2699	2400	2400	1934	
		C2	4621	3521	3152	3025	2968	2832	2663	2293	
	L-3	SN	3.5	3.5	3.0	3.0	3.0	2.5	2.1	2.1	
		x	23.9	23.9	17.1	22.7	28.1	16.0	14.3	20.6	
		C1	4808	3708	3246	3246	3246	2699	2400	2400	
		C2	5103	4003	3691	3559	3508	3152	2898	2734	
	A	SN	4.0	4.0	3.5	3.5	3.5	3.0	2.5	2.5	
		x	15.2	15.2	12.0	16.4	20.9	13.5	12.0	17.5	
		C1	5705	4605	4204	4204	4204	3742	3195	3195	
		C2	6159	5059	4868	4640	4535	4298	3857	3602	
	B	SN	4.5	4.5	4.0	4.0	3.5	3.5	3.0	3.0	
		x	16.0	16.0	13.3	18.1	12.8	16.1	16.2	22.9	12 Years
		C1	6212	5112	4605	4605	4204	4204	3742	3742	
		C2	6648	5548	5135	4976	4808	4642	4182	4044	
	C	SN	5.0	5.0	4.5	4.5	4.0	4.0	3.5	3.0	
		x	16.3	16.3	14.0	19.0	14.2	17.7	19.1	14.2	
		C1	7304	6204	5112	5112	4605	4605	4204	3742	
		C2	7713	6613	5597	5468	5095	4990	4557	4253	
	D	SN	5.0	5.0	4.5	4.5	4.0	4.0	3.5	3.0	
		x	10.6	10.6	9.0	12.7	9.2	11.7	12.8	9.2	
		C1	7304	6204	5112	5112	4605	4605	4204	3742	
		C2	7987	6887	5915	5678	5451	5238	4809	4656	
	E	SN	5.0	5.0	5.0	4.5	4.5	4.0	3.5	3.5	
		x	7.9	7.9	12.1	9.5	12.7	8.8	9.6	14.4	
		C1	7304	6204	6204	5112	5112	4605	4204	4204	
		C2	8289	7189	6772	5902	5678	5512	5068	4711	
	F	SN	5.5	5.5	5.0	5.0	4.5	4.5	4.0	3.5	8 Years
		x	10.0	10.0	8.7	12.3	9.2	11.8	13.5	10.6	
		C1	7810	6710	6204	6204	5112	5112	4605	4204	
		C2	8563	7463	7077	6770	5914	5728	5133	4972	
	G	SN	5.5	5.5	5.5	5.0	4.5	4.5	4.0	3.5	
		x	7.9	7.9	12.0	9.8	7.2	9.3	10.8	8.3	
		C1	7810	6710	6710	6204	5112	5112	4605	4204	
		C2	8782	7682	7307	6959	6155	5913	5322	5196	
	H	SN	5.5	5.5	5.5	5.0	4.5	4.5	4.0	3.5	
		x	6.5	6.5	10.0	8.1	5.9	7.8	9.0	6.9	
		C1	7810	6710	6710	6204	5112	5112	4605	4204	
		C2	8977	7877	7423	7094	6464	6102	5497	5460	
	I	SN	5.5	5.5	5.5	5.0	4.5	4.5	4.0	3.5	
		x	5.5	5.5	8.6	6.9	5.0	6.6	7.7	5.9	5 Years
		C1	7810	6710	6710	6204	5112	5112	4605	4204	
		C2	9164	8064	7584	7306	6601	6287	5656	5663	
	J	SN	(5.5)	(5.5)	5.5	5.0	5.0	4.5	4.0	3.5	
		x	(4.8)	(4.8)	7.6	6.1	8.3	5.8	6.8	5.1	
		C1	(7810)	(6710)	6710	6204	6204	5112	4605	4204	
		C2	(9378)	(8278)	7698	7401	7092	6465	5812	5794	

Analysis Period : 25 years
SN : Structural Number
x : Initial Performance Period (years)
C1 : Initial Construction Cost (pesos/meter)
C2 : Total Discounted Cost including Maintenance Cost (pesos/meter)
() : Initial Performance Period less than Design

TABLE 3

Basic Design

Rehabilitation Method	Traffic Loading Class	CBR k Mr	2 80 2500	3 130 4000	4 170 5000	6 210 6000	8 230 7000	10 250 8000	15 280 12000	20 300 15000	Design Performance Period
	L-1	h	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	
		x	45.0	49.1	51.7	53.9	55.0	56.0	57.4	58.3	
		C1	1857	1857	1857	1857	1857	1857	1857	1857	
		C2	2051	2048	2047	2045	2045	2044	2043	2043	
	L-2	h	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	
		x	32.2	35.8	38.1	40.2	41.2	42.1	43.4	44.3	20 Years
		C1	1857	1857	1857	1857	1857	1857	1857	1857	
		C2	2065	2060	2058	2055	2055	2054	2052	2052	
	L-3	h	15.0	15.0	13.0	13.0	13.0	13.0	13.0	13.0	
		x	22.5	25.3	20.4	21.9	22.6	23.3	24.4	25.0	
		C1	2034	2034	1857	1857	1857	1857	1857	1857	
		C2	2291	2256	2149	2127	2111	2097	2083	2080	
	A	h	20.0	18.0	18.0	18.0	18.0	18.0	18.0	18.0	
		x	19.4	15.5	16.6	17.7	18.2	18.5	19.1	19.6	
		C1	2973	2796	2796	2796	2796	2796	2796	2796	
		C2	3312	3273	3229	3191	3160	3158	3130	3127	
	B	h	23.0	23.0	23.0	20.0	20.0	20.0	20.0	20.0	
		x	19.3	21.1	22.1	14.7	15.1	15.5	16.1	16.4	15 Years
		C1	3238	3238	3238	2973	2973	2973	2973	2973	
		C2	3588	3531	3507	3520	3471	3468	3425	3422	
	C	h	25.0	25.0	25.0	23.0	23.0	23.0	23.0	23.0	
		x	16.2	17.6	18.6	14.4	14.8	15.1	15.6	15.9	
		C1	3415	3415	3415	3238	3238	3238	3238	3238	
		C2	3901	3851	3809	3819	3817	3763	3760	3757	
Rigid OI -Rigid Ex	D	h	28.0	28.0	28.0	28.0	28.0	28.0	28.0	25.0	
		x	17.0	18.3	19.2	20.0	20.4	20.7	21.2	14.3	
		C1	3681	3681	3681	3681	3681	3681	3681	3415	
		C2	4139	4092	4051	4017	4015	4012	3984	4020	
	E	h	30.0	30.0	28.0	28.0	28.0	28.0	28.0	28.0	
		x	17.5	18.8	15.0	15.6	15.9	16.2	16.7	16.9	
		C1	3858	3858	3681	3681	3681	3681	3681	3681	
		C2	4325	4275	4311	4247	4244	4191	4187	4185	
	F	h	33.0	33.0	30.0	30.0	30.0	30.0	30.0	30.0	15 Years
		x	19.5	20.8	14.8	15.4	15.7	16.0	16.4	16.6	
		C1	4124	4124	3858	3858	3858	3858	3858	3858	
		C2	4511	4470	4512	4444	4442	4439	4382	4380	
	G	h	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	
		x	16.0	17.1	17.8	18.5	18.8	19.1	19.5	19.7	
		C1	4124	4124	4124	4124	4124	4124	4124	4124	
		C2	4731	4614	4607	4558	4556	4515	4512	4510	
	H	h	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	
		x	13.6	14.5	15.2	15.8	16.1	16.3	16.7	16.9	
		C1	4124	4124	4124	4124	4124	4124	4124	4124	
		C2	4899	4813	4739	4734	4673	4671	4668	4666	
	I	h	33.0	33.0	33.0	33.0	33.0	33.0	33.0	33.0	
		x	11.8	12.7	13.3	13.8	14.1	14.3	14.6	14.9	12 Years
		C1	4124	4124	4124	4124	4124	4124	4124	4124	
		C2	5112	5000	4903	4898	4818	4816	4812	4810	
	J	h	(33.0)	(33.0)	33.0	33.0	33.0	33.0	33.0	33.0	
		x	(10.4)	(11.2)	11.8	12.3	12.5	12.7	13.0	13.2	
		C1	(4124)	(4124)	4124	4124	4124	4124	4124	4124	
		C2	(5249)	(5121)	5112	5004	5002	4999	4907	4905	

Analysis Period : 25 years
h : Thickness of PCC Overlay (cm)
x : Initial Performance Period (years)
C1 : Initial Construction Cost (pesos/meter)
C2 : Total Discounted Cost including Maintenance Cost (pesos/meter)
() : Initial Performance Period less than Design

TABLE 4

Basic Design

Rehabilitation Method	Traffic Loading Class	CBR k Mr	2 80 2500	3 130 4000	4 170 5000	6 210 6000	8 230 7000	10 250 8000	15 280 12000	20 300 15000	Design Performance Period
Flexible Ol -Rigid Ex	L-1	h	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	15 Years
		x	40.7	62.8	74.0	83.3	91.2	98.2	119.3	131.1	
		C1	1093	1093	1093	1093	1093	1093	1093	1093	
		C2	1353	1345	1343	1341	1340	1340	1338	1337	
	L-2	h	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
		x	28.5	48.4	59.1	68.1	75.9	82.7	103.7	115.4	
		C1	1093	1093	1093	1093	1093	1093	1093	1093	
		C2	1363	1350	1346	1344	1342	1341	1339	1338	
	L-3	h	8.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	
		x	24.2	28.3	37.3	45.3	52.5	58.9	79.2	90.7	
		C1	1585	1093	1093	1093	1093	1093	1093	1093	
		C2	1863	1364	1355	1351	1348	1346	1342	1340	
	A	h	13.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	12 Years
		x	12.6	16.8	23.7	30.4	36.6	42.4	61.6	72.7	
		C1	2897	2394	2394	2394	2394	2394	2394	2394	
		C2	3423	2777	2679	2654	2642	2635	2619	2614	
	B	h	(15.0)	13.0	10.0	10.0	10.0	10.0	10.0	10.0	
		x	(10.8)	16.9	14.8	19.9	25.0	29.9	47.3	57.9	
		C1	(3232)	2897	2394	2394	2394	2394	2394	2394	
		C2	(3873)	3285	2824	2724	2669	2655	2630	2622	
	C	h	(15.0)	15.0	13.0	10.0	10.0	10.0	10.0	10.0	
		x	(6.0)	14.6	14.9	12.1	15.8	19.6	34.2	43.8	
		C1	(3232)	3232	2897	2394	2394	2394	2394	2394	
		C2	(4362)	3683	3338	2907	2799	2725	2647	2633	
	D	h		15.0	13.0	10.0	10.0	10.0	10.0	10.0	8 Years
		x	n.a.	9.5	9.6	7.7	10.3	13.1	25.0	33.5	
		C1		3232	2897	2394	2394	2394	2394	2394	
		C2		3961	3599	3246	3014	2867	2669	2648	
	E	h		(15.0)	15.0	13.0	10.0	10.0	10.0	10.0	
		x	n.a.	(7.0)	10.8	10.2	7.7	9.9	19.9	27.5	
		C1		(3232)	3232	2897	2394	2394	2394	2394	
		C2		(4215)	3873	3555	3246	3070	2724	2661	
	F	h		(15.0)	(15.0)	15.0	13.0	13.0	10.0	10.0	
		x	n.a.	(4.9)	(7.7)	10.9	9.8	12.5	15.0	21.4	
		C1		(3232)	(3232)	3232	2897	2897	2394	2394	
		C2		(4665)	(4168)	3872	3598	3423	2823	2700	
	G	h			(15.0)	15.0	13.0	13.0	10.0	10.0	
		x	n.a.	n.a.	(6.0)	8.6	7.7	10.0	12.1	17.7	
		C1			(3232)	3232	2897	2897	2394	2394	
		C2			(4362)	4041	3795	3597	2916	2758	
	H	h			15.0	15.0	13.0	13.0	10.0	10.0	5 Years
		x	n.a.	n.a.	4.9	7.2	6.4	8.3	10.1	15.1	
		C1			3232	3232	2897	2897	2394	2394	
		C2			4665	4183	3956	3706	3015	2802	
	I	h				15.0	13.0	13.0	10.0	10.0	
		x	n.a.	n.a.	n.a.	6.1	5.4	7.1	8.7	13.2	
		C1				3232	2897	2897	2394	2394	
		C2				4346	4143	3845	3159	2867	
	J	h				15.0	15.0	13.0	10.0	10.0	
		x	n.a.	n.a.	n.a.	5.3	7.3	6.2	7.7	11.7	
		C1				3232	3232	2897	2394	2394	
		C2				4505	4182	4007	3246	2949	

Analysis Period : 25 years
h : Thickness of AC Overlay (cm)
x : Initial Performance Period (years)
C1 : Initial Construction Cost (pesos/meter)
C2 : Total Discounted Cost including Maintenance Cost (pesos/meter)
() : Initial Performance Period less than Design

TABLE 5

Basic Design

Rehabilitation Method	Traffic Loading Class	CBR k Mr	2 80 2500	3 130 4000	4 170 5000	6 210 6000	8 230 7000	10 250 8000	15 280 12000	20 300 15000	Design Performance Period
Flexible OL -Flexible Ex	L-1	h	8.0	5.0	5.0	3.0	3.0	3.0	3.0	3.0	10 Years
		x	11.7	10.8	16.0	11.1	14.6	18.2	32.4	41.8	
		C1	1540	1048	1048	735	735	735	735	735	
		C2	2080	1580	1416	1175	1107	1055	1004	1000	
	L-2	h	10.0	8.0	8.0	5.0	5.0	3.0	3.0	3.0	
		x	11.8	15.8	22.5	13.1	17.1	10.9	21.5	29.4	
		C1	1853	1540	1540	1048	1048	735	735	735	
		C2	2426	1938	1834	1463	1399	1199	1029	1006	
	L-3	h		10.0	8.0	8.0	8.0	8.0	3.0	3.0	
		x	n.a.	11.7	10.1	14.1	18.2	22.3	9.6	14.4	
		C1		1853	1540	1540	1540	1540	735	735	
		C2		2427	2143	1965	1884	1834	1247	1107	
	A	h			10.0	10.0	8.0	8.0	5.0	5.0	5 Years
		x	n.a.	n.a.	5.1	7.4	5.7	7.5	6.5	10.1	
		C1			2349	2349	2036	2036	1544	1544	
		C2			3656	3272	3162	2894	2372	2087	
	B	h					10.0	10.0	8.0	5.0	
		x	n.a.	n.a.	n.a.	n.a.	5.5	7.2	9.2	5.6	
		C1					2349	2349	2036	1544	
		C2					3581	3303	2715	2484	
	C	h							8.0	8.0	
		x	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5.1	8.0	
		C1							2036	2036	
		C2							3236	2862	
	D	h							10.0	8.0	5 Years
		x	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	5.5	4.9	
		C1							2349	2036	
		C2							3581	3317	
	E	h								10.0	
		x	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	6.3	
		C1								2349	
		C2								3429	
	F	h									
		x	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
		C1									
		C2									
	G	h									
		x	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
		C1									
		C2									
	H	h									
		x	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
		C1									
		C2									
	I	h									5 Years
		x	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
		C1									
		C2									
	J	h									
		x	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	
		C1									
		C2									

Analysis Period : 25 years
h : Thickness of AC Overlay (cm)
x : Initial Performance Period (years)
C1 : Initial Construction Cost (pesos/meter)
C2 : Total Discounted Cost including Maintenance Cost (pesos/meter)
() : Initial Performance Period less than Design

APPENDIX 16-4
ECONOMIC EVALUATION OF PAVEMENT REHABILITATION METHOD: CASE STUDY SPOT

TABLE 1

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-1

Rehabilitation Method : 2-lane PCC Reconstruction (D=35.0/33.0 cm)
Traffic Loading Class : J/F
CBR of Subgrade : 3
AADT :

	First Year	Growth Rate
Car/taxi	6250	8.00 % p.a.
Jeepney	2260	5.00 % p.a.
Tricycle	560	5.00 % p.a.
Bus	950	4.50 % p.a.
Truck	2490	5.00 % p.a.
Total	12510	

Serviceability, Construction Cost and Traffic Cost (2-lane)

Year	w/o Service-ability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-i (km/km)	w/o Delta-t (sec/km)	with Service-ability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-i (km/km)	with Delta-t (sec/km)
1.00	2.00	-	3.049	.455	38.81	4.39	2.071	1.996	.000	.00
2.00	2.00	-	9.629	.455	38.81	4.28	2.071	6.305	.000	.00
3.00	2.00	-	13.514	.454	38.82	4.15	-	8.851	.000	.00
4.00	2.00	-	14.226	.454	38.82	4.02	-	9.319	.000	.00
5.00	2.00	-	14.976	.454	38.82	3.87	-	9.936	.012	.54
6.00	2.00	-	15.766	.453	38.83	3.71	-	10.832	.047	2.09
7.00	2.00	-	16.598	.453	38.83	3.53	-	11.833	.086	3.78
8.00	2.00	-	17.475	.453	38.84	3.34	-	12.957	.128	5.64
9.00	2.00	-	18.398	.453	38.84	3.12	-	14.224	.175	7.71
10.00	2.00	-	19.370	.452	38.84	2.87	-	15.669	.228	10.18
11.00	2.00	-	20.395	.452	38.85	2.59	-	17.539	.288	17.83
11.28	2.00	-	5.987	.452	38.85	2.50	1.803	5.361	.329	23.15
12.00	2.00	-	15.487	.452	38.85	3.38	-	10.679	.050	2.20
13.00	2.00	-	22.612	.451	38.85	2.92	-	17.782	.194	8.55
14.00	2.00	-	23.610	.451	38.86	2.60	-	20.317	.279	16.80
14.36	2.00	-	9.110	.451	38.86	2.50	1.038	8.145	.326	22.91
15.00	2.00	-	15.952	.451	38.86	3.46	-	10.890	.039	1.70
16.00	2.00	-	25.402	.450	38.86	3.05	-	20.317	.168	7.42
17.00	2.00	-	27.803	.450	38.87	2.75	-	22.986	.247	12.77
18.00	2.00	-	29.280	.450	38.87	2.51	-	25.720	.307	20.55
18.05	2.00	-	1.434	.449	38.88	2.50	1.038	1.295	.336	24.24
19.00	2.00	-	29.402	.449	38.88	3.46	-	20.066	.038	1.68
20.00	2.00	-	25.476	.449	38.88	3.18	-	24.672	.153	6.74
21.00	2.00	-	34.204	.449	38.88	2.96	-	27.267	.208	9.19
22.00	2.00	-	35.024	.449	38.89	2.78	-	29.984	.253	13.56
23.00	2.00	-	37.913	.448	38.89	2.62	-	32.836	.291	18.55
23.80	2.00	-	31.529	.448	38.89	2.50	1.038	28.497	.323	22.64
24.00	2.00	-	8.037	.448	38.89	3.87	-	5.283	.000	.00
25.00	2.00	-	42.097	.448	38.89	3.49	-.880	29.727	.072	3.19
Total		-	593.395	-	-		8.180	461.287	-	-
Averaged		-	-	.451	38.86		-	-	.158	9.09

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-1

Cost and Benefit Flow (2-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Cost: Total Cost	Cost: Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	2.071	-	2.071	(2.071)	.011	.007	3.049	1.996	1.057	(1.057)
2	2.071	-	2.071	(1.801)	.033	.021	9.629	6.305	3.335	(2.900)
3	-	-	-	(-)	.044	.029	13.514	8.851	4.679	(3.538)
4	-	-	-	(-)	.044	.029	14.226	9.319	4.923	(3.237)
5	-	-	-	(-)	.044	.029	14.976	9.936	5.055	(2.890)
6	-	-	-	(-)	.044	.029	15.766	10.832	4.949	(2.461)
7	-	-	-	(-)	.044	.029	16.598	11.833	4.780	(2.067)
8	-	-	-	(-)	.044	.029	17.475	12.957	4.533	(1.704)
9	-	-	-	(-)	.044	.029	18.398	14.224	4.189	(1.369)
10	-	-	-	(-)	.044	.029	19.370	15.669	3.716	(1.056)
11	-	-	-	(-)	.044	.029	20.395	17.539	2.871	(.710)
12	-	1.803	1.803	(.388)	.044	.033	21.474	16.041	5.444	(1.170)
13	-	-	-	(-)	.044	.035	22.612	17.782	4.838	(.904)
14	-	-	-	(-)	.044	.035	23.810	20.317	3.501	(.569)
15	-	1.038	1.038	(.147)	.044	.035	25.072	19.035	6.046	(.854)
16	-	-	-	(-)	.044	.035	26.402	20.317	6.093	(.749)
17	-	-	-	(-)	.044	.035	27.803	22.986	4.826	(.516)
18	-	-	-	(-)	.044	.035	29.280	25.720	3.569	(.332)
19	-	1.038	1.038	(.084)	.044	.035	30.836	21.361	9.464	(.766)
20	-	-	-	(-)	.044	.035	32.476	24.672	7.812	(.549)
21	-	-	-	(-)	.044	.035	34.204	27.267	6.945	(.424)
22	-	-	-	(-)	.044	.035	36.024	29.984	6.049	(.321)
23	-	-	-	(-)	.044	.035	37.913	32.836	5.116	(.236)
24	-	1.038	1.038	(.042)	.044	.035	39.966	33.781	6.193	(.249)
25	-	-.880	-.880	(-.031)	.044	.035	42.097	29.727	12.378	(.432)
Total	4.142	4.038	8.180	(4.501)	1.049	.775	593.395	461.287	132.381	(31.061)

Net Present Value : 25.560 million pesos/km
B/C Ratio : 5.95
Internal Rate of Return : 229.3 %

Delta-i & Delta-t

	w/o	with	saving
Delta-i(km/km)	.451	.158	.293
Delta-t(sec/km)	38.859	9.090	29.766

TABLE 2

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-2

Rehabilitation Method : 1-lane PCC Reconstruction (D=35.0 cm)
Traffic Loading Class :)
CBR of Subgrade : 3
AADT :

	First Year	Growth Rate
Car/Van	6250	6.00 % p.a.
Jeepney	2260	5.00 % p.a.
Tricycle	560	5.00 % p.a.
Bus	950	4.50 % p.a.
Truck	2490	5.00 % p.a.
Total	12510	

Serviceability, Construction Cost and Traffic Cost (1-lane)

Year	w/o Service-ability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Service-ability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	1.525	.455	38.81	4.39	1.176	.998	.000	.00
2.00	2.00	-	4.814	.455	38.81	4.28	1.176	3.153	.000	.00
3.00	2.00	-	6.757	.454	38.82	4.15	-	4.426	.000	.00
4.00	2.00	-	7.113	.454	38.82	4.02	-	4.659	.000	.00
5.00	2.00	-	7.488	.454	38.82	3.87	-	4.968	.012	.54
6.00	2.00	-	7.883	.453	38.83	3.71	-	5.416	.047	2.09
7.00	2.00	-	8.299	.453	38.83	3.53	-	5.917	.086	3.78
8.00	2.00	-	8.737	.453	38.84	3.34	-	6.478	.128	5.64
9.00	2.00	-	9.199	.453	38.84	3.12	-	7.112	.175	7.71
10.00	2.00	-	9.685	.452	38.84	2.87	-	7.835	.228	10.18
11.00	2.00	-	10.197	.452	38.85	2.59	-	8.770	.288	17.83
11.28	2.00	-	2.994	.452	38.85	2.50	1.880	2.681	.329	23.15
12.00	2.00	-	7.744	.452	38.85	4.37	-	5.080	.000	.00
13.00	2.00	-	11.306	.451	38.85	4.18	-	7.418	.000	.00
14.00	2.00	-	11.905	.451	38.86	3.97	-	7.812	.000	.00
15.00	2.00	-	12.536	.451	38.86	3.74	-	8.499	.032	1.42
16.00	2.00	-	13.201	.450	38.86	3.47	-	9.451	.089	3.90
17.00	2.00	-	13.902	.450	38.87	3.17	-	10.551	.152	6.72
18.00	2.00	-	14.640	.450	38.87	2.82	-	11.840	.226	10.05
18.78	2.00	-	12.051	.449	38.88	2.50	1.880	10.524	.301	19.76
19.00	2.00	-	3.367	.449	38.88	4.45	-	2.211	.000	.00
20.00	2.00	-	16.238	.449	38.88	4.19	-	10.667	.000	.00
21.00	2.00	-	17.102	.449	38.88	3.90	-	11.237	.000	.00
22.00	2.00	-	18.012	.449	38.89	3.57	-	12.547	.059	2.58
23.00	2.00	-	18.972	.446	38.89	3.19	-	14.246	.139	6.14
24.00	2.00	-	19.983	.448	38.89	2.72	-	16.327	.234	11.28
24.41	2.00	-	8.677	.448	38.89	2.50	1.880	7.660	.311	21.17
25.00	2.00	-	12.372	.448	38.89	4.32	-1.635	8.135	.000	.00
Total		-	296.698	-	-		6.356	216.618	-	-
Average		-	-	.451	38.86		-	-	.101	5.50

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-2

Cost and Benefit Flow (1-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Total Cost	Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.176	-	1.176	(1.176)	.005	.004	1.525	.998	.528	(.528)
2	1.176	-	1.176	(1.022)	.016	.011	4.814	3.153	1.668	(1.450)
3	-	-	-	(-)	.022	.014	6.757	4.426	2.339	(1.769)
4	-	-	-	(-)	.022	.014	7.113	4.659	2.461	(1.618)
5	-	-	-	(-)	.022	.014	7.488	4.968	2.528	(1.445)
6	-	-	-	(-)	.022	.014	7.883	5.416	2.475	(1.230)
6	-	-	-	(-)	.022	.014	8.299	5.917	2.390	(1.033)
7	-	-	-	(-)	.022	.014	8.737	6.478	2.267	(.852)
8	-	-	-	(-)	.022	.014	9.199	7.112	2.095	(.685)
9	-	-	-	(-)	.022	.014	9.685	7.835	1.858	(.528)
10	-	-	-	(-)	.022	.014	10.197	8.770	1.435	(.355)
11	-	-	-	(-)	.022	.014	10.737	7.760	2.984	(.641)
12	-	1.880	1.880	(.404)	.022	.014	11.306	7.418	3.896	(.728)
13	-	-	-	(-)	.022	.014	11.905	7.812	4.100	(.666)
14	-	-	-	(-)	.022	.014	12.536	8.499	4.044	(.572)
15	-	-	-	(-)	.022	.014	13.201	9.451	3.757	(.462)
16	-	-	-	(-)	.022	.014	13.902	10.551	3.358	(.359)
17	-	-	-	(-)	.022	.014	14.640	11.840	2.808	(.281)
18	-	-	-	(-)	.022	.014	15.418	12.735	2.691	(.217)
19	-	1.880	1.880	(.152)	.022	.014	16.238	10.667	5.578	(.392)
20	-	-	-	(-)	.022	.014	17.102	11.237	5.873	(.359)
21	-	-	-	(-)	.022	.014	18.012	12.547	5.473	(.291)
22	-	-	-	(-)	.022	.014	18.972	14.246	4.733	(.219)
23	-	-	-	(-)	.022	.014	19.983	16.327	3.663	(.147)
24	-	-	-	(-)	.022	.014	21.048	15.795	5.261	(.184)
25	-	.245	.245	(.009)	.022	.014				
Total	2.351	4.005	6.366	(2.762)	.524	.342	296.698	216.618	80.262	(16.992)

Net Present Value : 14.229 million pesos/km
B/C Ratio : 6.15
Internal Rate of Return :180.4 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I (km/km)	.451	.101	.350
Delta-t (sec/km)	38.855	5.496	33.359

TABLE 3

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-3

Rehabilitation Method : 1-lane PCC Reconstruction (D=35.0 cm)
Traffic Loading Class : 1
CBR of Subgrade : 4
AADT :

	First Year	Growth Rate
Car/Van	2860	6.00 % p.a.
Jeepney	1390	5.00 % p.a.
Tricycle	290	5.00 % p.a.
Bus	950	4.50 % p.a.
Truck	1770	5.00 % p.a.
Total	7260	

Serviceability, Construction Cost and Traffic Cost (1-lane)

Year	w/o Service-ability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Service-ability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	1.003	.475	37.67	4.41	1.176	.652	.000	.00
2.00	2.00	-	3.162	.475	37.68	4.32	1.176	2.055	.000	.00
3.00	2.00	-	4.432	.474	37.68	4.22	-	2.880	.000	.00
4.00	2.00	-	4.658	.474	37.69	4.11	-	3.028	.000	.00
5.00	2.00	-	4.897	.473	37.70	4.00	-	3.184	.000	.00
6.00	2.00	-	5.148	.473	37.71	3.87	-	3.399	.015	.66
7.00	2.00	-	5.412	.473	37.72	3.74	-	3.684	.046	1.99
8.00	2.00	-	5.689	.472	37.73	3.59	-	3.999	.079	3.44
9.00	2.00	-	5.981	.472	37.74	3.43	-	4.350	.116	5.03
10.00	2.00	-	6.289	.472	37.75	3.25	-	4.740	.156	6.76
11.00	2.00	-	6.612	.471	37.76	3.05	-	5.177	.200	8.68
12.00	2.00	-	6.952	.471	37.77	2.83	-	5.684	.249	11.78
13.00	2.00	-	7.309	.471	37.78	2.59	-	6.306	.304	18.21
13.32	2.00	-	2.485	.470	37.79	2.50	1.880	2.224	.343	22.80
14.00	2.00	-	5.200	.470	37.79	4.40	-	3.385	.000	.00
15.00	2.00	-	8.081	.470	37.80	4.23	-	5.262	.000	.00
16.00	2.00	-	8.498	.470	37.81	4.05	-	5.534	.000	.00
17.00	2.00	-	8.936	.469	37.82	3.84	-	5.898	.013	.57
18.00	2.00	-	9.397	.469	37.83	3.62	-	6.515	.063	2.75
19.00	2.00	-	9.881	.468	37.84	3.36	-	7.219	.119	5.18
20.00	2.00	-	10.392	.468	37.84	3.08	-	8.028	.182	7.92
21.00	2.00	-	10.929	.468	37.85	2.75	-	9.001	.254	12.55
21.67	2.00	-	7.653	.467	37.86	2.50	1.880	6.731	.321	20.56
22.00	2.00	-	3.841	.467	37.86	4.43	-	2.503	.000	.00
23.00	2.00	-	12.088	.467	37.87	4.19	-	7.881	.000	.00
24.00	2.00	-	12.714	.467	37.88	3.92	-	8.290	.000	.00
25.00	2.00	-	13.372	.466	37.89	3.62	-.850	9.197	.054	2.33
Total		-	191.010	-	-		5.261	136.805	-	-
Average		-	-	.471	37.78		-	-	.093	4.86

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-3

Cost and Benefit Flow (1-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Total Cost	Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.176	-	1.176	(1.176)	.005	.004	1.003	.652	.353	(.353)
2	1.176	-	1.176	(1.022)	.016	.011	3.162	2.055	1.113	(.968)
3	-	-	-	(-)	.022	.014	4.432	2.880	1.559	(1.179)
4	-	-	-	(-)	.022	.014	4.658	3.028	1.638	(1.077)
5	-	-	-	(-)	.022	.014	4.897	3.184	1.721	(.984)
6	-	-	-	(-)	.022	.014	5.148	3.399	1.757	(.873)
7	-	-	-	(-)	.022	.014	5.412	3.684	1.736	(.750)
8	-	-	-	(-)	.022	.014	5.689	3.999	1.698	(.638)
9	-	-	-	(-)	.022	.014	5.981	4.350	1.640	(.536)
10	-	-	-	(-)	.022	.014	6.289	4.740	1.556	(.442)
11	-	-	-	(-)	.022	.014	6.612	5.177	1.442	(.356)
12	-	-	-	(-)	.022	.014	6.952	5.684	1.275	(.274)
13	-	-	-	(-)	.022	.014	7.309	6.306	1.011	(.189)
14	-	1.880	1.880	(.306)	.022	.014	7.685	5.610	2.083	(.339)
15	-	-	-	(-)	.022	.014	8.081	5.262	2.827	(.400)
16	-	-	-	(-)	.022	.014	8.498	5.534	2.971	(.365)
17	-	-	-	(-)	.022	.014	8.936	5.898	3.045	(.325)
18	-	-	-	(-)	.022	.014	9.397	6.515	2.889	(.268)
19	-	-	-	(-)	.022	.014	9.881	7.219	2.670	(.216)
20	-	-	-	(-)	.022	.014	10.392	8.028	2.371	(.167)
21	-	-	-	(-)	.022	.014	10.929	9.001	1.935	(.118)
22	-	1.880	1.880	(.100)	.022	.014	11.494	9.234	2.267	(.120)
23	-	-	-	(-)	.022	.014	12.088	7.881	4.215	(.195)
24	-	-	-	(-)	.022	.014	12.714	8.290	4.432	(.178)
25	-	-.850	-.850	(-.030)	.022	.014	13.372	9.197	4.183	(.146)
Total	2.351	2.910	5.261	(2.574)	.524	.342	191.010	136.805	54.388	(11.458)

Net Present Value : 8.884 million pesos/km
B/C Ratio : 1.45
Internal Rate of Return : 96.5 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.471	.093	.377
Delta-t(sec/km)	37.782	4.860	32.922

TABLE 4

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-4

Rehabilitation Method : 2-lane Flex. Overlay-Rg.Ex (h=15.0 cm)
Traffic Loading Class : 1/E
CBR of Subgrade : 6
AADT :

	First Year	Growth Rate
Car/Van	2860	6.00 % p.a.
Jeepney	1390	5.00 % p.a.
Tricycle	290	5.00 % p.a.
Bus	950	4.50 % p.a.
Truck	1770	5.00 % p.a.
Total	7260	

Serviceability,Construction Cost and Traffic Cost (2-lane)

Year	w/o Service-ability	w/o Const. Cost (Mp/ka)	w/o Traffic Cost (Mp/ka)	w/o Delta-I (ka/ka)	w/o Delta-t (sec/ka)	with Service-ability	with Const. Cost (Mp/ka)	with Traffic Cost (Mp/ka)	with Delta-I (ka/ka)	with Delta-t (sec/ka)
1.00	2.00	-	2.005	.475	37.67	3.56	1.535	1.340	.028	1.22
2.00	2.00	-	6.324	.475	37.68	3.28	1.535	4.681	.137	5.93
3.00	2.00	-	8.863	.474	37.68	3.06	-	6.911	.197	8.52
4.00	2.00	-	9.317	.474	37.69	2.86	-	7.584	.246	11.33
5.00	2.00	-	9.794	.473	37.70	2.68	-	8.327	.290	15.46
6.00	2.00	-	10.296	.473	37.71	2.52	-	9.098	.331	21.20
6.11	2.00	-	1.188	.473	37.72	2.50	1.038	1.071	.352	23.74
7.00	2.00	-	8.636	.473	37.72	3.48	-	6.509	.038	1.65
8.00	2.00	-	11.379	.472	37.73	3.12	-	8.646	.165	7.18
9.00	2.00	-	11.963	.472	37.74	2.84	-	9.695	.241	10.78
10.00	2.00	-	12.577	.472	37.75	2.59	-	10.833	.303	18.02
10.41	2.00	-	5.454	.471	37.76	2.50	1.038	4.877	.342	22.69
11.00	2.00	-	7.789	.471	37.76	3.70	-	5.116	.012	.51
12.00	2.00	-	13.903	.471	37.77	3.39	-	10.034	.107	1.65
13.00	2.00	-	14.618	.471	37.78	3.17	-	11.161	.170	7.38
14.00	2.00	-	15.371	.470	37.79	2.98	-	12.229	.218	9.48
15.00	2.00	-	16.162	.470	37.80	2.81	-	13.371	.260	13.13
16.00	2.00	-	16.995	.470	37.81	2.66	-	14.588	.297	17.56
17.00	2.00	-	17.871	.469	37.82	2.51	-	15.856	.332	21.69
17.08	2.00	-	1.505	.469	37.83	2.50	1.038	1.358	.350	23.85
18.00	2.00	-	17.288	.469	37.83	3.65	-	11.466	.018	.77
19.00	2.00	-	18.763	.468	37.84	3.42	-	14.303	.109	4.72
20.00	2.00	-	20.784	.468	37.84	3.25	-	15.684	.155	6.75
21.00	2.00	-	21.857	.468	37.85	3.10	-	17.036	.192	8.36
22.00	2.00	-	22.987	.467	37.86	2.97	-	18.412	.225	9.76
23.00	2.00	-	24.177	.467	37.87	2.85	-	19.917	.254	12.57
24.00	2.00	-	25.428	.467	37.88	2.74	-	21.524	.281	15.81
25.00	2.00	-	26.745	.466	37.89	2.63	-.142	23.212	.307	18.89
Total		-	382.021	-	-		6.043	304.837	-	-
Average		-	-	.471	37.78		-	-	.213	11.59

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-4

Cost and Benefit Flow (2-lane) (unit : million pesos/ka)

Year	Cost Initial Cost	Cost Rehab. Cost	Cost Total Cost	Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings) Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.535	-	1.535	(1.535)	.011	.009	2.005	1.340	.667	(.657)
2	1.535	-	1.535	(1.335)	.033	.026	6.324	4.681	1.649	(1.434)
3	-	-	-	(-)	.044	.035	8.863	6.911	1.961	(1.483)
4	-	-	-	(-)	.044	.035	9.317	7.584	1.742	(1.145)
5	-	-	-	(-)	.044	.035	9.794	8.327	1.476	(.844)
6	-	-	-	(-)	.044	.035	10.296	9.098	1.207	(.600)
7	-	1.038	1.038	(.449)	.044	.035	10.824	7.580	3.253	(1.406)
8	-	-	-	(-)	.044	.035	11.379	8.646	2.742	(1.031)
9	-	-	-	(-)	.044	.035	11.963	9.695	2.277	(.744)
10	-	-	-	(-)	.044	.035	12.577	10.833	1.752	(.498)
11	-	1.038	1.038	(.257)	.044	.035	13.223	9.992	3.240	(.801)
12	-	-	-	(-)	.044	.035	13.903	10.034	3.878	(.834)
13	-	-	-	(-)	.044	.035	14.618	11.161	3.466	(.648)
14	-	-	-	(-)	.044	.035	15.371	12.229	3.150	(.512)
15	-	-	-	(-)	.044	.035	16.162	13.371	2.800	(.395)
16	-	-	-	(-)	.044	.035	16.995	14.588	2.416	(.297)
17	-	-	-	(-)	.044	.035	17.871	15.856	2.024	(.216)
18	-	1.038	1.038	(.096)	.044	.035	18.793	12.824	5.978	(.555)
19	-	-	-	(-)	.044	.035	19.763	14.303	5.468	(.412)
20	-	-	-	(-)	.044	.035	20.784	15.684	5.108	(.359)
21	-	-	-	(-)	.044	.035	21.857	17.036	4.830	(.295)
22	-	-	-	(-)	.044	.035	22.987	18.412	4.584	(.241)
23	-	-	-	(-)	.044	.035	24.177	19.917	4.268	(.197)
24	-	-	-	(-)	.044	.035	25.428	21.524	3.912	(.157)
25	-	-.142	-.142	(-.005)	.044	.035	26.745	23.212	3.541	(.124)
Total	3.070	2.973	6.043	(3.667)	1.049	.844	382.021	304.837	77.389	(15.929)

Net Present Value : 12.262 million pesos/ka
B/C Ratio : 1.34
Internal Rate of Return :108.0 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(ka/ka)	.471	.213	.258
Delta-t(sec/ka)	37.778	11.594	26.184

TABLE 5

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-5

Rehabilitation Method : 2-lane PCC Reconstruction (D=35.0/33.0 cm)
Traffic Loading Class : I/E
CBR of Subgrade : 3
AADT :

	First Year	Growth Rate
Car/Van	2860	6.00 % p.a.
Jeepney	1390	5.00 % p.a.
Trcycle	290	5.00 % p.a.
Bus	950	4.50 % p.a.
Truck	1770	5.00 % p.a.
Total	7260	

Serviceability,Construction Cost and Traffic Cost (2-lane)

Year	w/o Serviceability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Serviceability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	2.005	.475	37.67	4.41	2.071	1.303	.000	.00
2.00	2.00	-	6.324	.475	37.68	4.31	2.071	4.110	.000	.00
3.00	2.00	-	8.863	.474	37.68	4.21	-	5.761	.000	.00
4.00	2.00	-	9.317	.474	37.69	4.09	-	6.056	.000	.00
5.00	2.00	-	9.794	.473	37.70	3.97	-	6.367	.000	.00
6.00	2.00	-	10.296	.473	37.71	3.84	-	6.852	.023	1.00
7.00	2.00	-	10.824	.473	37.72	3.68	-	7.441	.056	2.44
8.00	2.00	-	11.379	.472	37.73	3.53	-	8.095	.092	4.00
9.00	2.00	-	11.963	.472	37.74	3.35	-	8.824	.132	5.72
10.00	2.00	-	12.577	.472	37.75	3.16	-	9.642	.175	7.61
11.00	2.00	-	13.223	.471	37.76	2.94	-	10.563	.224	9.71
12.00	2.00	-	13.903	.471	37.77	2.70	-	11.703	.278	15.22
12.71	2.00	-	10.440	.471	37.78	2.50	1.803	9.234	.330	21.30
13.00	2.00	-	4.178	.471	37.78	3.68	-	2.760	.014	.63
14.00	2.00	-	15.371	.470	37.79	3.14	-	11.427	.140	6.06
15.00	2.00	-	16.162	.470	37.80	2.79	-	13.148	.243	11.16
16.00	2.00	-	16.995	.470	37.81	2.52	-	14.840	.315	19.68
16.07	2.00	-	1.283	.469	37.82	2.50	1.038	1.157	.350	23.75
17.00	2.00	-	16.588	.469	37.82	3.35	-	11.388	.053	2.31
18.00	2.00	-	18.793	.469	37.83	3.00	-	14.058	.194	8.42
19.00	2.00	-	19.763	.468	37.84	2.73	-	16.457	.266	13.88
20.00	2.00	-	20.784	.468	37.84	2.51	-	18.295	.323	20.68
20.03	2.00	-	.711	.468	37.85	2.50	1.038	.642	.350	23.91
21.00	2.00	-	21.146	.468	37.85	3.48	-	14.312	.038	1.64
22.00	2.00	-	22.987	.467	37.86	3.20	-	17.336	.154	6.70
23.00	2.00	-	24.177	.467	37.87	3.00	-	19.134	.210	9.13
24.00	2.00	-	25.428	.467	37.88	2.82	-	20.969	.255	12.67
25.00	2.00	-	26.745	.466	37.89	2.66	-.193	22.916	.293	17.30
Total		-	382.021	-	-		7.829	295.389	-	-
Average		-	-	.470	37.78		-	-	.161	8.75

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-5

Cost and Benefit Flow (2-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Total Cost	Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	2.071	-	2.071	(2.071)	.011	.007	2.005	1.303	.706	(.706)
2	2.071	-	2.071	(1.801)	.033	.021	6.324	4.110	2.226	(1.935)
3	-	-	-	(-)	.044	.029	8.863	5.761	3.118	(2.358)
4	-	-	-	(-)	.044	.029	9.317	6.056	3.276	(2.154)
5	-	-	-	(-)	.044	.029	9.794	6.367	3.442	(1.968)
6	-	-	-	(-)	.044	.029	10.296	6.852	3.459	(1.720)
7	-	-	-	(-)	.044	.029	10.824	7.441	3.398	(1.469)
8	-	-	-	(-)	.044	.029	11.379	8.095	3.299	(1.240)
9	-	-	-	(-)	.044	.029	11.963	8.824	3.154	(1.031)
10	-	-	-	(-)	.044	.029	12.577	9.642	2.950	(.839)
11	-	-	-	(-)	.044	.029	13.223	10.563	2.675	(.661)
12	-	-	-	(-)	.044	.029	13.903	11.703	2.215	(.476)
13	-	1.803	1.803	(.337)	.044	.030	14.618	11.993	2.638	(.493)
14	-	-	-	(-)	.044	.035	15.371	11.427	3.952	(.642)
15	-	-	-	(-)	.044	.035	16.162	13.148	3.023	(.427)
16	-	-	-	(-)	.044	.035	16.995	14.840	2.164	(.266)
17	-	1.038	1.038	(.111)	.044	.035	17.871	12.545	5.334	(.570)
18	-	-	-	(-)	.044	.035	18.793	14.658	4.144	(.385)
19	-	-	-	(-)	.044	.035	19.763	16.457	3.314	(.268)
20	-	-	-	(-)	.044	.035	20.784	18.295	2.497	(.175)
21	-	1.038	1.038	(.063)	.044	.035	21.857	14.954	6.912	(.422)
22	-	-	-	(-)	.044	.035	22.987	17.336	5.660	(.301)
23	-	-	-	(-)	.044	.035	24.177	19.134	5.052	(.233)
24	-	-	-	(-)	.044	.035	25.428	20.969	4.468	(.179)
25	-	-.193	-.193	(-.007)	.044	.035	26.745	22.916	3.837	(.134)
Total	4.142	3.687	7.829	(4.377)	1.049	.766	382.021	295.389	86.915	(21.054)

Net Present Value : 16.678 million pesos/km
B/C Ratio : 4.81
Internal Rate of Return : 115.5 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I (km/km)	.470	.161	.309
Delta-t(sec/km)	37.783	8.747	29.036

TABLE 6

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-6

Rehabilitation Method : 2-lane Flex. Overlay-Rg.Ex (h=13.0 cm)
Traffic Loading Class : I/E
CBR of Subgrade : 8
AADT :

	First Year	Growth Rate
Car/Van	3330	6.00 % p.a.
Jeepney	1270	5.00 % p.a.
Trcycle	230	5.00 % p.a.
Bus	700	4.50 % p.a.
Truck	1620	5.00 % p.a.
Total	7150	

Serviceability,Construction Cost and Traffic Cost (2-lane)

Year	w/o Service-ability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Service-ability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	1.862	.465	37.72	3.56	1.376	1.249	.027	1.19
2.00	2.00	-	5.877	.465	37.73	3.26	1.376	4.372	.137	5.85
3.00	2.00	-	8.244	.464	37.74	3.01	-	6.487	.201	8.76
4.00	2.00	-	8.673	.464	37.75	2.79	-	7.176	.256	12.96
5.00	2.00	-	9.125	.463	37.76	2.58	-	7.925	.305	18.85
5.41	2.00	-	3.947	.463	37.77	2.50	1.038	3.536	.338	22.80
6.00	2.00	-	5.654	.463	37.77	3.65	-	3.758	.017	.76
7.00	2.00	-	10.102	.463	37.78	3.23	-	7.468	.129	5.82
8.00	2.00	-	10.629	.462	37.78	2.92	-	8.459	.214	9.30
9.00	2.00	-	11.184	.462	37.79	2.64	-	9.505	.282	16.15
9.56	2.00	-	6.622	.462	37.80	2.50	1.038	5.894	.330	21.94
10.00	2.00	-	5.146	.462	37.80	3.79	-	3.368	.001	.06
11.00	2.00	-	12.883	.461	37.81	3.44	-	8.826	.089	3.86
12.00	2.00	-	13.031	.461	37.82	3.20	-	9.875	.156	6.79
13.00	2.00	-	13.713	.461	37.83	3.00	-	10.858	.207	9.00
14.00	2.00	-	14.431	.460	37.84	2.82	-	11.896	.250	12.43
15.00	2.00	-	15.187	.460	37.85	2.66	-	13.022	.289	17.21
16.00	2.00	-	15.983	.460	37.85	2.50	-	14.198	.326	21.67
16.02	2.00	-	.385	.459	37.86	2.50	1.038	.348	.344	23.89
17.00	2.00	-	16.437	.459	37.86	3.65	-	10.948	.018	.76
18.00	2.00	-	17.704	.459	37.87	3.42	-	12.848	.107	4.65
19.00	2.00	-	18.634	.459	37.88	3.25	-	14.092	.152	6.63
20.00	2.00	-	19.613	.458	37.89	3.10	-	15.318	.189	8.23
21.00	2.00	-	20.645	.458	37.90	2.97	-	16.573	.221	9.65
22.00	2.00	-	21.731	.458	37.91	2.84	-	17.957	.251	12.64
23.00	2.00	-	22.875	.457	37.91	2.73	-	19.434	.278	16.01
24.00	2.00	-	24.080	.457	37.92	2.61	-	20.989	.304	19.22
25.00	2.00	-	25.349	.457	37.93	2.50	-.005	22.632	.329	22.31
Total		-	359.245	-	-		5.862	289.011	-	-
Average		-	-	.461	37.83		-	-	.205	11.40

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-6

Cost and Benefit Flow (2-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Cost: Total Cost	Cost: Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.376	-	1.376	(1.376)	.011	.009	1.862	1.249	.615	(.615)
2	1.376	-	1.376	(1.197)	.033	.026	5.877	4.372	1.512	(1.315)
3	-	-	-	(-)	.044	.035	8.244	6.487	1.765	(1.335)
4	-	-	-	(-)	.044	.035	8.673	7.176	1.506	(.990)
5	-	-	-	(-)	.044	.035	9.125	7.925	1.209	(.691)
6	-	1.038	1.038	(.516)	.044	.035	9.601	7.294	2.315	(1.151)
7	-	-	-	(-)	.044	.035	10.102	7.468	2.642	(1.142)
8	-	-	-	(-)	.044	.035	10.629	8.459	2.178	(.819)
9	-	-	-	(-)	.044	.035	11.184	9.505	1.688	(.552)
10	-	1.038	1.038	(.295)	.044	.035	11.768	9.261	2.515	(.715)
11	-	-	-	(-)	.044	.035	12.383	8.826	3.566	(.981)
12	-	-	-	(-)	.044	.035	13.031	9.875	3.164	(.680)
13	-	-	-	(-)	.044	.035	13.713	10.858	2.864	(.535)
14	-	-	-	(-)	.044	.035	14.431	11.896	2.543	(.413)
15	-	-	-	(-)	.044	.035	15.187	13.022	2.173	(.307)
16	-	-	-	(-)	.044	.035	15.983	14.198	1.794	(.220)
17	-	1.038	1.038	(.111)	.044	.035	16.822	11.295	5.535	(.591)
18	-	-	-	(-)	.044	.035	17.704	12.848	4.865	(.452)
19	-	-	-	(-)	.044	.035	18.634	14.092	4.551	(.368)
20	-	-	-	(-)	.044	.035	19.613	15.318	4.304	(.302)
21	-	-	-	(-)	.044	.035	20.645	16.573	4.080	(.249)
22	-	-	-	(-)	.044	.035	21.731	17.957	3.783	(.201)
23	-	-	-	(-)	.044	.035	22.875	19.434	3.449	(.159)
24	-	-	-	(-)	.044	.035	24.080	20.989	3.099	(.125)
25	-	-.005	-.005	(.000)	.044	.035	25.349	22.632	2.725	(.095)
Total	2.752	3.110	5.862	(3.495)	1.049	.844	359.245	289.011	70.440	(14.906)

Net Present Value : 11.411 million pesos/km
B/C Ratio : 4.27
Internal Rate of Return :111.3 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.461	.205	.256
Delta-t(sec/km)	37.826	11.403	26.423

TABLE 7

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-7

Rehabilitation Method : 1-lane PCC Reconstruction (D=33.0 cm)
Traffic Loading Class : H
CBR of Subgrade : 8
AADT :

	First Year	Growth Rate
Car/Van	1310	6.00 % p.a.
Jeepney	1270	5.00 % p.a.
Trycycle	460	5.00 % p.a.
Bus	570	4.50 % p.a.
Truck	1270	5.00 % p.a.
Total	4680	

Serviceability,Construction Cost and Traffic Cost (1-lane)

Year	w/o Service-ability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Service-ability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	.656	.475	40.41	4.40	1.131	.424	.000	.00
2.00	2.00	-	2.068	.475	40.42	4.29	1.131	1.336	.000	.00
3.00	2.00	-	2.896	.475	40.42	4.18	-	1.872	.000	.00
4.00	2.00	-	3.042	.475	40.42	4.05	-	1.967	.000	.00
5.00	2.00	-	3.196	.474	40.42	3.92	-	2.073	.003	.14
6.00	2.00	-	3.358	.474	40.42	3.77	-	2.252	.037	1.62
7.00	2.00	-	3.528	.474	40.43	3.61	-	2.450	.073	3.22
8.00	2.00	-	3.707	.474	40.43	3.44	-	2.671	.112	4.96
9.00	2.00	-	3.894	.473	40.43	3.25	-	2.918	.156	6.88
10.00	2.00	-	4.092	.473	40.43	3.03	-	3.196	.203	9.00
11.00	2.00	-	4.299	.473	40.43	2.80	-	3.523	.256	12.99
12.00	2.00	-	4.517	.473	40.43	2.53	-	3.926	.316	20.53
12.11	2.00	-	.512	.472	40.44	2.50	1.791	.460	.351	24.98
13.00	2.00	-	4.235	.472	40.44	4.35	-	2.740	.000	.00
14.00	2.00	-	4.988	.472	40.44	4.16	-	3.228	.000	.00
15.00	2.00	-	5.241	.472	40.44	3.96	-	3.392	.000	.00
16.00	2.00	-	5.507	.471	40.44	3.73	-	3.699	.037	1.64
17.00	2.00	-	5.787	.471	40.44	3.48	-	4.105	.094	4.15
18.00	2.00	-	6.082	.471	40.44	3.19	-	4.569	.157	6.96
19.00	2.00	-	6.391	.471	40.44	2.86	-	5.107	.229	10.15
19.96	2.00	-	6.474	.470	40.44	2.50	1.791	5.606	.310	19.98
20.00	2.00	-	.242	.470	40.44	4.49	-	.157	.000	.00
21.00	2.00	-	7.059	.470	40.44	4.25	-	4.572	.000	.00
22.00	2.00	-	7.418	.470	40.44	3.97	-	4.805	.000	.00
23.00	2.00	-	7.796	.470	40.45	3.66	-	5.275	.043	1.92
24.00	2.00	-	8.194	.469	40.45	3.30	-	5.970	.122	5.40
25.00	2.00	-	8.612	.469	40.45	2.89	-.243	6.793	.213	9.42
Total		-	123.792	-	-		5.601	89.086	-	-
Average		-	-	.472	40.43		-	-	.100	5.33

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-7

Cost and Benefit Flow (1-lane)

(unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Total Cost	Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.131	-	1.131	(1.131)	.005	.004	.656	.424	.234	(.234)
2	1.131	-	1.131	(.983)	.016	.011	2.068	1.336	.737	(.641)
3	-	-	-	(-)	.022	.014	2.896	1.872	1.032	(.780)
4	-	-	-	(-)	.022	.014	3.042	1.967	1.083	(.712)
5	-	-	-	(-)	.022	.014	3.196	2.073	1.131	(.647)
6	-	-	-	(-)	.022	.014	3.358	2.252	1.114	(.554)
7	-	-	-	(-)	.022	.014	3.528	2.450	1.085	(.469)
8	-	-	-	(-)	.022	.014	3.707	2.671	1.043	(.392)
9	-	-	-	(-)	.022	.014	3.894	2.918	.984	(.322)
10	-	-	-	(-)	.022	.014	4.092	3.196	.904	(.257)
11	-	-	-	(-)	.022	.014	4.299	3.523	.784	(.194)
12	-	-	-	(-)	.022	.014	4.517	3.926	.599	(.129)
13	-	1.791	1.791	(.335)	.022	.014	4.747	3.200	1.554	(.290)
14	-	-	-	(-)	.022	.014	4.988	3.228	1.767	(.287)
15	-	-	-	(-)	.022	.014	5.241	3.392	1.856	(.262)
16	-	-	-	(-)	.022	.014	5.507	3.699	1.816	(.223)
17	-	-	-	(-)	.022	.014	5.787	4.105	1.690	(.181)
18	-	-	-	(-)	.022	.014	6.082	4.569	1.520	(.141)
19	-	-	-	(-)	.022	.014	6.391	5.107	1.292	(.104)
20	-	1.791	1.791	(.126)	.022	.014	6.716	5.762	.962	(.068)
21	-	-	-	(-)	.022	.014	7.059	4.572	2.494	(.152)
22	-	-	-	(-)	.022	.014	7.418	4.805	2.621	(.139)
23	-	-	-	(-)	.022	.014	7.796	5.275	2.529	(.117)
24	-	-	-	(-)	.022	.014	8.194	5.970	2.231	(.090)
25	-	-.243	-.243	(-.008)	.022	.014	8.612	6.793	1.827	(.064)
Total	2.262	3.339	5.601	(2.566)	.524	.342	123.792	89.086	34.888	(7.449)

Net Present Value : 4.882 million pesos/km
B/C Ratio : 2.90
Internal Rate of Return : 58.5 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.472	.100	.372
Delta-t(sec/km)	40.434	5.331	35.103

TABLE 8

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-8

Rehabilitation Method : 2-lane PCC Reconstruction (D=35.0/30.0 cm)
Traffic Loading Class : H/D
CBR of Subgrade : 6
AADT :

	First Year	Growth Rate
Car/Van	1310	6.00 % p.a.
Jeepney	1270	5.00 % p.a.
Tricycle	460	5.00 % p.a.
Bus	570	4.50 % p.a.
Truck	1270	5.00 % p.a.
Total	4880	

Serviceability, Construction Cost and Traffic Cost (2-lane)

Year	w/o Service-ability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Service-ability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	1.312	.475	40.41	4.43	2.004	.848	.000	.00
2.00	2.00	-	4.135	.475	40.42	4.36	2.004	2.672	.000	.00
3.00	2.00	-	5.792	.475	40.42	4.28	-	3.744	.000	.00
4.00	2.00	-	6.085	.475	40.42	4.20	-	3.933	.000	.00
5.00	2.00	-	6.393	.474	40.42	4.11	-	4.133	.000	.00
6.00	2.00	-	6.716	.474	40.42	4.01	-	4.342	.000	.00
7.00	2.00	-	7.056	.474	40.43	3.91	-	4.608	.010	.43
8.00	2.00	-	7.413	.474	40.43	3.80	-	4.966	.035	1.55
9.00	2.00	-	7.789	.473	40.43	3.68	-	5.358	.062	2.76
10.00	2.00	-	8.184	.473	40.43	3.55	-	5.790	.092	4.07
11.00	2.00	-	8.598	.473	40.43	3.41	-	6.266	.124	5.48
12.00	2.00	-	9.035	.473	40.43	3.25	-	6.792	.159	7.02
13.00	2.00	-	9.493	.472	40.44	3.08	-	7.375	.197	8.70
14.00	2.00	-	9.975	.472	40.44	2.90	-	8.029	.238	10.74
15.00	2.00	-	10.482	.472	40.44	2.69	-	8.841	.284	16.60
15.84	2.00	-	9.291	.471	40.44	2.50	1.803	8.200	.331	22.56
16.00	2.00	-	1.724	.471	40.44	3.95	-	1.116	.000	.00
17.00	2.00	-	11.575	.471	40.44	3.56	-	7.931	.057	2.53
18.00	2.00	-	12.163	.471	40.44	3.34	-	8.914	.129	5.72
19.00	2.00	-	12.782	.471	40.44	3.16	-	9.767	.176	7.81
20.00	2.00	-	13.433	.470	40.44	3.01	-	10.612	.215	9.54
21.00	2.00	-	14.117	.470	40.44	2.87	-	11.512	.250	12.29
22.00	2.00	-	14.836	.470	40.44	2.74	-	12.493	.281	16.34
23.00	2.00	-	15.593	.470	40.45	2.61	-	13.519	.311	20.14
23.97	2.00	-	15.905	.469	40.45	2.50	1.038	14.161	.339	23.70
24.00	2.00	-	.483	.469	40.45	4.08	-	.313	.000	.00
25.00	2.00	-	17.224	.469	40.45	3.57	-.903	11.632	.041	1.83
Total		-	247.583	-	-		5.947	187.868	-	-
Average		-	-	.472	40.43		-	-	.123	6.66

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-8

Cost and Benefit Flow (2-lane) (unit : million pesos/km)

Year	Cost Initial Cost	Cost Rehab. Cost	Total Cost	Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings) Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	2.004	-	2.004	(2.004)	.011	.007	1.312	.848	.468	(.468)
2	2.004	-	2.004	(1.743)	.033	.021	4.135	2.672	1.474	(1.282)
3	-	-	-	(-)	.044	.029	5.792	3.744	2.064	(1.560)
4	-	-	-	(-)	.044	.029	6.085	3.933	2.167	(1.425)
5	-	-	-	(-)	.044	.029	6.393	4.133	2.275	(1.301)
6	-	-	-	(-)	.044	.029	6.716	4.342	2.389	(1.188)
7	-	-	-	(-)	.044	.029	7.056	4.608	2.463	(1.065)
8	-	-	-	(-)	.044	.029	7.413	4.966	2.463	(.926)
9	-	-	-	(-)	.044	.029	7.789	5.358	2.446	(.799)
10	-	-	-	(-)	.044	.029	8.184	5.790	2.409	(.685)
11	-	-	-	(-)	.044	.029	8.598	6.266	2.348	(.580)
12	-	-	-	(-)	.044	.029	9.035	6.792	2.258	(.485)
13	-	-	-	(-)	.044	.029	9.493	7.375	2.133	(.399)
14	-	-	-	(-)	.044	.029	9.975	8.029	1.961	(.319)
15	-	-	-	(-)	.044	.029	10.482	8.841	1.656	(.234)
16	-	1.803	1.803	(.222)	.044	.030	11.015	9.316	1.713	(.210)
17	-	-	-	(-)	.044	.035	11.575	7.931	3.652	(.390)
18	-	-	-	(-)	.044	.035	12.163	8.914	3.257	(.303)
19	-	-	-	(-)	.044	.035	12.782	9.767	3.023	(.244)
20	-	-	-	(-)	.044	.035	13.433	10.612	2.829	(.199)
21	-	-	-	(-)	.044	.035	14.117	11.512	2.613	(.160)
22	-	-	-	(-)	.044	.035	14.836	12.493	2.352	(.125)
23	-	-	-	(-)	.044	.035	15.593	13.519	2.082	(.096)
24	-	1.038	1.038	(.042)	.044	.035	16.388	14.474	1.922	(.077)
25	-	-.903	-.903	(-.032)	.044	.035	17.224	11.632	5.601	(.196)
Total	4.009	1.938	5.947	(3.979)	1.049	.745	247.583	187.868	60.019	(14.716)

Net Present Value : 10.737 million pesos/km
B/C Ratio : 3.70
Internal Rate of Return : 69.8 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.472	.123	.349
Delta-t(sec/km)	40.434	6.660	33.774

TABLE 9

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-9

Rehabilitation Method : 1-lane PCC Reconstruction (0-35.0 cm)
Traffic Loading Class : H
CBR of Subgrade : 6
AADT :

	First Year	Growth Rate
Car/Van	1310	8.00 % p.a.
Jeepney	1270	5.00 % p.a.
Tricycle	460	5.00 % p.a.
Bus	570	4.50 % p.a.
Truck	1270	5.00 % p.a.
Total	4880	

Serviceability, Construction Cost and Traffic Cost (1-lane)

Year	w/o Serviceability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Serviceability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	.656	.475	40.41	4.43	1.176	.424	.000	.00
2.00	2.00	-	2.068	.475	40.42	4.36	1.176	1.336	.000	.00
3.00	2.00	-	2.896	.475	40.42	4.28	-	1.872	.000	.00
4.00	2.00	-	3.042	.475	40.42	4.20	-	1.967	.000	.00
5.00	2.00	-	3.196	.474	40.42	4.11	-	2.066	.000	.00
6.00	2.00	-	3.358	.474	40.42	4.01	-	2.171	.000	.00
7.00	2.00	-	3.528	.474	40.43	3.91	-	2.304	.010	.43
8.00	2.00	-	3.707	.474	40.43	3.80	-	2.483	.035	1.55
9.00	2.00	-	3.894	.473	40.43	3.68	-	2.679	.062	2.78
10.00	2.00	-	4.092	.473	40.43	3.55	-	2.895	.092	4.07
11.00	2.00	-	4.299	.473	40.43	3.41	-	3.133	.124	5.48
12.00	2.00	-	4.517	.473	40.43	3.25	-	3.396	.159	7.02
13.00	2.00	-	4.747	.472	40.43	3.08	-	3.688	.197	8.70
14.00	2.00	-	4.988	.472	40.44	2.90	-	4.015	.238	10.74
15.00	2.00	-	5.241	.472	40.44	2.69	-	4.421	.284	16.60
15.84	2.00	-	4.645	.471	40.44	2.50	1.880	4.100	.331	22.56
16.00	2.00	-	.862	.471	40.44	4.48	-	.558	.000	.00
17.00	2.00	-	5.787	.471	40.44	4.34	-	3.747	.000	.00
18.00	2.00	-	6.082	.471	40.44	4.18	-	3.938	.000	.00
19.00	2.00	-	6.391	.471	40.44	4.02	-	4.138	.000	.00
20.00	2.00	-	6.716	.470	40.44	3.83	-	4.430	.018	.80
21.00	2.00	-	7.059	.470	40.44	3.63	-	4.869	.064	2.82
22.00	2.00	-	7.418	.470	40.44	3.40	-	5.366	.114	5.06
23.00	2.00	-	7.796	.470	40.45	3.15	-	5.931	.171	7.55
24.00	2.00	-	8.194	.469	40.45	2.86	-	6.577	.234	10.36
25.00	2.00	-	8.612	.469	40.45	2.53	-.018	7.434	.306	19.54
Total		-	123.792	-	-		4.214	89.937	-	-
Average		-	-	.472	40.43		-	-	.094	4.85

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-9

Cost and Benefit Flow (1-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Total Cost	Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.176	-	1.176	(1.176)	.005	.004	.656	.424	.234	(.234)
2	1.176	-	1.176	(1.022)	.016	.011	2.068	1.336	.737	(.641)
3	-	-	-	(-)	.022	.014	2.896	1.872	1.032	(.780)
4	-	-	-	(-)	.022	.014	3.042	1.967	1.083	(.712)
5	-	-	-	(-)	.022	.014	3.196	2.066	1.138	(.650)
6	-	-	-	(-)	.022	.014	3.358	2.171	1.194	(.594)
7	-	-	-	(-)	.022	.014	3.528	2.304	1.232	(.532)
8	-	-	-	(-)	.022	.014	3.707	2.483	1.231	(.463)
9	-	-	-	(-)	.022	.014	3.894	2.679	1.223	(.400)
10	-	-	-	(-)	.022	.014	4.092	2.895	1.204	(.342)
11	-	-	-	(-)	.022	.014	4.299	3.133	1.174	(.290)
12	-	-	-	(-)	.022	.014	4.517	3.396	1.129	(.243)
13	-	-	-	(-)	.022	.014	4.747	3.688	1.067	(.199)
14	-	-	-	(-)	.022	.014	4.988	4.015	.981	(.159)
15	-	-	-	(-)	.022	.014	5.241	4.421	.828	(.117)
16	-	1.880	1.880	(.231)	.022	.014	5.507	4.658	.857	(.105)
17	-	-	-	(-)	.022	.014	5.787	3.747	2.048	(.219)
18	-	-	-	(-)	.022	.014	6.082	3.938	2.152	(.200)
19	-	-	-	(-)	.022	.014	6.391	4.138	2.260	(.183)
20	-	-	-	(-)	.022	.014	6.716	4.430	2.294	(.161)
21	-	-	-	(-)	.022	.014	7.059	4.869	2.197	(.134)
22	-	-	-	(-)	.022	.014	7.418	5.366	2.060	(.109)
23	-	-	-	(-)	.022	.014	7.796	5.931	1.873	(.087)
24	-	-	-	(-)	.022	.014	8.194	6.577	1.624	(.065)
25	-	-.018	-.018	(-.001)	.022	.014	8.612	7.434	1.186	(.041)
Total	2.351	1.862	4.214	(2.428)	.524	.342	123.792	89.937	34.038	(7.663)

Net Present Value : 5.234 million pesos/km
B/C Ratio : 3.16
Internal Rate of Return : 57.4 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.472	.094	.378
Delta-t(sec/km)	40.434	4.849	35.585

TABLE 10

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-10

Rehabilitation Method : 1-lane PCC Reconstruction (0-35.0 cm)
Traffic Loading Class : C
CBR of Subgrade : 4
AADT :

	First Year	Growth Rate
Car/Van	720	6.50 % p.a.
Jeepney	880	5.50 % p.a.
Tricycle	0	.00 % p.a.
Bus	240	5.00 % p.a.
Truck	940	5.00 % p.a.
Total	2780	

Serviceability.Construction Cost and Traffic Cost (1-lane)

Year	w/o Serviceability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Serviceability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	.403	.485	35.18	4.44	1.176	.260	.000	.00
2.00	2.00	-	1.275	.484	35.20	4.38	1.176	.823	.000	.00
3.00	2.00	-	1.790	.484	35.22	4.32	-	1.156	.000	.00
4.00	2.00	-	1.885	.484	35.24	4.25	-	1.218	.000	.00
5.00	2.00	-	1.986	.483	35.26	4.17	-	1.283	.000	.00
6.00	2.00	-	2.092	.483	35.28	4.10	-	1.351	.000	.00
7.00	2.00	-	2.204	.482	35.30	4.01	-	1.424	.000	.00
8.00	2.00	-	2.321	.482	35.32	3.92	-	1.512	.008	.35
9.00	2.00	-	2.445	.481	35.34	3.82	-	1.630	.031	1.31
10.00	2.00	-	2.576	.481	35.36	3.72	-	1.758	.055	2.33
11.00	2.00	-	2.714	.480	35.38	3.61	-	1.898	.081	3.44
12.00	2.00	-	2.859	.480	35.40	3.48	-	2.053	.109	4.63
13.00	2.00	-	3.012	.480	35.42	3.35	-	2.223	.139	5.92
14.00	2.00	-	3.174	.479	35.44	3.21	-	2.411	.172	7.33
15.00	2.00	-	3.344	.479	35.46	3.05	-	2.620	.208	8.86
16.00	2.00	-	3.523	.478	35.48	2.88	-	2.857	.248	11.07
17.00	2.00	-	3.713	.478	35.50	2.69	-	3.143	.291	15.69
17.88	2.00	-	3.425	.477	35.52	2.50	1.880	3.026	.336	20.48
18.00	2.00	-	.487	.477	35.52	4.48	-	.315	.000	.00
19.00	2.00	-	4.122	.477	35.54	4.36	-	2.668	.000	.00
20.00	2.00	-	4.344	.476	35.56	4.22	-	2.812	.000	.00
21.00	2.00	-	4.578	.476	35.58	4.06	-	2.964	.000	.00
22.00	2.00	-	4.824	.476	35.60	3.90	-	3.138	.004	.19
23.00	2.00	-	5.084	.475	35.62	3.71	-	3.447	.046	1.96
24.00	2.00	-	5.358	.475	35.64	3.51	-	3.794	.092	3.91
25.00	2.00	-	5.647	.474	35.66	3.29	-.524	4.187	.142	6.07
Total		-	79.185	-	-		3.707	55.970	-	-
Average		-	-	.479	35.42		-	-	.076	3.60

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-10

Cost and Benefit Flow (1-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Total Cost	Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.176	-	1.176	(1.176)	.005	.004	.403	.260	.145	(.145)
2	1.176	-	1.176	(1.022)	.016	.011	1.275	.823	.457	(.398)
3	-	-	-	(-)	.022	.014	1.790	1.156	.642	(.485)
4	-	-	-	(-)	.022	.014	1.885	1.218	.675	(.444)
5	-	-	-	(-)	.022	.014	1.986	1.283	.711	(.406)
6	-	-	-	(-)	.022	.014	2.092	1.351	.748	(.372)
7	-	-	-	(-)	.022	.014	2.204	1.424	.787	(.340)
8	-	-	-	(-)	.022	.014	2.321	1.512	.816	(.307)
9	-	-	-	(-)	.022	.014	2.445	1.630	.823	(.269)
10	-	-	-	(-)	.022	.014	2.576	1.758	.826	(.235)
11	-	-	-	(-)	.022	.014	2.714	1.898	.823	(.204)
12	-	-	-	(-)	.022	.014	2.859	2.053	.814	(.175)
13	-	-	-	(-)	.022	.014	3.012	2.223	.797	(.149)
14	-	-	-	(-)	.022	.014	3.174	2.411	.770	(.125)
15	-	-	-	(-)	.022	.014	3.344	2.620	.732	(.103)
16	-	-	-	(-)	.022	.014	3.523	2.857	.675	(.083)
17	-	-	-	(-)	.022	.014	3.713	3.143	.577	(.062)
18	-	1.880	1.880	(.175)	.022	.014	3.912	3.342	.578	(.054)
19	-	-	-	(-)	.022	.014	4.122	2.668	1.462	(.118)
20	-	-	-	(-)	.022	.014	4.344	2.812	1.539	(.108)
21	-	-	-	(-)	.022	.014	4.578	2.964	1.621	(.099)
22	-	-	-	(-)	.022	.014	4.824	3.138	1.693	(.090)
23	-	-	-	(-)	.022	.014	5.084	3.447	1.645	(.076)
24	-	-	-	(-)	.022	.014	5.358	3.794	1.572	(.063)
25	-	-.524	-.524	(-.018)	.022	.014	5.647	4.187	1.467	(.051)
Total	2.351	1.356	3.707	(2.354)	.524	.342	79.185	55.970	23.398	(4.962)

Net Present Value : 2.608 million pesos/km
B/C Ratio : 2.11
Internal Rate of Return : 34.1 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.479	.076	.404
Delta-t(sec/km)	35.423	3.599	31.824

TABLE 11

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-11

Rehabilitation Method : 2-lane PCC Reconstruction (D=35.0/30.0 cm)
Traffic Loading Class : C/D
CBR of Subgrade : 4
AADT :

	First Year	Growth Rate
Car/Van	720	6.50 % p.a.
Jeepney	880	5.50 % p.a.
Trycycle	0	.00 % p.a.
Bus	240	5.00 % p.a.
Truck	940	5.00 % p.a.
Total	2780	

Serviceability,Construction Cost and Traffic Cost (2-lane)

Year	w/o Service-ability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Service-ability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	.807	.485	35.18	4.44	2.004	.521	.000	.00
2.00	2.00	-	2.549	.484	35.20	4.38	2.004	1.646	.000	.00
3.00	2.00	-	3.580	.484	35.22	4.32	-	2.312	.000	.00
4.00	2.00	-	3.771	.484	35.24	4.25	-	2.435	.000	.00
5.00	2.00	-	3.972	.483	35.26	4.17	-	2.565	.000	.00
6.00	2.00	-	4.184	.483	35.28	4.10	-	2.703	.000	.00
7.00	2.00	-	4.407	.482	35.30	4.01	-	2.847	.000	.00
8.00	2.00	-	4.643	.482	35.32	3.92	-	3.025	.008	.35
9.00	2.00	-	4.891	.481	35.34	3.82	-	3.259	.031	1.31
10.00	2.00	-	5.152	.481	35.36	3.72	-	3.516	.055	2.33
11.00	2.00	-	5.428	.480	35.38	3.61	-	3.797	.081	3.44
12.00	2.00	-	5.719	.480	35.40	3.48	-	4.106	.109	4.63
13.00	2.00	-	6.025	.480	35.42	3.35	-	4.446	.139	5.92
14.00	2.00	-	6.348	.479	35.44	3.21	-	4.822	.172	7.33
15.00	2.00	-	6.688	.479	35.46	3.05	-	5.239	.208	8.86
16.00	2.00	-	7.047	.478	35.48	2.88	-	5.713	.248	11.07
17.00	2.00	-	7.425	.478	35.50	2.69	-	6.286	.291	15.69
17.88	2.00	-	6.849	.477	35.52	2.50	1.803	6.052	.338	20.48
18.00	2.00	-	.975	.477	35.52	3.94	-	.631	.000	.00
19.00	2.00	-	8.244	.477	35.54	3.48	-	5.708	.069	2.92
20.00	2.00	-	8.688	.476	35.56	3.22	-	6.505	.154	6.58
21.00	2.00	-	9.155	.476	35.58	3.02	-	7.187	.209	8.92
22.00	2.00	-	9.648	.476	35.60	2.84	-	7.889	.255	11.93
23.00	2.00	-	10.168	.475	35.62	2.68	-	8.650	.294	16.23
24.00	2.00	-	10.716	.475	35.64	2.53	-	9.442	.331	20.18
24.22	2.00	-	2.461	.474	35.66	2.50	1.038	2.212	.352	22.49
25.00	2.00	-	8.833	.474	35.66	3.59	-.915	5.866	.025	1.05
Total		-	158.371	-	-		5.935	119.378	-	-
Average		-	-	.479	35.43		-	-	.125	6.36

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-11

Cost and Benefit Flow (2-lane) (unit : million pesos/km)

Year	Cost Initial Cost	Cost Rehab. Cost	Cost Total Cost	Cost Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings) Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	2.004	-	2.004	(2.004)	.011	.007	.807	.521	.290	(.290)
2	2.004	-	2.004	(1.743)	.033	.021	2.549	1.646	.915	(.795)
3	-	-	-	(-)	.044	.029	3.580	2.312	1.284	(.971)
4	-	-	-	(-)	.044	.029	3.771	2.435	1.351	(.888)
5	-	-	-	(-)	.044	.029	3.972	2.565	1.422	(.813)
6	-	-	-	(-)	.044	.029	4.184	2.703	1.496	(.744)
7	-	-	-	(-)	.044	.029	4.407	2.847	1.575	(.681)
8	-	-	-	(-)	.044	.029	4.643	3.025	1.633	(.614)
9	-	-	-	(-)	.044	.029	4.891	3.259	1.647	(.538)
10	-	-	-	(-)	.044	.029	5.152	3.516	1.652	(.470)
11	-	-	-	(-)	.044	.029	5.428	3.797	1.647	(.407)
12	-	-	-	(-)	.044	.029	5.719	4.106	1.628	(.350)
13	-	-	-	(-)	.044	.029	6.025	4.446	1.594	(.298)
14	-	-	-	(-)	.044	.029	6.348	4.822	1.541	(.250)
15	-	-	-	(-)	.044	.029	6.688	5.239	1.464	(.207)
16	-	-	-	(-)	.044	.029	7.047	5.713	1.349	(.166)
17	-	-	-	(-)	.044	.029	7.425	6.286	1.154	(.123)
18	-	1.803	1.803	(.168)	.044	.029	7.824	6.683	1.155	(.107)
19	-	-	-	(-)	.044	.035	8.244	5.708	2.545	(.206)
20	-	-	-	(-)	.044	.035	8.688	6.505	2.191	(.154)
21	-	-	-	(-)	.044	.035	9.155	7.187	1.977	(.121)
22	-	-	-	(-)	.044	.035	9.648	7.889	1.768	(.094)
23	-	-	-	(-)	.044	.035	10.168	8.650	1.526	(.070)
24	-	-	-	(-)	.044	.035	10.716	9.442	1.282	(.052)
25	-	.123	.123	(.004)	.044	.035	11.294	8.078	3.224	(.113)
Total	4.008	1.926	5.935	(3.919)	1.049	.731	158.371	119.378	39.310	(9.521)

Net Present Value : 5.602 million pesos/km
B/C Ratio : 2.43
Internal Rate of Return : 40.6 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.479	.125	.355
Delta-t(sec/km)	35.431	6.360	29.071

TABLE 12

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-12

Rehabilitation Method : 2-lane Flex. Overlay-Rs.Ex (h=13.0 cm)
Traffic Loading Class : C/D
CBR of Subgrade : 8
AADT :

	First Year	Growth Rate
Car/Van	720	6.50 % p.a.
Jeepney	880	5.50 % p.a.
Tricycle	0	.00 % p.a.
Bus	240	5.00 % p.a.
Truck	940	5.00 % p.a.
Total	2780	

Serviceability, Construction Cost and Traffic Cost (2-lane)

Year	w/o Service-ability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Service-ability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	.807	.485	35.18	3.69	1.376	.528	.013	.56
2.00	2.00	-	2.549	.484	35.20	3.45	1.376	1.820	.105	4.43
3.00	2.00	-	3.580	.484	35.22	3.25	-	2.682	.158	6.72
4.00	2.00	-	3.771	.484	35.24	3.07	-	2.937	.204	8.65
5.00	2.00	-	3.972	.483	35.26	2.90	-	3.203	.245	10.60
6.00	2.00	-	4.184	.483	35.28	2.75	-	3.505	.283	14.58
7.00	2.00	-	4.407	.482	35.30	2.60	-	3.823	.319	18.37
7.70	2.00	-	3.247	.482	35.32	2.50	1.038	2.896	.349	21.51
8.00	2.00	-	1.396	.482	35.32	3.88	-	.902	.000	.00
9.00	2.00	-	4.891	.481	35.34	3.47	-	3.409	.078	3.30
10.00	2.00	-	5.152	.481	35.36	3.19	-	3.873	.161	6.83
11.00	2.00	-	5.428	.480	35.38	2.95	-	4.303	.224	9.50
12.00	2.00	-	5.719	.480	35.40	2.73	-	4.774	.278	14.19
13.00	2.00	-	6.025	.480	35.42	2.53	-	5.277	.328	19.46
13.16	2.00	-	1.042	.479	35.44	2.50	1.038	.936	.356	22.41
14.00	2.00	-	5.306	.479	35.44	3.68	-	3.476	.013	.54
15.00	2.00	-	6.688	.479	35.46	3.44	-	4.780	.103	4.40
16.00	2.00	-	7.047	.478	35.48	3.25	-	5.284	.157	6.68
17.00	2.00	-	7.425	.478	35.50	3.08	-	5.780	.200	8.52
18.00	2.00	-	7.824	.477	35.52	2.92	-	6.287	.238	10.15
19.00	2.00	-	8.244	.477	35.54	2.78	-	6.863	.273	13.86
20.00	2.00	-	8.688	.476	35.56	2.65	-	7.468	.306	17.38
21.00	2.00	-	9.155	.476	35.58	2.52	-	8.107	.337	20.74
21.15	2.00	-	1.419	.476	35.60	2.50	1.038	1.277	.354	22.63
22.00	2.00	-	8.229	.476	35.60	3.72	-	5.378	.009	.39
23.00	2.00	-	10.168	.475	35.62	3.51	-	7.195	.091	3.89
24.00	2.00	-	10.716	.475	35.64	3.35	-	7.900	.136	5.80
25.00	2.00	-	11.294	.474	35.66	3.21	-.655	8.593	.172	7.32
Total		-	158.371	-	-		5.212	123.253	-	-
Average		-	-	.480	35.42		-	-	.196	10.12

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-12

Cost and Benefit Flow (2-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Cost: Total Cost	Cost: Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.376	-	1.376	(1.376)	.011	.009	.807	.528	.281	(.281)
2	1.376	-	1.376	(1.197)	.033	.026	2.549	1.820	.736	(.640)
3	-	-	-	(-)	.044	.035	3.580	2.682	.907	(.686)
4	-	-	-	(-)	.044	.035	3.771	2.937	.842	(.554)
5	-	-	-	(-)	.044	.035	3.972	3.203	.778	(.445)
6	-	-	-	(-)	.044	.035	4.184	3.505	.688	(.342)
7	-	-	-	(-)	.044	.035	4.407	3.823	.593	(.256)
8	-	1.038	1.038	(.390)	.044	.035	4.643	3.798	.858	(.321)
9	-	-	-	(-)	.044	.035	4.891	3.409	1.490	(.487)
10	-	-	-	(-)	.044	.035	5.152	3.873	1.288	(.366)
11	-	-	-	(-)	.044	.035	5.428	4.303	1.133	(.280)
12	-	-	-	(-)	.044	.035	5.719	4.774	.953	(.205)
13	-	-	-	(-)	.044	.035	6.025	5.277	.757	(.141)
14	-	1.038	1.038	(.169)	.044	.035	6.348	4.412	1.944	(.316)
15	-	-	-	(-)	.044	.035	6.688	4.780	1.917	(.271)
16	-	-	-	(-)	.044	.035	7.047	5.284	1.771	(.218)
17	-	-	-	(-)	.044	.035	7.425	5.780	1.654	(.177)
18	-	-	-	(-)	.044	.035	7.824	6.287	1.546	(.144)
19	-	-	-	(-)	.044	.035	8.244	6.863	1.390	(.112)
20	-	-	-	(-)	.044	.035	8.688	7.468	1.228	(.086)
21	-	-	-	(-)	.044	.035	9.155	8.107	1.056	(.065)
22	-	1.038	1.038	(.055)	.044	.035	9.648	6.656	3.001	(.159)
23	-	-	-	(-)	.044	.035	10.168	7.195	2.981	(.138)
24	-	-	-	(-)	.044	.035	10.716	7.900	2.825	(.113)
25	-	-.655	-.655	(-.023)	.044	.035	11.294	8.593	2.709	(.095)
Total	2.752	2.460	5.212	(3.164)	1.049	.844	158.371	123.253	35.323	(6.897)

Net Present Value : 3.733 million pesos/km
B/C Ratio : 2.18
Internal Rate of Return : 38.2 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.480	.196	.283
Delta-t(sec/km)	35.422	10.121	25.301

TABLE 13

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-13

Rehabilitation Method : 2-lane PCC Reconstruction (0-33.0/28.0 cm)
Traffic Loading Class : C/D
CBR of Subgrade : 8
AADT :

	First Year	Growth Rate
Car/Van	720	6.50 % p.a.
Jeepney	880	5.50 % p.a.
Tricycle	0	.00 % p.a.
Bus	240	5.00 % p.a.
Truck	940	5.00 % p.a.
Total	2780	

Serviceability,Construction Cost and Traffic Cost (2-lane)

Year	w/o Service-ability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Service-ability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	.807	.485	35.18	4.42	1.915	.521	.000	.00
2.00	2.00	-	2.549	.484	35.20	4.34	1.915	1.646	.000	.00
3.00	2.00	-	3.580	.484	35.22	4.25	-	2.312	.000	.00
4.00	2.00	-	3.771	.484	35.24	4.15	-	2.435	.000	.00
5.00	2.00	-	3.972	.483	35.26	4.04	-	2.565	.000	.00
6.00	2.00	-	4.184	.483	35.28	3.93	-	2.711	.003	.13
7.00	2.00	-	4.407	.482	35.30	3.81	-	2.938	.031	1.33
8.00	2.00	-	4.643	.482	35.32	3.68	-	3.188	.062	2.68
9.00	2.00	-	4.891	.481	35.34	3.53	-	3.465	.095	4.04
10.00	2.00	-	5.152	.481	35.36	3.38	-	3.772	.131	5.56
11.00	2.00	-	5.428	.480	35.38	3.21	-	4.113	.170	7.23
12.00	2.00	-	5.719	.480	35.40	3.02	-	4.495	.213	9.05
13.00	2.00	-	6.025	.480	35.42	2.81	-	4.943	.260	12.34
14.00	2.00	-	6.348	.479	35.44	2.58	-	5.480	.312	17.86
14.33	2.00	-	2.177	.479	35.46	2.50	1.803	1.946	.349	21.80
15.00	2.00	-	4.511	.479	35.46	3.90	-	2.918	.000	.00
16.00	2.00	-	7.047	.478	35.48	3.71	-	4.772	.046	1.96
17.00	2.00	-	7.425	.478	35.50	3.57	-	5.221	.086	3.64
18.00	2.00	-	7.824	.477	35.52	3.45	-	5.665	.117	4.98
19.00	2.00	-	8.244	.477	35.54	3.34	-	6.120	.145	6.17
20.00	2.00	-	8.688	.476	35.56	3.23	-	6.596	.170	7.25
21.00	2.00	-	9.155	.476	35.58	3.13	-	7.095	.194	8.27
22.00	2.00	-	9.648	.476	35.60	3.04	-	7.623	.217	9.25
23.00	2.00	-	10.168	.475	35.62	2.95	-	8.184	.239	10.27
24.00	2.00	-	10.716	.475	35.64	2.86	-	8.817	.260	12.59
25.00	2.00	-	11.294	.474	35.66	2.77	-.407	9.490	.281	14.86
Total		-	158.371	-	-		5.226	119.030	-	-
Average		-	-	.480	35.42		-	-	.130	6.20

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-13

Cost and Benefit Flow (2-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Total Cost	Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.915	-	1.915	(1.915)	.011	.007	.807	.521	.290	(.290)
2	1.915	-	1.915	(1.665)	.033	.021	2.549	1.646	.915	(.795)
3	-	-	-	(-)	.044	.029	3.580	2.312	1.284	(.971)
4	-	-	-	(-)	.044	.029	3.771	2.435	1.351	(.888)
5	-	-	-	(-)	.044	.029	3.972	2.565	1.422	(.813)
6	-	-	-	(-)	.044	.029	4.184	2.711	1.488	(.740)
7	-	-	-	(-)	.044	.029	4.407	2.938	1.485	(.642)
8	-	-	-	(-)	.044	.029	4.643	3.188	1.470	(.553)
9	-	-	-	(-)	.044	.029	4.891	3.465	1.441	(.471)
10	-	-	-	(-)	.044	.029	5.152	3.772	1.396	(.397)
11	-	-	-	(-)	.044	.029	5.428	4.113	1.330	(.329)
12	-	-	-	(-)	.044	.029	5.719	4.495	1.239	(.266)
13	-	-	-	(-)	.044	.029	6.025	4.943	1.097	(.205)
14	-	-	-	(-)	.044	.029	6.348	5.480	.883	(.143)
15	-	1.803	1.803	(.255)	.044	.033	6.688	4.864	1.835	(.259)
16	-	-	-	(-)	.044	.035	7.047	4.772	2.283	(.281)
17	-	-	-	(-)	.044	.035	7.425	5.221	2.213	(.236)
18	-	-	-	(-)	.044	.035	7.824	5.665	2.168	(.201)
19	-	-	-	(-)	.044	.035	8.244	6.120	2.133	(.172)
20	-	-	-	(-)	.044	.035	8.688	6.596	2.101	(.148)
21	-	-	-	(-)	.044	.035	9.155	7.095	2.068	(.126)
22	-	-	-	(-)	.044	.035	9.648	7.623	2.034	(.108)
23	-	-	-	(-)	.044	.035	10.168	8.184	1.992	(.092)
24	-	-	-	(-)	.044	.035	10.716	8.817	1.908	(.077)
25	-	-.407	-.407	(-.014)	.044	.035	11.294	9.490	1.812	(.063)
Total	3.830	1.396	5.226	(3.821)	1.049	.755	158.371	119.030	39.635	(9.267)

Net Present Value : 5.445 million pesos/km
B/C Ratio : 2.43
Internal Rate of Return : 41.5 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.480	.130	.349
Delta-t(sec/km)	35.420	6.200	29.220

TABLE 14

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-14

Rehabilitation Method : 1-lane PCC Reconstruction (D=33.0 cm)
Traffic Loading Class : G
CBR of Subgrade : 8
AADT :

	First Year	Growth Rate
Car/Van	720	6.50 % p.a.
Jeepney	880	5.50 % p.a.
Tricycle	0	.00 % p.a.
Bus	240	5.00 % p.a.
Truck	940	5.00 % p.a.
Total	2780	

Serviceability, Construction Cost and Traffic Cost (1-lane)

Year	w/o Serviceability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (ks/km)	w/o Delta-t (sec/km)	with Serviceability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (ks/km)	with Delta-t (sec/km)
1.00	2.00	-	.403	.485	35.18	4.42	1.131	.260	.000	.00
2.00	2.00	-	1.275	.484	35.20	4.34	1.131	.823	.000	.00
3.00	2.00	-	1.790	.484	35.22	4.25	-	1.156	.000	.00
4.00	2.00	-	1.885	.484	35.24	4.15	-	1.218	.000	.00
5.00	2.00	-	1.986	.483	35.26	4.04	-	1.283	.000	.00
6.00	2.00	-	2.092	.483	35.28	3.93	-	1.356	.003	.14
7.00	2.00	-	2.204	.482	35.30	3.81	-	1.469	.031	1.34
8.00	2.00	-	2.321	.482	35.32	3.68	-	1.594	.062	2.63
9.00	2.00	-	2.445	.481	35.34	3.53	-	1.732	.095	4.03
10.00	2.00	-	2.576	.481	35.36	3.38	-	1.885	.131	5.55
11.00	2.00	-	2.714	.480	35.38	3.21	-	2.056	.170	7.21
12.00	2.00	-	2.859	.480	35.40	3.02	-	2.246	.212	9.02
13.00	2.00	-	3.012	.480	35.42	2.82	-	2.469	.259	12.25
14.00	2.00	-	3.174	.479	35.44	2.58	-	2.738	.311	17.76
14.34	2.00	-	1.140	.479	35.46	2.50	1.791	1.018	.349	21.75
15.00	2.00	-	2.205	.479	35.46	4.40	-	1.426	.000	.00
16.00	2.00	-	3.523	.478	35.48	4.24	-	2.280	.000	.00
17.00	2.00	-	3.713	.478	35.50	4.07	-	2.402	.000	.00
18.00	2.00	-	3.912	.477	35.52	3.88	-	2.549	.007	.28
19.00	2.00	-	4.122	.477	35.54	3.66	-	2.816	.055	2.33
20.00	2.00	-	4.344	.476	35.56	3.43	-	3.120	.108	4.60
21.00	2.00	-	4.578	.476	35.58	3.17	-	3.467	.167	7.13
22.00	2.00	-	4.824	.476	35.60	2.87	-	3.866	.234	9.97
23.00	2.00	-	5.084	.475	35.62	2.52	-	4.391	.310	17.90
23.06	2.00	-	.340	.475	35.64	2.50	1.791	.306	.353	22.58
24.00	2.00	-	5.018	.475	35.64	4.29	-	3.251	.000	.00
25.00	2.00	-	5.647	.474	35.66	4.04	-1.239	3.659	.000	.00
Total		-	79.185	-	-		4.604	56.833	-	-
Average		-	-	.479	35.43		-	-	.106	5.42

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-14

Cost and Benefit Flow (1-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Total Cost	Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.131	-	1.131	(1.131)	.005	.004	.403	.260	.145	(.145)
2	1.131	-	1.131	(.983)	.016	.011	1.275	.823	.457	(.398)
3	-	-	-	(-)	.022	.014	1.790	1.156	.642	(.485)
4	-	-	-	(-)	.022	.014	1.885	1.218	.675	(.444)
5	-	-	-	(-)	.022	.014	1.986	1.283	.711	(.406)
6	-	-	-	(-)	.022	.014	2.092	1.356	.744	(.370)
7	-	-	-	(-)	.022	.014	2.204	1.469	.742	(.321)
8	-	-	-	(-)	.022	.014	2.321	1.594	.735	(.276)
9	-	-	-	(-)	.022	.014	2.445	1.732	.721	(.236)
10	-	-	-	(-)	.022	.014	2.576	1.885	.698	(.199)
11	-	-	-	(-)	.022	.014	2.714	2.056	.666	(.165)
12	-	-	-	(-)	.022	.014	2.859	2.246	.621	(.133)
13	-	-	-	(-)	.022	.014	3.012	2.469	.551	(.103)
14	-	-	-	(-)	.022	.014	3.174	2.738	.444	(.072)
15	-	1.791	1.791	(.253)	.022	.014	3.344	2.444	.907	(.126)
16	-	-	-	(-)	.022	.014	3.523	2.280	1.251	(.154)
17	-	-	-	(-)	.022	.014	3.713	2.402	1.318	(.141)
18	-	-	-	(-)	.022	.014	3.912	2.549	1.371	(.127)
19	-	-	-	(-)	.022	.014	4.122	2.816	1.314	(.106)
20	-	-	-	(-)	.022	.014	4.344	3.120	1.231	(.087)
21	-	-	-	(-)	.022	.014	4.578	3.467	1.118	(.068)
22	-	-	-	(-)	.022	.014	4.824	3.866	.966	(.051)
23	-	-	-	(-)	.022	.014	5.084	4.391	.701	(.032)
24	-	1.791	1.791	(.072)	.022	.014	5.358	3.556	1.809	(.073)
25	-	-1.239	-1.239	(-.043)	.022	.014	5.647	3.659	1.996	(.070)
Total	2.262	2.342	4.604	(2.396)	.524	.342	79.185	56.833	22.534	(4.790)

Net Present Value : 2.394 million pesos/km
B/C Ratio : 2.00
Internal Rate of Return : 34.3 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(ks/km)	.479	.106	.374
Delta-t(sec/km)	35.428	5.424	30.004

TABLE 15

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-15

Rehabilitation Method : 2-lane Flex. Overlay-Rg.Ex (h=15.0 cm)
Traffic Loading Class : C/D
CBR of Subgrade : 6
AADT :

	First Year	Growth Rate
Car/Van	720	5.50 % p.a.
Jeepney	880	5.50 % p.a.
Tricycle	0	.00 % p.a.
Bus	240	5.00 % p.a.
Truck	940	5.00 % p.a.
Total	2780	

Serviceability, Construction Cost and Traffic Cost (2-lane)

Year	w/o Service-ability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (ka/km)	w/o Delta-t (sec/km)	with Service-ability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (ka/km)	with Delta-t (sec/km)
1.00	2.00	-	.807	.485	35.18	3.88	1.535	.528	.014	.61
2.00	2.00	-	2.549	.484	35.20	3.45	1.535	1.820	.105	4.44
3.00	2.00	-	3.580	.484	35.22	3.27	-	2.672	.154	6.54
4.00	2.00	-	3.771	.484	35.24	3.11	-	2.916	.195	8.28
5.00	2.00	-	3.972	.483	35.26	2.97	-	3.167	.232	9.83
6.00	2.00	-	4.184	.483	35.28	2.83	-	3.445	.266	12.75
7.00	2.00	-	4.407	.482	35.30	2.70	-	3.743	.297	16.07
8.00	2.00	-	4.643	.482	35.32	2.58	-	4.059	.328	19.25
8.64	2.00	-	3.139	.481	35.34	2.50	1.038	2.807	.352	21.80
9.00	2.00	-	1.752	.481	35.34	3.82	-	1.132	.000	.00
10.00	2.00	-	5.152	.481	35.36	3.42	-	3.638	.091	3.86
11.00	2.00	-	5.428	.480	35.38	3.16	-	4.115	.171	7.25
12.00	2.00	-	5.719	.480	35.40	2.93	-	4.557	.230	9.76
13.00	2.00	-	6.025	.480	35.42	2.73	-	5.043	.281	14.48
14.00	2.00	-	6.348	.479	35.44	2.54	-	5.554	.327	19.36
14.25	2.00	-	1.647	.479	35.46	2.50	1.038	1.478	.354	22.26
15.00	2.00	-	5.041	.479	35.46	3.70	-	3.301	.012	.52
16.00	2.00	-	7.047	.478	35.48	3.44	-	5.036	.103	4.39
17.00	2.00	-	7.425	.478	35.50	3.25	-	5.569	.157	6.68
18.00	2.00	-	7.824	.477	35.52	3.08	-	6.087	.199	8.49
19.00	2.00	-	8.244	.477	35.54	2.94	-	6.615	.236	10.06
20.00	2.00	-	8.688	.476	35.56	2.80	-	7.209	.270	13.52
21.00	2.00	-	9.155	.476	35.58	2.67	-	7.835	.301	16.88
22.00	2.00	-	9.648	.476	35.60	2.55	-	8.494	.331	20.07
22.41	2.00	-	4.139	.475	35.62	2.50	1.038	3.713	.351	22.25
23.00	2.00	-	6.029	.475	35.62	3.78	-	3.913	.002	.09
24.00	2.00	-	10.716	.475	35.64	3.54	-	7.508	.080	3.43
25.00	2.00	-	11.294	.474	35.66	3.37	-.783	8.276	.129	5.51
Total		-	158.371	-	-		5.402	124.232	-	-
Average		-	-	.479	35.42		-	-	.199	10.30

Evaluation of Pavement Rehabilitation Method : Case Study Spot N-CS-15

Cost and Benefit Flow (2-lane) (unit : million pesos/km)

Year	Cost Initial Cost	Cost Rehab. Cost	Total Cost	Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings) Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.535	-	1.535	(1.535)	.011	.009	.807	.528	.281	(.281)
2	1.535	-	1.535	(1.335)	.033	.026	2.549	1.820	.736	(.640)
3	-	-	-	(-)	.044	.035	3.580	2.672	.917	(.693)
4	-	-	-	(-)	.044	.035	3.771	2.916	.863	(.568)
5	-	-	-	(-)	.044	.035	3.972	3.167	.814	(.465)
6	-	-	-	(-)	.044	.035	4.184	3.445	.748	(.372)
7	-	-	-	(-)	.044	.035	4.407	3.743	.672	(.291)
8	-	-	-	(-)	.044	.035	4.643	4.059	.592	(.223)
9	-	1.038	1.038	(.339)	.044	.035	4.891	3.939	.960	(.314)
10	-	-	-	(-)	.044	.035	5.152	3.638	1.522	(.433)
11	-	-	-	(-)	.044	.035	5.428	4.115	1.321	(.327)
12	-	-	-	(-)	.044	.035	5.719	4.557	1.170	(.251)
13	-	-	-	(-)	.044	.035	6.025	5.043	.990	(.185)
14	-	-	-	(-)	.044	.035	6.348	5.554	.802	(.130)
15	-	1.038	1.038	(.147)	.044	.035	6.688	4.780	1.917	(.271)
16	-	-	-	(-)	.044	.035	7.047	5.036	2.020	(.248)
17	-	-	-	(-)	.044	.035	7.425	5.569	1.865	(.199)
18	-	-	-	(-)	.044	.035	7.824	6.087	1.745	(.162)
19	-	-	-	(-)	.044	.035	8.244	6.615	1.638	(.132)
20	-	-	-	(-)	.044	.035	8.688	7.209	1.487	(.104)
21	-	-	-	(-)	.044	.035	9.155	7.835	1.329	(.081)
22	-	-	-	(-)	.044	.035	9.648	8.494	1.163	(.062)
23	-	1.038	1.038	(.048)	.044	.035	10.168	7.826	2.550	(.118)
24	-	-	-	(-)	.044	.035	10.716	7.508	3.217	(.129)
25	-	-.783	-.783	(-.027)	.044	.035	11.294	8.276	3.028	(.106)
Total	3.070	2.332	5.402	(3.377)	1.049	.844	158.371	124.232	34.344	(6.785)

Net Present Value : 3.408 million pesos/km
B/C Ratio : 2.01
Internal Rate of Return : 34.0 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(ka/km)	.479	.199	.281
Delta-t(sec/km)	35.424	10.302	25.122

TABLE 16

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-1

Rehabilitation Method : 2-lane PCC Reconstruction (0-35.0/33.0 cm)
Traffic Loading Class : C/F
CBR of Subgrade : 4
AADT :

	First Year	Growth Rate
Car/Van	9470	6.00 % p.a.
Jeepney	1260	5.00 % p.a.
Trycycle	70	5.00 % p.a.
Bus	1340	5.00 % p.a.
Truck	2080	4.00 % p.a.
Total	14200	

Serviceability,Construction Cost and Traffic Cost (2-lane)

Year	w/o					with				
	Service-ability	Const. Cost (Mp/km)	Traffic Cost (Mp/km)	Delta-I (km/km)	Delta-t (sec/km)	Service-ability	Const. Cost (Mp/km)	Traffic Cost (Mp/km)	Delta-I (km/km)	Delta-t (sec/km)
1.00	2.00	-	3.424	.448	37.10	4.44	2.071	2.262	.000	.00
2.00	2.00	-	10.807	.447	37.12	4.37	2.071	7.142	.000	.00
3.00	2.00	-	15.162	.447	37.14	4.30	-	10.023	.000	.00
4.00	2.00	-	15.955	.446	37.16	4.22	-	10.550	.000	.00
5.00	2.00	-	16.790	.446	37.18	4.14	-	11.105	.000	.00
6.00	2.00	-	17.669	.445	37.20	4.05	-	11.690	.000	.00
7.00	2.00	-	18.596	.445	37.22	3.96	-	12.307	.000	.00
8.00	2.00	-	19.573	.444	37.24	3.85	-	13.238	.021	.93
9.00	2.00	-	20.603	.444	37.27	3.74	-	14.264	.045	1.95
10.00	2.00	-	21.688	.443	37.29	3.63	-	15.388	.070	3.05
11.00	2.00	-	22.831	.443	37.31	3.50	-	16.623	.097	4.24
12.00	2.00	-	24.036	.442	37.33	3.36	-	17.984	.127	5.53
13.00	2.00	-	25.306	.442	37.35	3.21	-	19.488	.159	6.93
14.00	2.00	-	26.645	.442	37.36	3.04	-	21.155	.194	8.47
15.00	2.00	-	28.056	.441	37.38	2.85	-	23.070	.232	11.13
16.00	2.00	-	29.543	.441	37.40	2.65	-	25.373	.275	16.52
16.67	2.00	-	20.745	.440	37.42	2.50	1.803	18.507	.314	21.44
17.00	2.00	-	10.367	.440	37.42	3.82	-	6.879	.000	.00
18.00	2.00	-	32.765	.440	37.44	3.46	-	23.495	.079	3.45
19.00	2.00	-	34.508	.439	37.46	3.22	-	26.284	.145	6.33
20.00	2.00	-	36.347	.439	37.48	3.03	-	28.847	.192	8.39
21.00	2.00	-	38.285	.438	37.50	2.86	-	31.504	.231	11.15
22.00	2.00	-	40.328	.438	37.51	2.70	-	34.421	.267	15.69
23.00	2.00	-	42.484	.438	37.53	2.56	-	37.462	.300	19.91
23.41	2.00	-	18.425	.437	37.55	2.50	1.038	16.599	.322	22.75
24.00	2.00	-	26.332	.437	37.55	3.69	-	17.719	.012	.53
25.00	2.00	-	47.154	.437	37.57	3.38	-.798	34.580	.101	4.43
Total		-	664.422	-	-		6.186	507.959	-	-
Average		-	-	.442	37.35		-	-	.118	6.40

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-1

Cost and Benefit Flow (2-lane)

(unit : million pesos/km)

Year	Cost				Benefit (Maintenance Cost and Traffic Cost Savings)					
	Initial Cost	Rehab. Cost	Total Cost	(Dis'd)	Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	(Dis'd)
1	2.071	-	2.071	(2.071)	.011	.007	3.424	2.262	1.165	(1.165)
2	2.071	-	2.071	(1.801)	.033	.021	10.807	7.142	3.676	(3.197)
3	-	-	-	(-)	.044	.029	15.162	10.023	5.154	(3.897)
4	-	-	-	(-)	.044	.029	15.955	10.550	5.420	(3.564)
5	-	-	-	(-)	.044	.029	16.790	11.105	5.700	(3.259)
6	-	-	-	(-)	.044	.029	17.669	11.690	5.994	(2.980)
7	-	-	-	(-)	.044	.029	18.596	12.307	6.305	(2.726)
8	-	-	-	(-)	.044	.029	19.573	13.238	6.350	(2.387)
9	-	-	-	(-)	.044	.029	20.603	14.264	6.354	(2.077)
10	-	-	-	(-)	.044	.029	21.688	15.388	6.315	(1.795)
11	-	-	-	(-)	.044	.029	22.831	16.623	6.223	(1.538)
12	-	-	-	(-)	.044	.029	24.036	17.984	6.067	(1.304)
13	-	-	-	(-)	.044	.029	25.306	19.488	5.833	(1.090)
14	-	-	-	(-)	.044	.029	26.645	21.155	5.504	(.895)
15	-	-	-	(-)	.044	.029	28.056	23.070	5.001	(.707)
16	-	-	-	(-)	.044	.029	29.543	25.373	4.186	(.514)
17	-	1.803	1.803	(.193)	.044	.031	31.112	25.386	5.739	(.613)
18	-	-	-	(-)	.044	.035	32.765	23.495	9.278	(.862)
19	-	-	-	(-)	.044	.035	34.508	26.284	8.233	(.665)
20	-	-	-	(-)	.044	.035	36.347	28.847	7.508	(.528)
21	-	-	-	(-)	.044	.035	38.285	31.504	6.789	(.415)
22	-	-	-	(-)	.044	.035	40.328	34.421	5.916	(.314)
23	-	-	-	(-)	.044	.035	42.484	37.462	5.030	(.232)
24	-	1.038	1.038	(.042)	.044	.035	44.757	34.317	10.448	(.420)
25	-	-.798	-.798	(-.028)	.044	.035	47.154	34.580	12.582	(.440)
Total	4.142	2.044	6.186	(4.078)	1.049	.739	664.422	507.959	156.772	(37.585)

Net Present Value : 33.506 million pesos/km
B/C Ratio : 9.22
Internal Rate of Return :282.5 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.442	.118	.324
Delta-t(sec/km)	37.351	6.400	30.951

TABLE 17

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-2

Rehabilitation Method : 1-lane PCC Reconstruction (D-33.0 cm)
Traffic Loading Class : E
CBR of Subgrade : 3
AADT :

	First Year	Growth Rate
Car/Van	4170	6.00 % p.a.
Jeepney	1080	4.50 % p.a.
Trycycle	10	4.50 % p.a.
Bus	580	5.00 % p.a.
Truck	1300	4.00 % p.a.
Total	7140	

Serviceability,Construction Cost and Traffic Cost (1-lane)

Year	w/o Service-ability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Service-ability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	.881	.458	36.70	4.46	1.131	.579	.000	.00
2.00	2.00	-	2.776	.452	36.72	4.41	1.131	1.826	.000	.00
3.00	2.00	-	3.888	.452	36.75	4.36	-	2.558	.000	.00
4.00	2.00	-	4.084	.451	36.77	4.31	-	2.688	.000	.00
5.00	2.00	-	4.291	.451	36.79	4.25	-	2.825	.000	.00
6.00	2.00	-	4.508	.450	36.81	4.19	-	2.969	.000	.00
7.00	2.00	-	4.737	.450	36.83	4.13	-	3.120	.000	.00
8.00	2.00	-	4.977	.449	36.86	4.06	-	3.279	.000	.00
9.00	2.00	-	5.230	.449	36.88	3.98	-	3.447	.000	.00
10.00	2.00	-	5.496	.448	36.90	3.91	-	3.668	.012	.53
11.00	2.00	-	5.776	.448	36.92	3.82	-	3.926	.030	1.31
12.00	2.00	-	6.071	.447	36.94	3.73	-	4.207	.049	2.15
13.00	2.00	-	6.382	.447	36.96	3.64	-	4.511	.070	3.04
14.00	2.00	-	6.708	.446	36.98	3.54	-	4.844	.092	4.01
15.00	2.00	-	7.052	.446	37.00	3.42	-	5.206	.116	5.04
16.00	2.00	-	7.414	.445	37.02	3.30	-	5.604	.142	6.17
17.00	2.00	-	7.795	.445	37.04	3.17	-	6.040	.170	7.39
18.00	2.00	-	8.196	.444	37.06	3.03	-	6.520	.200	8.71
19.00	2.00	-	8.618	.444	37.08	2.87	-	7.069	.233	11.07
20.00	2.00	-	9.063	.443	37.10	2.70	-	7.719	.270	15.62
21.00	2.00	-	9.531	.443	37.12	2.50	-	8.450	.310	20.66
21.01	2.00	-	.127	.443	37.14	2.50	1.791	.115	.332	23.36
22.00	2.00	-	9.897	.443	37.14	4.39	-	6.547	.000	.00
23.00	2.00	-	10.544	.442	37.16	4.27	-	6.977	.000	.00
24.00	2.00	-	11.091	.442	37.18	4.13	-	7.341	.000	.00
25.00	2.00	-	11.667	.441	37.20	3.99	-1.125	7.724	.000	.00
Total		-	166.802	-	-		2.928	119.760	-	-
Average		-	-	.447	36.96		-	-	.078	4.19

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-2

Cost and Benefit Flow (1-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Cost: Total Cost	Cost: (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.131	-	1.131	(1.131)	.005	.004	.881	.579	.304	(.304)
2	1.131	-	1.131	(.983)	.016	.011	2.776	1.826	.956	(.831)
3	-	-	-	(-)	.022	.014	3.888	2.558	1.338	(1.011)
4	-	-	-	(-)	.022	.014	4.084	2.688	1.404	(.923)
5	-	-	-	(-)	.022	.014	4.291	2.825	1.474	(.843)
6	-	-	-	(-)	.022	.014	4.508	2.969	1.547	(.769)
7	-	-	-	(-)	.022	.014	4.737	3.120	1.624	(.702)
8	-	-	-	(-)	.022	.014	4.977	3.279	1.705	(.641)
9	-	-	-	(-)	.022	.014	5.230	3.447	1.791	(.585)
10	-	-	-	(-)	.022	.014	5.496	3.668	1.835	(.522)
11	-	-	-	(-)	.022	.014	5.776	3.926	1.858	(.459)
12	-	-	-	(-)	.022	.014	6.071	4.207	1.872	(.402)
13	-	-	-	(-)	.022	.014	6.382	4.511	1.878	(.351)
14	-	-	-	(-)	.022	.014	6.708	4.844	1.872	(.304)
15	-	-	-	(-)	.022	.014	7.052	5.206	1.853	(.262)
16	-	-	-	(-)	.022	.014	7.414	5.604	1.818	(.223)
17	-	-	-	(-)	.022	.014	7.795	6.040	1.762	(.188)
18	-	-	-	(-)	.022	.014	8.196	6.520	1.683	(.156)
19	-	-	-	(-)	.022	.014	8.618	7.069	1.557	(.126)
20	-	-	-	(-)	.022	.014	9.063	7.719	1.352	(.095)
21	-	-	-	(-)	.022	.014	9.531	8.450	1.089	(.067)
22	-	1.791	1.791	(.095)	.022	.014	10.024	6.662	3.370	(.179)
23	-	-	-	(-)	.022	.014	10.544	6.977	3.575	(.165)
24	-	-	-	(-)	.022	.014	11.091	7.341	3.758	(.152)
25	-	-1.125	-1.125	(-.039)	.022	.014	11.667	7.724	3.950	(.138)
Total	2.262	.666	2.928	(2.170)	.524	.342	166.802	119.760	47.224	(10.399)

Net Present Value : 8.229 million pesos/km
B/C Ratio : 4.79
Internal Rate of Return : 83.7 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.447	.078	.369
Delta-t(sec/km)	36.965	4.194	32.771

TABLE 18

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-3

Rehabilitation Method : 2-lane PCC Reconstruction (D=33.0/30.0 cm)
Traffic Loading Class : E/D
CBR of Subgrade : 3
AADT :

	First Year	Growth Rate
Car/Van	4170	6.00 % p.a.
Jeepney	1080	4.50 % p.a.
Tricycle	10	4.50 % p.a.
Bus	580	5.00 % p.a.
Truck	1300	4.00 % p.a.
Total	7140	

Serviceability, Construction Cost and Traffic Cost (2-lane)

Year	w/o					with				
	Service-ability	Const. Cost (Mp/km)	Traffic Cost (Mp/km)	Delta-I (km/km)	Delta-t (sec/km)	Service-ability	Const. Cost (Mp/km)	Traffic Cost (Mp/km)	Delta-I (km/km)	Delta-t (sec/km)
1.00	2.00	-	1.762	.453	36.70	4.44	1.960	1.159	.000	.00
2.00	2.00	-	5.552	.452	36.72	4.38	1.960	3.652	.000	.00
3.00	2.00	-	7.776	.452	36.75	4.31	-	5.116	.000	.00
4.00	2.00	-	8.169	.451	36.77	4.24	-	5.376	.000	.00
5.00	2.00	-	8.582	.451	36.79	4.17	-	5.649	.000	.00
6.00	2.00	-	9.016	.450	36.81	4.09	-	5.937	.000	.00
7.00	2.00	-	9.473	.450	36.83	4.00	-	6.240	.000	.00
8.00	2.00	-	9.954	.449	36.86	3.91	-	6.628	.010	.45
9.00	2.00	-	10.460	.449	36.88	3.81	-	7.119	.032	1.39
10.00	2.00	-	10.993	.448	36.90	3.70	-	7.656	.055	2.40
11.00	2.00	-	11.553	.448	36.92	3.58	-	8.244	.080	3.49
12.00	2.00	-	12.143	.447	36.94	3.46	-	8.889	.108	4.68
13.00	2.00	-	12.763	.447	36.96	3.32	-	9.599	.137	5.96
14.00	2.00	-	13.416	.446	36.98	3.17	-	10.383	.169	7.36
15.00	2.00	-	14.104	.446	37.00	3.00	-	11.253	.204	8.89
16.00	2.00	-	14.828	.445	37.02	2.82	-	12.275	.243	12.21
17.00	2.00	-	15.590	.445	37.04	2.61	-	13.480	.286	17.52
17.50	2.00	-	8.177	.444	37.06	2.50	1.803	7.315	.321	21.85
18.00	2.00	-	8.216	.444	37.08	3.71	-	5.486	.010	.45
19.00	2.00	-	17.237	.444	37.08	3.33	-	12.628	.106	4.63
20.00	2.00	-	18.126	.443	37.10	3.07	-	14.149	.177	7.72
21.00	2.00	-	19.063	.443	37.12	2.84	-	15.615	.232	10.09
22.00	2.00	-	20.049	.443	37.14	2.64	-	17.231	.278	16.73
22.76	2.00	-	15.973	.442	37.16	2.50	1.038	14.247	.316	21.45
23.00	2.00	-	5.115	.442	37.16	3.85	-	3.384	.000	.00
24.00	2.00	-	22.181	.442	37.19	3.42	-	15.889	.081	3.52
25.00	2.00	-	23.333	.441	37.20	3.15	-.620	17.940	.158	6.91
Total		-	333.603	-	-		6.141	252.538	-	-
Average		-	-	.447	36.97		-	-	.111	5.87

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-3

Cost and Benefit Flow (2-lane) (unit : million pesos/km)

Year	Cost			Benefit (Maintenance Cost and Traffic Cost Savings)				
	Initial Cost	Rehab. Cost	Total Cost	Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit
1	1.960	-	1.960 (1.960)	.011	.007	1.762	1.159	.807 (.607)
2	1.960	-	1.960 (1.704)	.033	.021	5.552	3.652	1.912 (1.662)
3	-	-	- (-)	.044	.029	7.776	5.116	2.675 (2.023)
4	-	-	- (-)	.044	.029	8.169	5.376	2.808 (1.846)
5	-	-	- (-)	.044	.029	8.582	5.649	2.947 (1.685)
6	-	-	- (-)	.044	.029	9.016	5.937	3.094 (1.538)
7	-	-	- (-)	.044	.029	9.473	6.240	3.249 (1.404)
8	-	-	- (-)	.044	.029	9.954	6.628	3.342 (1.256)
9	-	-	- (-)	.044	.029	10.460	7.119	3.356 (1.097)
10	-	-	- (-)	.044	.029	10.993	7.656	3.352 (.953)
11	-	-	- (-)	.044	.029	11.553	8.244	3.325 (.822)
12	-	-	- (-)	.044	.029	12.143	8.889	3.269 (.703)
13	-	-	- (-)	.044	.029	12.763	9.599	3.179 (.594)
14	-	-	- (-)	.044	.029	13.416	10.383	3.048 (.495)
15	-	-	- (-)	.044	.029	14.104	11.253	2.867 (.405)
16	-	-	- (-)	.044	.029	14.828	12.275	2.569 (.316)
17	-	-	- (-)	.044	.029	15.590	13.480	2.125 (.227)
18	-	1.803	1.803 (.168)	.044	.032	16.392	12.801	3.603 (.335)
19	-	-	- (-)	.044	.035	17.237	12.628	4.617 (.373)
20	-	-	- (-)	.044	.035	18.126	14.149	3.986 (.280)
21	-	-	- (-)	.044	.035	19.063	15.615	3.456 (.211)
22	-	-	- (-)	.044	.035	20.049	17.231	2.826 (.150)
23	-	1.038	1.038 (.048)	.044	.035	21.088	17.631	3.465 (.160)
24	-	-	- (-)	.044	.035	22.181	15.889	6.301 (.253)
25	-	-.620	-.620 (-.022)	.044	.035	23.333	17.940	5.402 (.189)
Total	3.919	2.222	6.141 (3.858)	1.049	.734	333.603	252.538	81.380 (19.586)

Net Present Value : 15.729 million pesos/km
B/C Ratio : 5.08
Internal Rate of Return :101.3 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.447	.111	.335
Delta-t(sec/km)	36.969	5.870	31.100

TABLE 19

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-4

Rehabilitation Method : 1-lane PCC Reconstruction (D=30.0 cm)
Traffic Loading Class : E
CBR of Subgrade : 8
AADT :

	First Year	Growth Rate
Car/Van	2500	6.00 % p.a.
Jeepney	810	5.00 % p.a.
Tricycle	0	.00 % p.a.
Bus	610	5.00 % p.a.
Truck	1120	4.00 % p.a.
Total	5040	

Serviceability, Construction Cost and Traffic Cost (1-lane)

Year	w/o Serviceability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Serviceability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	.685	.469	35.91	4.43	1.064	.448	.000	.00
2.00	2.00	-	2.159	.468	35.94	4.35	1.064	1.410	.000	.00
3.00	2.00	-	3.021	.467	35.96	4.27	-	1.974	.000	.00
4.00	2.00	-	3.172	.467	35.99	4.18	-	2.073	.000	.00
5.00	2.00	-	3.330	.466	36.02	4.08	-	2.177	.000	.00
6.00	2.00	-	3.496	.466	36.04	3.98	-	2.286	.000	.00
7.00	2.00	-	3.670	.465	36.07	3.87	-	2.445	.018	.78
8.00	2.00	-	3.854	.465	36.10	3.75	-	2.637	.045	1.93
9.00	2.00	-	4.047	.464	36.12	3.62	-	2.847	.074	3.16
10.00	2.00	-	4.250	.463	36.15	3.48	-	3.078	.105	4.50
11.00	2.00	-	4.463	.463	36.18	3.33	-	3.334	.139	5.95
12.00	2.00	-	4.688	.462	36.20	3.16	-	3.617	.175	7.53
13.00	2.00	-	4.924	.462	36.23	2.98	-	3.932	.215	9.26
14.00	2.00	-	5.172	.461	36.25	2.77	-	4.307	.259	13.22
15.00	2.00	-	5.433	.461	36.28	2.55	-	4.746	.308	18.83
15.21	2.00	-	1.175	.460	36.30	2.50	1.657	1.057	.339	22.45
16.00	2.00	-	4.532	.460	36.30	4.39	-	2.972	.000	.00
17.00	2.00	-	5.996	.459	36.33	4.29	-	3.932	.000	.00
18.00	2.00	-	6.300	.459	36.35	4.06	-	4.132	.000	.00
19.00	2.00	-	6.619	.458	36.38	3.88	-	4.373	.007	.29
20.00	2.00	-	6.955	.458	36.40	3.67	-	4.803	.051	2.21
21.00	2.00	-	7.309	.457	36.43	3.45	-	5.289	.101	4.34
22.00	2.00	-	7.680	.457	36.45	3.19	-	5.840	.155	6.70
23.00	2.00	-	8.072	.456	36.47	2.91	-	6.469	.216	9.34
24.00	2.00	-	8.484	.456	36.50	2.58	-	7.277	.286	16.61
24.23	2.00	-	2.087	.455	36.52	2.50	1.657	1.872	.332	22.07
25.00	2.00	-	6.830	.455	36.52	4.34	-1.460	4.488	.000	.00
Total		-	128.401	-	-		3.983	93.815	-	-
Average		-	-	.461	36.24		-	-	.105	5.52

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-4

Cost and Benefit Flow (1-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Cost: Total Cost	Cost: Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.064	-	1.064	(1.064)	.005	.004	.685	.448	.240	(.240)
2	1.064	-	1.064	(.925)	.016	.011	2.159	1.410	.754	(.656)
3	-	-	-	(-)	.022	.014	3.021	1.974	1.055	(.797)
4	-	-	-	(-)	.022	.014	3.172	2.073	1.106	(.727)
5	-	-	-	(-)	.022	.014	3.330	2.177	1.160	(.663)
6	-	-	-	(-)	.022	.014	3.496	2.286	1.217	(.605)
7	-	-	-	(-)	.022	.014	3.670	2.445	1.233	(.533)
8	-	-	-	(-)	.022	.014	3.854	2.637	1.225	(.460)
9	-	-	-	(-)	.022	.014	4.047	2.847	1.208	(.395)
10	-	-	-	(-)	.022	.014	4.250	3.078	1.179	(.335)
11	-	-	-	(-)	.022	.014	4.463	3.334	1.137	(.281)
12	-	-	-	(-)	.022	.014	4.688	3.617	1.078	(.232)
13	-	-	-	(-)	.022	.014	4.924	3.932	.999	(.187)
14	-	-	-	(-)	.022	.014	5.172	4.307	.872	(.142)
15	-	-	-	(-)	.022	.014	5.433	4.746	.694	(.098)
16	-	1.657	1.657	(.204)	.022	.014	5.707	4.029	1.686	(.207)
17	-	-	-	(-)	.022	.014	5.996	3.932	2.071	(.221)
18	-	-	-	(-)	.022	.014	6.300	4.132	2.175	(.202)
19	-	-	-	(-)	.022	.014	6.619	4.373	2.254	(.182)
20	-	-	-	(-)	.022	.014	6.955	4.803	2.159	(.152)
21	-	-	-	(-)	.022	.014	7.309	5.289	2.027	(.124)
22	-	-	-	(-)	.022	.014	7.680	5.840	1.848	(.098)
23	-	-	-	(-)	.022	.014	8.072	6.469	1.610	(.074)
24	-	-	-	(-)	.022	.014	8.484	7.277	1.214	(.049)
25	-	.197	.197	(.007)	.022	.014	8.917	6.360	2.565	(.090)
Total	2.128	1.854	3.983	(2.200)	.524	.342	128.401	93.815	34.768	(7.751)

Net Present Value : 5.551 million pesos/km
B/C Ratio : 3.52
Internal Rate of Return : 66.3 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.461	.105	.357
Delta-t(sec/km)	36.237	5.525	30.712

TABLE 20

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-5

Rehabilitation Method : 2-lane Flex. Overlay-Rs.Ex (h=10.0 cm)
Traffic Loading Class : E/D
CBR of Subgrade : 8
AADT :

	First Year	Growth Rate
Car/Van	2500	6.00 % p.a.
Jeepney	810	5.00 % p.a.
Trycycle	0	.00 % p.a.
Bus	610	5.00 % p.a.
Truck	1120	4.00 % p.a.
Total	5040	

Serviceability,Construction Cost and Traffic Cost (2-lane)

Year	w/o Service-ability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-i (ka/km)	w/o Delta-t (sec/km)	with Service-ability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-i (ka/km)	with Delta-t (sec/km)
1.00	2.00	-	1.371	.469	35.91	3.78	1.137	.898	.003	.12
2.00	2.00	-	4.317	.468	35.94	3.53	1.137	3.052	.081	3.46
3.00	2.00	-	6.042	.467	35.96	3.32	-	4.484	.134	5.72
4.00	2.00	-	6.343	.467	35.99	3.13	-	4.904	.180	7.71
5.00	2.00	-	6.659	.466	36.02	2.95	-	5.340	.223	9.56
6.00	2.00	-	6.991	.466	36.04	2.78	-	5.832	.264	13.45
7.00	2.00	-	7.341	.465	36.07	2.61	-	6.364	.303	17.92
7.67	2.00	-	5.149	.465	36.10	2.50	1.038	4.602	.335	21.58
8.00	2.00	-	2.559	.465	36.10	3.95	-	1.674	.000	.00
9.00	2.00	-	8.094	.464	36.12	3.60	-	5.577	.052	2.23
10.00	2.00	-	8.500	.463	36.15	3.35	-	6.251	.121	5.22
11.00	2.00	-	8.927	.463	36.18	3.13	-	6.894	.177	7.59
12.00	2.00	-	9.375	.462	36.20	2.92	-	7.550	.226	9.71
13.00	2.00	-	9.847	.462	36.23	2.73	-	8.297	.272	14.57
14.00	2.00	-	10.344	.461	36.25	2.54	-	9.092	.315	19.58
14.22	2.00	-	2.361	.461	36.28	2.50	1.038	2.127	.341	22.57
15.00	2.00	-	8.504	.461	36.28	3.79	-	5.582	.001	.06
16.00	2.00	-	11.415	.460	36.30	3.55	-	8.062	.076	3.27
17.00	2.00	-	11.992	.459	36.33	3.37	-	8.859	.124	5.36
18.00	2.00	-	12.599	.459	36.35	3.20	-	9.645	.164	7.07
19.00	2.00	-	13.238	.458	36.38	3.06	-	10.448	.200	8.60
20.00	2.00	-	13.910	.458	36.40	2.92	-	11.292	.232	10.24
21.00	2.00	-	14.617	.457	36.43	2.78	-	12.245	.263	13.84
22.00	2.00	-	15.361	.457	36.45	2.66	-	13.250	.292	17.30
23.00	2.00	-	16.144	.456	36.47	2.53	-	14.315	.321	20.66
23.25	2.00	-	4.315	.456	36.50	2.50	1.038	3.890	.338	22.75
24.00	2.00	-	12.652	.456	36.50	3.80	-	8.313	.000	.00
25.00	2.00	-	17.834	.455	36.52	3.59	-.879	12.538	.069	2.97
Total		-	256.801	-	-		4.510	201.377	-	-
Average		-	-	.462	36.23		-	-	.182	9.75

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-5

Cost and Benefit Flow (2-lane)

(unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Cost: Total Cost	Cost: Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.137	-	1.137	(1.137)	.011	.009	1.371	.898	.475	(.475)
2	1.137	-	1.137	(.989)	.033	.026	4.317	3.052	1.271	(1.106)
3	-	-	-	(-)	.044	.035	6.042	4.484	1.567	(1.185)
4	-	-	-	(-)	.044	.035	6.343	4.904	1.448	(.952)
5	-	-	-	(-)	.044	.035	6.659	5.340	1.328	(.759)
6	-	-	-	(-)	.044	.035	6.991	5.832	1.168	(.581)
7	-	-	-	(-)	.044	.035	7.341	6.364	.986	(.426)
8	-	1.038	1.038	(.390)	.044	.035	7.708	6.276	1.441	(.542)
9	-	-	-	(-)	.044	.035	8.094	5.577	2.526	(.826)
10	-	-	-	(-)	.044	.035	8.500	6.251	2.257	(.642)
11	-	-	-	(-)	.044	.035	8.927	6.894	2.041	(.504)
12	-	-	-	(-)	.044	.035	9.375	7.550	1.834	(.394)
13	-	-	-	(-)	.044	.035	9.847	8.297	1.559	(.291)
14	-	-	-	(-)	.044	.035	10.344	9.092	1.260	(.205)
15	-	1.038	1.038	(.147)	.044	.035	10.866	7.709	3.165	(.447)
16	-	-	-	(-)	.044	.035	11.415	8.062	3.361	(.413)
17	-	-	-	(-)	.044	.035	11.992	8.859	3.141	(.336)
18	-	-	-	(-)	.044	.035	12.599	9.645	2.963	(.275)
19	-	-	-	(-)	.044	.035	13.238	10.448	2.798	(.226)
20	-	-	-	(-)	.044	.035	13.910	11.292	2.627	(.185)
21	-	-	-	(-)	.044	.035	14.617	12.245	2.381	(.145)
22	-	-	-	(-)	.044	.035	15.361	13.250	2.119	(.113)
23	-	-	-	(-)	.044	.035	16.144	14.315	1.837	(.085)
24	-	1.038	1.038	(.042)	.044	.035	16.967	12.203	4.773	(.192)
25	-	-.879	-.879	(-.031)	.044	.035	17.834	12.538	5.304	(.185)
Total	2.274	2.236	4.510	(2.674)	1.049	.844	256.802	201.377	55.630	(11.490)

Net Present Value : 8.816 million pesos/km
B/C Ratio : 4.30
Internal Rate of Return :114.3 %

Delta-i & Delta-t

	w/o	with	saving
Delta-i(km/km)	.462	.182	.279
Delta-t(sec/km)	36.230	9.753	26.477

TABLE 21

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-6

Rehabilitation Method : 2-lane PCC Reconstruction (0-30.0/28.0 cm)
Traffic Loading Class : E/D
CBR of Subgrade : 8
AADT :

	First Year	Growth Rate
Car/Van	2500	6.00 % p.a.
Jeepney	810	5.00 % p.a.
Tricycle	0	.00 % p.a.
Bus	610	5.00 % p.a.
Truck	1120	4.00 % p.a.
Total	5040	

Serviceability, Construction Cost and Traffic Cost (2-lane)

Year	w/o Serviceability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-i (km/km)	w/o Delta-t (sec/km)	with Serviceability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-i (km/km)	with Delta-t (sec/km)
1.00	2.00	-	1.371	.469	35.91	4.42	1.848	.895	.000	.00
2.00	2.00	-	4.317	.468	35.94	4.34	1.848	2.820	.000	.00
3.00	2.00	-	6.042	.467	35.96	4.25	-	3.948	.000	.00
4.00	2.00	-	6.343	.467	35.99	4.15	-	4.146	.000	.00
5.00	2.00	-	6.659	.466	36.02	4.04	-	4.354	.000	.00
6.00	2.00	-	6.991	.466	36.04	3.93	-	4.586	.003	.12
7.00	2.00	-	7.341	.465	36.07	3.81	-	4.949	.030	1.30
8.00	2.00	-	7.708	.465	36.10	3.68	-	5.349	.060	2.56
9.00	2.00	-	8.094	.464	36.12	3.53	-	5.790	.092	3.93
10.00	2.00	-	8.500	.463	36.15	3.38	-	6.278	.126	5.42
11.00	2.00	-	8.927	.463	36.18	3.21	-	6.819	.164	7.04
12.00	2.00	-	9.375	.462	36.20	3.02	-	7.421	.205	8.82
13.00	2.00	-	9.847	.462	36.23	2.81	-	8.125	.250	12.16
14.00	2.00	-	10.344	.461	36.25	2.58	-	8.968	.301	17.92
14.33	2.00	-	3.537	.461	36.28	2.50	1.803	3.172	.336	22.03
15.00	2.00	-	7.329	.461	36.28	3.90	-	4.804	.000	.00
16.00	2.00	-	11.415	.460	36.30	3.71	-	7.821	.044	1.91
17.00	2.00	-	11.992	.459	36.33	3.57	-	8.522	.082	3.54
18.00	2.00	-	12.599	.459	36.35	3.45	-	9.211	.113	4.85
19.00	2.00	-	13.238	.458	36.38	3.34	-	9.916	.139	6.00
20.00	2.00	-	13.910	.458	36.40	3.23	-	10.648	.164	7.05
21.00	2.00	-	14.617	.457	36.43	3.13	-	11.416	.186	8.04
22.00	2.00	-	15.361	.457	36.45	3.04	-	12.224	.208	8.99
23.00	2.00	-	16.144	.456	36.47	2.95	-	13.081	.229	9.99
24.00	2.00	-	16.967	.456	36.50	2.86	-	14.043	.250	12.41
25.00	2.00	-	17.834	.455	36.52	2.77	-.407	15.064	.270	14.79
Total		-	256.802	-	-		5.093	194.371	-	-
Average		-	-	.462	36.22		-	-	.125	6.11

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-6

Cost and Benefit Flow (2-lane) (unit : million pesos/km)

Year	Cost Initial Cost	Cost Rehab. Cost	Total Cost	Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings) Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.848	-	1.848	(1.848)	.011	.007	1.371	.895	.479	(.479)
2	1.848	-	1.848	(1.607)	.033	.021	4.317	2.820	1.508	(1.311)
3	-	-	-	(-)	.044	.029	6.042	3.948	2.109	(1.595)
4	-	-	-	(-)	.044	.029	6.343	4.146	2.212	(1.455)
5	-	-	-	(-)	.044	.029	6.659	4.354	2.321	(1.327)
6	-	-	-	(-)	.044	.029	6.991	4.586	2.421	(1.204)
7	-	-	-	(-)	.044	.029	7.341	4.949	2.407	(1.040)
8	-	-	-	(-)	.044	.029	7.708	5.349	2.374	(.892)
9	-	-	-	(-)	.044	.029	8.094	5.790	2.319	(.758)
10	-	-	-	(-)	.044	.029	8.500	6.278	2.237	(.636)
11	-	-	-	(-)	.044	.029	8.927	6.819	2.123	(.525)
12	-	-	-	(-)	.044	.029	9.375	7.421	1.970	(.423)
13	-	-	-	(-)	.044	.029	9.847	8.125	1.738	(.325)
14	-	-	-	(-)	.044	.029	10.344	8.968	1.391	(.226)
15	-	1.803	1.803	(.255)	.044	.033	10.866	7.975	2.901	(.410)
16	-	-	-	(-)	.044	.035	11.415	7.821	3.602	(.443)
17	-	-	-	(-)	.044	.035	11.992	8.522	3.478	(.372)
18	-	-	-	(-)	.044	.035	12.599	9.211	3.397	(.316)
19	-	-	-	(-)	.044	.035	13.238	9.916	3.331	(.269)
20	-	-	-	(-)	.044	.035	13.910	10.648	3.270	(.230)
21	-	-	-	(-)	.044	.035	14.617	11.416	3.209	(.196)
22	-	-	-	(-)	.044	.035	15.361	12.224	3.145	(.167)
23	-	-	-	(-)	.044	.035	16.144	13.081	3.071	(.142)
24	-	-	-	(-)	.044	.035	16.967	14.043	2.933	(.118)
25	-	-.407	-.407	(-.014)	.044	.035	17.834	15.064	2.778	(.097)
Total	3.697	1.396	5.093	(3.696)	1.049	.755	256.802	194.371	62.724	(14.955)

Net Present Value : 11.259 million pesos/km
B/C Ratio : 4.05
Internal Rate of Return : 79.1 %

Delta-i & Delta-t

	w/o	with	saving
Delta-i(km/km)	.462	.125	.337
Delta-t(sec/km)	36.225	6.110	30.115

TABLE 22

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-7

Rehabilitation Method : 2-lane PCC Reconstruction (D=30.0/28.0 cm)
Traffic Loading Class : D/C
CBR of Subgrade : 4
AADT :

	First Year	Growth Rate
Car/Van	880	5.50 % p.a.
Jeepney	510	4.50 % p.a.
Tricycle	0	.00 % p.a.
Bus	510	4.50 % p.a.
Truck	750	3.50 % p.a.
Total	2650	

Serviceability,Construction Cost and Traffic Cost (2-lane)

Year	w/o Serviceability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Serviceability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	.333	.495	34.72	4.45	1.848	.539	.000	.00
2.00	2.00	-	2.606	.495	34.75	4.39	1.848	1.687	.000	.00
3.00	2.00	-	3.625	.494	34.77	4.33	-	2.346	.000	.00
4.00	2.00	-	3.781	.493	34.80	4.26	-	2.448	.000	.00
5.00	2.00	-	3.944	.493	34.83	4.19	-	2.554	.000	.00
6.00	2.00	-	4.115	.492	34.85	4.11	-	2.665	.000	.00
7.00	2.00	-	4.293	.492	34.88	4.03	-	2.781	.000	.00
8.00	2.00	-	4.479	.491	34.90	3.95	-	2.909	.003	.11
9.00	2.00	-	4.673	.490	34.93	3.85	-	3.102	.025	1.04
10.00	2.00	-	4.876	.490	34.96	3.75	-	3.312	.048	2.03
11.00	2.00	-	5.087	.489	34.98	3.65	-	3.540	.073	3.10
12.00	2.00	-	5.309	.489	35.01	3.53	-	3.788	.100	4.24
13.00	2.00	-	5.540	.488	35.04	3.41	-	4.059	.130	5.48
14.00	2.00	-	5.782	.488	35.06	3.27	-	4.356	.161	6.83
15.00	2.00	-	6.034	.487	35.09	3.12	-	4.682	.196	8.29
16.00	2.00	-	6.298	.486	35.11	2.96	-	5.042	.233	9.88
17.00	2.00	-	6.573	.486	35.14	2.78	-	5.470	.275	13.52
18.00	2.00	-	6.861	.485	35.17	2.58	-	5.959	.320	18.21
18.38	2.00	-	2.750	.485	35.19	2.50	1.803	2.463	.354	21.71
19.00	2.00	-	4.413	.485	35.19	3.77	-	2.875	.003	.15
20.00	2.00	-	7.477	.484	35.22	3.50	-	5.288	.089	3.76
21.00	2.00	-	7.805	.484	35.24	3.29	-	5.816	.147	6.22
22.00	2.00	-	8.149	.483	35.27	3.12	-	6.314	.192	8.14
23.00	2.00	-	8.508	.482	35.29	2.96	-	6.812	.231	9.81
24.00	2.00	-	8.883	.482	35.32	2.82	-	7.356	.267	12.95
25.00	2.00	-	9.276	.481	35.34	2.68	-.318	7.932	.300	16.47
Total		-	141.969	-	-		5.182	106.096	-	-
Average		-	-	.488	35.04		-	-	.121	5.84

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-7

Cost and Benefit Flow (2-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Total Cost	Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.848	-	1.848	(1.848)	.011	.007	.333	.539	.298	(.298)
2	1.848	-	1.848	(1.607)	.033	.021	2.606	1.687	.931	(.810)
3	-	-	-	(-)	.044	.029	3.625	2.346	1.294	(.978)
4	-	-	-	(-)	.044	.029	3.781	2.448	1.348	(.887)
5	-	-	-	(-)	.044	.029	3.944	2.554	1.405	(.804)
6	-	-	-	(-)	.044	.029	4.115	2.665	1.465	(.728)
7	-	-	-	(-)	.044	.029	4.293	2.781	1.527	(.660)
8	-	-	-	(-)	.044	.029	4.479	2.909	1.584	(.596)
9	-	-	-	(-)	.044	.029	4.673	3.102	1.585	(.518)
10	-	-	-	(-)	.044	.029	4.876	3.312	1.579	(.449)
11	-	-	-	(-)	.044	.029	5.087	3.540	1.563	(.386)
12	-	-	-	(-)	.044	.029	5.309	3.788	1.536	(.330)
13	-	-	-	(-)	.044	.029	5.540	4.059	1.496	(.280)
14	-	-	-	(-)	.044	.029	5.782	4.356	1.441	(.234)
15	-	-	-	(-)	.044	.029	6.034	4.682	1.367	(.193)
16	-	-	-	(-)	.044	.029	6.298	5.042	1.271	(.156)
17	-	-	-	(-)	.044	.029	6.573	5.470	1.119	(.120)
18	-	-	-	(-)	.044	.029	6.861	5.959	.917	(.085)
19	-	1.803	1.803	(.146)	.044	.033	7.162	5.338	1.835	(.148)
20	-	-	-	(-)	.044	.035	7.477	5.288	2.197	(.154)
21	-	-	-	(-)	.044	.035	7.805	5.816	1.998	(.122)
22	-	-	-	(-)	.044	.035	8.149	6.314	1.844	(.098)
23	-	-	-	(-)	.044	.035	8.508	6.812	1.705	(.079)
24	-	-	-	(-)	.044	.035	8.883	7.356	1.536	(.062)
25	-	-.318	-.318	(-.011)	.044	.035	9.276	7.932	1.352	(.047)
Total	3.697	1.486	5.182	(3.590)	1.049	.728	141.969	106.096	36.194	(9.222)

Net Present Value : 5.631 million pesos/km
B/C Ratio : 2.57
Internal Rate of Return : 44.2 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.488	.121	.367
Delta-t(sec/km)	35.040	5.844	29.196

TABLE 23

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-8

Rehabilitation Method : 1-lane PCC Reconstruction (D=28.0 cm)
Traffic Loading Class : D
CBR of Subgrade : 8
AADT :

	First Year	Growth Rate
Car/Van	670	5.50 % p.a.
Jeepney	460	4.50 % p.a.
Tricycle	0	.00 % p.a.
Bus	300	4.50 % p.a.
Truck	710	3.50 % p.a.
Total	2140	

Serviceability, Construction Cost and Traffic Cost (1-lane)

Year	w/o					with				
	Service-ability	Const. Cost (Mp/km)	Traffic Cost (Mp/km)	Delta-I (km/km)	Delta-t (sec/km)	Service-ability	Const. Cost (Mp/km)	Traffic Cost (Mp/km)	Delta-I (km/km)	Delta-t (sec/km)
1.00	2.00	-	.329	.494	34.75	4.42	1.020	.213	.000	.00
2.00	2.00	-	1.028	.494	34.78	4.34	1.020	.665	.000	.00
3.00	2.00	-	1.429	.493	34.81	4.25	-	.924	.000	.00
4.00	2.00	-	1.489	.493	34.84	4.15	-	.963	.000	.00
5.00	2.00	-	1.552	.492	34.86	4.04	-	1.004	.000	.00
6.00	2.00	-	1.618	.491	34.89	3.93	-	1.050	.003	.13
7.00	2.00	-	1.687	.491	34.92	3.81	-	1.126	.032	1.35
8.00	2.00	-	1.759	.490	34.95	3.68	-	1.210	.063	2.66
9.00	2.00	-	1.833	.489	34.97	3.53	-	1.302	.097	4.08
10.00	2.00	-	1.912	.489	35.00	3.38	-	1.403	.133	5.63
11.00	2.00	-	1.993	.488	35.03	3.21	-	1.515	.173	7.31
12.00	2.00	-	2.078	.488	35.06	3.02	-	1.639	.216	9.15
13.00	2.00	-	2.167	.487	35.08	2.81	-	1.783	.264	12.41
14.00	2.00	-	2.260	.486	35.11	2.58	-	1.956	.317	17.84
14.33	2.00	-	.767	.486	35.14	2.50	1.568	.687	.355	21.71
15.00	2.00	-	1.590	.486	35.14	4.40	-	1.030	.000	.00
16.00	2.00	-	2.458	.485	35.17	4.24	-	1.593	.000	.00
17.00	2.00	-	2.564	.485	35.19	4.07	-	1.662	.000	.00
18.00	2.00	-	2.674	.484	35.22	3.87	-	1.747	.007	.30
19.00	2.00	-	2.790	.483	35.25	3.66	-	1.912	.056	2.38
20.00	2.00	-	2.910	.483	35.28	3.42	-	2.098	.110	4.68
21.00	2.00	-	3.036	.482	35.30	3.16	-	2.309	.171	7.25
22.00	2.00	-	3.167	.482	35.33	2.86	-	2.550	.239	10.13
23.00	2.00	-	3.304	.481	35.36	2.52	-	2.865	.316	18.07
23.04	2.00	-	.147	.480	35.38	2.50	1.568	.133	.358	22.60
24.00	2.00	-	3.300	.480	35.38	4.29	-	2.143	.000	.00
25.00	2.00	-	3.597	.480	35.41	4.04	-1.080	2.336	.000	.00
Total		-	55.440	-	-		4.097	39.816	-	-
Average		-	-	.487	35.10		-	-	.108	5.47

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-8

Cost and Benefit Flow (1-lane)

(unit : million pesos/km)

Year	Cost			Benefit (Maintenance Cost and Traffic Cost Savings)					
	Initial Cost	Rehab. Cost	Total Cost (Dis'd)	Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.020	-	1.020 (1.020)	.005	.004	.329	.213	.118	(.118)
2	1.020	-	1.020 (.887)	.016	.011	1.028	.665	.369	(.321)
3	-	-	- (-)	.022	.014	1.429	.924	.513	(.388)
4	-	-	- (-)	.022	.014	1.489	.963	.534	(.351)
5	-	-	- (-)	.022	.014	1.552	1.004	.556	(.318)
6	-	-	- (-)	.022	.014	1.618	1.050	.576	(.286)
7	-	-	- (-)	.022	.014	1.687	1.126	.568	(.246)
8	-	-	- (-)	.022	.014	1.759	1.210	.556	(.209)
9	-	-	- (-)	.022	.014	1.833	1.302	.539	(.176)
10	-	-	- (-)	.022	.014	1.912	1.403	.516	(.147)
11	-	-	- (-)	.022	.014	1.993	1.515	.486	(.120)
12	-	-	- (-)	.022	.014	2.078	1.639	.447	(.096)
13	-	-	- (-)	.022	.014	2.167	1.783	.391	(.073)
14	-	-	- (-)	.022	.014	2.260	1.956	.312	(.051)
15	-	1.568	1.568 (.222)	.022	.014	2.357	1.717	.647	(.091)
16	-	-	- (-)	.022	.014	2.458	1.593	.872	(.107)
17	-	-	- (-)	.022	.014	2.564	1.662	.909	(.097)
18	-	-	- (-)	.022	.014	2.674	1.747	.935	(.087)
19	-	-	- (-)	.022	.014	2.790	1.912	.886	(.072)
20	-	-	- (-)	.022	.014	2.910	2.098	.820	(.058)
21	-	-	- (-)	.022	.014	3.036	2.309	.735	(.045)
22	-	-	- (-)	.022	.014	3.167	2.550	.625	(.033)
23	-	-	- (-)	.022	.014	3.304	2.865	.447	(.021)
24	-	1.568	1.568 (.063)	.022	.014	3.448	2.276	1.180	(.047)
25	-	-1.080	-1.080 (-.038)	.022	.014	3.597	2.336	1.269	(.044)
Total	2.040	2.057	4.097 (2.154)	.524	.342	55.440	39.816	15.806	(3.603)

Net Present Value : 1.449 million pesos/km
B/C Ratio : 1.67
Internal Rate of Return : 28.9 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.487	.108	.379
Delta-t(sec/km)	35.097	5.470	29.627

TABLE 24

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-9

Rehabilitation Method : 2-lane PCC Reconstruction (D=28.0/28.0 cm)
Traffic Loading Class : D/C
CBR of Subgrade : 8
AADT :

	First Year	Growth Rate
Car/Van	670	5.50 % p.a.
Jeepney	460	4.50 % p.a.
Tricycle	0	.00 % p.a.
Bus	300	4.50 % p.a.
Truck	710	3.50 % p.a.
Total	2140	

Serviceability,Construction Cost and Traffic Cost (2-lane)

Year	w/o Serviceability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Serviceability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	.658	.494	34.75	4.42	1.804	.425	.000	.00
2.00	2.00	-	2.056	.494	34.78	4.34	1.804	1.329	.000	.00
3.00	2.00	-	2.858	.493	34.81	4.25	-	1.847	.000	.00
4.00	2.00	-	2.979	.493	34.84	4.15	-	1.926	.000	.00
5.00	2.00	-	3.105	.492	34.86	4.04	-	2.008	.000	.00
6.00	2.00	-	3.236	.491	34.89	3.93	-	2.100	.003	.13
7.00	2.00	-	3.374	.491	34.92	3.81	-	2.253	.032	1.35
8.00	2.00	-	3.517	.490	34.95	3.68	-	2.420	.063	2.66
9.00	2.00	-	3.667	.489	34.97	3.53	-	2.604	.097	4.08
10.00	2.00	-	3.823	.489	35.00	3.38	-	2.806	.133	5.63
11.00	2.00	-	3.986	.488	35.03	3.21	-	3.030	.173	7.31
12.00	2.00	-	4.157	.488	35.06	3.02	-	3.278	.216	9.15
13.00	2.00	-	4.334	.487	35.08	2.81	-	3.567	.264	12.41
14.00	2.00	-	4.520	.486	35.11	2.58	-	3.911	.317	17.84
14.33	2.00	-	1.534	.486	35.14	2.50	1.803	1.374	.355	21.71
15.00	2.00	-	3.180	.486	35.14	3.90	-	2.060	.000	.00
16.00	2.00	-	4.916	.485	35.17	3.71	-	3.337	.047	1.98
17.00	2.00	-	5.128	.485	35.19	3.57	-	3.615	.087	3.68
18.00	2.00	-	5.348	.484	35.22	3.45	-	3.883	.119	5.03
19.00	2.00	-	5.579	.483	35.25	3.34	-	4.154	.147	6.23
20.00	2.00	-	5.820	.483	35.28	3.23	-	4.432	.173	7.32
21.00	2.00	-	6.071	.482	35.30	3.13	-	4.720	.197	8.35
22.00	2.00	-	6.334	.482	35.33	3.04	-	5.021	.220	9.33
23.00	2.00	-	6.608	.481	35.36	2.95	-	5.337	.242	10.36
24.00	2.00	-	6.895	.480	35.38	2.86	-	5.690	.263	12.64
25.00	2.00	-	7.195	.480	35.41	2.77	-.407	6.062	.284	14.88
Total		-	110.879	-	-		5.004	83.190	-	-
Average		-	-	.487	35.09		-	-	.132	6.23

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-9

Cost and Benefit Flow (2-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Cost: Total Cost	Cost: Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.804	-	1.804	(1.804)	.011	.007	.658	.425	.236	(.236)
2	1.804	-	1.804	(1.669)	.033	.021	2.056	1.329	.739	(.642)
3	-	-	-	(-)	.044	.029	2.858	1.847	1.026	(.775)
4	-	-	-	(-)	.044	.029	2.979	1.926	1.068	(.702)
5	-	-	-	(-)	.044	.029	3.105	2.008	1.112	(.636)
6	-	-	-	(-)	.044	.029	3.236	2.100	1.152	(.573)
7	-	-	-	(-)	.044	.029	3.374	2.253	1.136	(.491)
8	-	-	-	(-)	.044	.029	3.517	2.420	1.112	(.418)
9	-	-	-	(-)	.044	.029	3.667	2.604	1.078	(.352)
10	-	-	-	(-)	.044	.029	3.823	2.806	1.032	(.293)
11	-	-	-	(-)	.044	.029	3.986	3.030	.972	(.240)
12	-	-	-	(-)	.044	.029	4.157	3.278	.894	(.192)
13	-	-	-	(-)	.044	.029	4.334	3.567	.783	(.146)
14	-	-	-	(-)	.044	.029	4.520	3.911	.624	(.101)
15	-	1.803	1.803	(.255)	.044	.033	4.714	3.434	1.290	(.182)
16	-	-	-	(-)	.044	.035	4.916	3.337	1.588	(.195)
17	-	-	-	(-)	.044	.035	5.128	3.615	1.521	(.163)
18	-	-	-	(-)	.044	.035	5.348	3.883	1.474	(.137)
19	-	-	-	(-)	.044	.035	5.579	4.154	1.434	(.116)
20	-	-	-	(-)	.044	.035	5.820	4.432	1.396	(.098)
21	-	-	-	(-)	.044	.035	6.071	4.720	1.359	(.083)
22	-	-	-	(-)	.044	.035	6.334	5.021	1.321	(.070)
23	-	-	-	(-)	.044	.035	6.608	5.337	1.280	(.059)
24	-	-	-	(-)	.044	.035	6.895	5.690	1.213	(.049)
25	-	-.407	-.407	(-.014)	.044	.035	7.195	6.062	1.141	(.040)
Total	3.608	1.396	5.004	(3.613)	1.049	.755	110.879	83.190	27.983	(6.992)

Net Present Value : 3.379 million pesos/km
B/C Ratio : 1.94
Internal Rate of Return : 33.6 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.487	.132	.355
Delta-t(sec/km)	35.086	6.233	28.852

TABLE 25

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-10

Rehabilitation Method : 2-lane Flex. Overlay-Rg.Ex (h=10.0 cm)
Traffic Loading Class : D/C
CBR of Subgrade : 6
AADT :

	First Year	Growth Rate
Car/Van	670	5.50 % p.a.
Jeepney	460	4.50 % p.a.
Trcycle	0	.00 % p.a.
Bus	300	4.50 % p.a.
Truck	710	3.50 % p.a.
Total	2140	

Serviceability,Construction Cost and Traffic Cost (2-lane)

Year	w/o Service-ability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Service-ability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	.658	.494	34.75	3.78	1.137	.426	.003	.13
2.00	2.00	-	2.056	.494	34.78	3.53	1.137	1.443	.085	3.60
3.00	2.00	-	2.858	.493	34.81	3.32	-	2.109	.141	5.95
4.00	2.00	-	2.979	.493	34.84	3.13	-	2.293	.190	8.02
5.00	2.00	-	3.105	.492	34.86	2.95	-	2.482	.235	9.93
6.00	2.00	-	3.236	.491	34.89	2.78	-	2.694	.279	13.65
7.00	2.00	-	3.374	.491	34.92	2.61	-	2.920	.320	17.86
7.66	2.00	-	2.328	.490	34.95	2.50	1.038	2.078	.354	21.29
8.00	2.00	-	1.190	.490	34.95	3.95	-	.770	.000	.00
9.00	2.00	-	3.667	.489	34.97	3.60	-	2.506	.055	2.34
10.00	2.00	-	3.823	.489	35.00	3.35	-	2.795	.129	5.44
11.00	2.00	-	3.986	.488	35.03	3.12	-	3.066	.187	7.90
12.00	2.00	-	4.157	.488	35.06	2.92	-	3.338	.239	10.10
13.00	2.00	-	4.334	.487	35.08	2.72	-	3.645	.287	14.72
14.00	2.00	-	4.520	.486	35.11	2.54	-	3.968	.333	19.44
14.21	2.00	-	.977	.486	35.14	2.50	1.038	.879	.360	22.24
15.00	2.00	-	3.737	.486	35.14	3.79	-	2.426	.002	.08
16.00	2.00	-	4.916	.485	35.17	3.55	-	3.446	.081	3.42
17.00	2.00	-	5.128	.485	35.19	3.36	-	3.765	.132	5.58
18.00	2.00	-	5.348	.484	35.22	3.20	-	4.075	.174	7.36
19.00	2.00	-	5.579	.483	35.25	3.05	-	4.387	.211	8.94
20.00	2.00	-	5.820	.483	35.28	2.91	-	4.712	.245	10.64
21.00	2.00	-	6.071	.482	35.30	2.78	-	5.075	.278	14.03
22.00	2.00	-	6.334	.482	35.33	2.65	-	5.454	.309	17.30
23.00	2.00	-	6.608	.481	35.36	2.53	-	5.852	.339	20.47
23.24	2.00	-	1.658	.480	35.38	2.50	1.038	1.493	.357	22.42
24.00	2.00	-	5.237	.480	35.38	3.80	-	3.401	.000	.00
25.00	2.00	-	7.195	.480	35.41	3.59	-.878	5.017	.073	3.11
Total		-	110.879	-	-		4.511	86.512	-	-
Average		-	-	.487	35.09		-	-	.193	9.86

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-10

Cost and Benefit Flow (2-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Cost: Total Cost	Cost: Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.137	-	1.137	(1.137)	.011	.009	.658	.426	.234	(.234)
2	1.137	-	1.137	(.989)	.033	.026	2.056	1.443	.620	(.539)
3	-	-	-	(-)	.044	.035	2.858	2.109	.757	(.573)
4	-	-	-	(-)	.044	.035	2.979	2.293	.694	(.456)
5	-	-	-	(-)	.044	.035	3.105	2.482	.631	(.361)
6	-	-	-	(-)	.044	.035	3.236	2.694	.551	(.274)
7	-	-	-	(-)	.044	.035	3.374	2.920	.462	(.200)
8	-	1.038	1.038	(.390)	.044	.035	3.517	2.847	.679	(.255)
9	-	-	-	(-)	.044	.035	3.667	2.506	1.170	(.382)
10	-	-	-	(-)	.044	.035	3.823	2.795	1.037	(.295)
11	-	-	-	(-)	.044	.035	3.986	3.066	.929	(.230)
12	-	-	-	(-)	.044	.035	4.157	3.338	.827	(.178)
13	-	-	-	(-)	.044	.035	4.334	3.645	.698	(.130)
14	-	-	-	(-)	.044	.035	4.520	3.968	.561	(.091)
15	-	1.038	1.038	(.147)	.044	.035	4.714	3.305	1.418	(.200)
16	-	-	-	(-)	.044	.035	4.916	3.446	1.479	(.182)
17	-	-	-	(-)	.044	.035	5.128	3.765	1.371	(.146)
18	-	-	-	(-)	.044	.035	5.348	4.075	1.282	(.119)
19	-	-	-	(-)	.044	.035	5.579	4.387	1.200	(.097)
20	-	-	-	(-)	.044	.035	5.820	4.712	1.117	(.078)
21	-	-	-	(-)	.044	.035	6.071	5.075	1.005	(.061)
22	-	-	-	(-)	.044	.035	6.334	5.454	.889	(.047)
23	-	-	-	(-)	.044	.035	6.608	5.852	.765	(.035)
24	-	1.038	1.038	(.042)	.044	.035	6.895	4.893	2.010	(.081)
25	-	-.878	-.878	(-.031)	.044	.035	7.195	5.017	2.186	(.076)
Total	2.274	2.237	4.511	(2.674)	1.049	.844	110.879	86.512	24.572	(5.322)

Net Present Value : 2.648 million pesos/km
B/C Ratio : 1.99
Internal Rate of Return : 37.2 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.487	.193	.294
Delta-t(sec/km)	35.091	9.855	25.236

TABLE 26

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-11

Rehabilitation Method : 1-lane PCC Reconstruction (D=30.0 cm)
Traffic Loading Class : D
CBR of Subgrade : 4
AADT :

	First Year	Growth Rate
Car/Van	670	5.50 % p.a.
Jeepney	460	4.50 % p.a.
Tricycle	0	.00 % p.a.
Bus	300	4.50 % p.a.
Truck	710	3.50 % p.a.
Total	2140	

Serviceability, Construction Cost and Traffic Cost (1-lane)

Year	w/o Serviceability	w/o Const. Cost (Mp/km)	w/o Traffic Cost (Mp/km)	w/o Delta-I (km/km)	w/o Delta-t (sec/km)	with Serviceability	with Const. Cost (Mp/km)	with Traffic Cost (Mp/km)	with Delta-I (km/km)	with Delta-t (sec/km)
1.00	2.00	-	.329	.494	34.75	4.45	1.064	.213	.000	.00
2.00	2.00	-	1.028	.494	34.78	4.39	1.064	.665	.000	.00
3.00	2.00	-	1.429	.493	34.81	4.33	-	.924	.000	.00
4.00	2.00	-	1.489	.493	34.84	4.26	-	.963	.000	.00
5.00	2.00	-	1.552	.492	34.86	4.19	-	1.004	.000	.00
6.00	2.00	-	1.618	.491	34.89	4.11	-	1.047	.000	.00
7.00	2.00	-	1.687	.491	34.92	4.03	-	1.091	.000	.00
8.00	2.00	-	1.759	.490	34.95	3.95	-	1.141	.003	.11
9.00	2.00	-	1.833	.489	34.97	3.85	-	1.216	.025	1.04
10.00	2.00	-	1.912	.489	35.00	3.75	-	1.297	.048	2.03
11.00	2.00	-	1.993	.488	35.03	3.65	-	1.385	.073	3.09
12.00	2.00	-	2.078	.488	35.06	3.53	-	1.482	.100	4.24
13.00	2.00	-	2.167	.487	35.08	3.41	-	1.587	.129	5.47
14.00	2.00	-	2.260	.486	35.11	3.27	-	1.701	.161	6.82
15.00	2.00	-	2.357	.486	35.14	3.12	-	1.828	.195	8.27
16.00	2.00	-	2.458	.485	35.17	2.96	-	1.967	.233	9.86
17.00	2.00	-	2.564	.485	35.19	2.78	-	2.132	.274	13.52
18.00	2.00	-	2.674	.484	35.22	2.58	-	2.322	.319	18.22
18.38	2.00	-	1.071	.483	35.25	2.50	1.657	.959	.353	21.73
19.00	2.00	-	1.719	.483	35.25	4.43	-	1.115	.000	.00
20.00	2.00	-	2.910	.483	35.28	4.29	-	1.888	.000	.00
21.00	2.00	-	3.036	.482	35.30	4.15	-	1.970	.000	.00
22.00	2.00	-	3.167	.482	35.33	4.00	-	2.055	.000	.00
23.00	2.00	-	3.304	.481	35.36	3.82	-	2.192	.022	.92
24.00	2.00	-	3.448	.480	35.38	3.64	-	2.385	.065	2.75
25.00	2.00	-	3.597	.480	35.41	3.43	-.564	2.601	.112	4.77
Total		-	55.440	-	-		3.222	39.128	-	-
Average		-	-	.487	35.09		-	-	.081	3.96

Evaluation of Pavement Rehabilitation Method : Case Study Spot S-CS-11

Cost and Benefit Flow (1-lane) (unit : million pesos/km)

Year	Cost: Initial Cost	Cost: Rehab. Cost	Cost: Total Cost	Cost: Total Cost (Dis'd)	Benefit (Maintenance Cost and Traffic Cost Savings): Maintenance Cost w/o	Maintenance Cost with	Traffic Cost w/o	Traffic Cost with	Total Benefit	Total Benefit (Dis'd)
1	1.064	-	1.064	(1.064)	.005	.004	.329	.213	.118	(.118)
2	1.064	-	1.064	(.925)	.016	.011	1.028	.665	.369	(.321)
3	-	-	-	(-)	.022	.014	1.429	.924	.513	(.388)
4	-	-	-	(-)	.022	.014	1.489	.963	.534	(.351)
5	-	-	-	(-)	.022	.014	1.552	1.004	.556	(.318)
6	-	-	-	(-)	.022	.014	1.618	1.047	.579	(.288)
7	-	-	-	(-)	.022	.014	1.687	1.091	.603	(.261)
8	-	-	-	(-)	.022	.014	1.759	1.141	.625	(.235)
9	-	-	-	(-)	.022	.014	1.833	1.216	.625	(.204)
10	-	-	-	(-)	.022	.014	1.912	1.297	.622	(.177)
11	-	-	-	(-)	.022	.014	1.993	1.385	.615	(.152)
12	-	-	-	(-)	.022	.014	2.078	1.482	.604	(.130)
13	-	-	-	(-)	.022	.014	2.167	1.587	.588	(.110)
14	-	-	-	(-)	.022	.014	2.260	1.701	.566	(.092)
15	-	-	-	(-)	.022	.014	2.357	1.828	.537	(.076)
16	-	-	-	(-)	.022	.014	2.458	1.967	.499	(.061)
17	-	-	-	(-)	.022	.014	2.564	2.132	.439	(.047)
18	-	-	-	(-)	.022	.014	2.674	2.322	.360	(.033)
19	-	1.657	1.657	(.134)	.022	.014	2.790	2.073	.724	(.058)
20	-	-	-	(-)	.022	.014	2.910	1.888	1.030	(.072)
21	-	-	-	(-)	.022	.014	3.036	1.970	1.074	(.066)
22	-	-	-	(-)	.022	.014	3.167	2.055	1.119	(.059)
23	-	-	-	(-)	.022	.014	3.304	2.192	1.120	(.052)
24	-	-	-	(-)	.022	.014	3.448	2.385	1.070	(.043)
25	-	-.564	-.564	(-.020)	.022	.014	3.597	2.601	1.004	(.035)
Total	2.128	1.094	3.222	(2.104)	.524	.342	55.440	39.128	16.494	(3.748)

Net Present Value : 1.644 million pesos/km
B/C Ratio : 1.78
Internal Rate of Return : 29.1 %

Delta-I & Delta-t

	w/o	with	saving
Delta-I(km/km)	.487	.081	.406
Delta-t(sec/km)	35.090	3.955	31.135

APPENDICES FOR CHAPTER 17