

REPUBLIC OF KENYA



MINISTRY OF PUBLIC WORKS

DETAILED DESIGN STUDY

ON

THE NAIROBI BYPASS PROJECT

DETAILED CALCULATIONS

FOR QUANTITIES

VOL-2

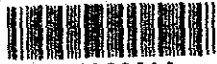
SEPTEMBER 1992

Japan International
Cooperation Agency

The Permanent Secretary
Ministry of Public Works
P.O. Box 30260
NAIROBI

The Chief Engineer (Roads)
Ministry of Public Works
P.O. Box 30260
NAIROBI

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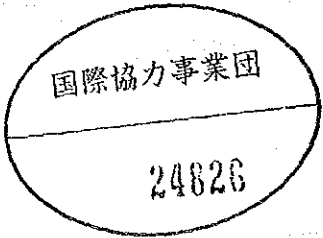
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3. Pavement

3.1 Summary

SCHEDULE OF PAVEMENT QUANTITIES

ITEMS	UNIT	Main Road	Slip Road	Approach Road	Service Road	TOTAL
Asphalt Concrete wearing Course	m ³	16,461.9	2,229.8	229.8	0.0	18,921.5
Asphalt Concrete Binder Course	m ³	32,923.8	3,430.3	459.6	0.0	36,813.7
Lean Concrete Base	m ³	90,341.9	11,151.5	1,020.1	0.0	102,513.5
Protecting and Curing Lean Concrete base	m ²	451,709.5	58,692.1	5,100.5	0.0	515,502.1
Graded Crushed Stone Base	m ³	46.9	98.3	2,011.1	39.0	2,195.3
Graded Crushed Stone Subbase	m ³	84,483.6	14,023.1	2,986.9	47.0	101,540.6
Graded Crushed Stone Shoulder	m ³	43,806.9	6,366.2	979.5	17.5	51,170.1
Tack Coat	m ²	823,094.2	68,701.5	9,192.0	0.0	900,987.7
0.6litre/m ²	litre	493,856.5	41,220.9	5,515.2	0.0	540,592.6
Prime Coat	m ²	411,547.1	55,744.2	4,596.0	0.0	471,887.3
1.0litre/m ²	litre	411,547.1	55,744.2	4,596.0	0.0	471,887.3
Double Surface Dressing	m ²	124,378.7	21,269.3	15,320.0	300.0	161,268.0
K1 60 First seal coat 1.3litre/m ²	litre	161,692.3	27,611.1	19,916.0	390.0	209,609.4
K1 60 Second seal coat 0.3litre/m ²	litre	37,313.6	6,371.8	4,596.0	90.0	48,371.4
10/14mm Precoated Chippings 0.0145m ³ /m ²	m ³	1,803.5	308.0	222.1	4.4	2,338.0
3/6mm Chippings 0.004m ³ /m ²	m ³	497.5	85.0	61.3	1.2	645.0
Single Surface Dressing	m ²	0.0	277.2	4,887.6	112.2	5,277.0
K1 60 Seal coat 0.6litre/m ²	litre	0.0	166.3	2,932.6	67.3	3,166.2
3/6mm Precoated Chippings 0.00529m ³ /m ²	m ³	0.0	1.5	25.9	0.6	28.0
Gravel Wearing Course	m ³	0.0	0.0	0.0	4,320.6	4,320.6
Filling	m ³	10,364.2	0.0	0.0	0.0	10,364.2
Grassing	m ²	26,728.9	3,561.4	1,690.0	0.0	31,980.3
Topsoil	m ³	0.0	1,975.4	845.0	0.0	2,820.4

3.2 Main Road

SCHEDULE OF PAVEMENT QUANTITIES FOR MAIN ROAD

ITEMS	UNIT	Main	Acceleration & Deceleration of					Bus stop (1:2)	Bus stop (1:1.5)	TOTAL
			Ngong Road Junction	Dagoretti Forest Junction	Thogoto Junction	Kikuyu Town Junction				
Asphalt Concrete wearing Course	m3	16,036.1	84.7	95.9	84.7	77.7	51.8	31.1	16,461.9	
Asphalt Concrete Binder Course	m3	32,072.1	169.4	191.8	169.4	155.4	103.6	62.2	32,923.8	
Lean Concrete Base	m3	88,003.2	469.2	531.0	469.2	430.6	274.1	164.5	90,341.9	
Graded Crushed Stone Base	m3						29.6	17.3	46.9	
Graded Crushed Stone Subbase	m3	81,877.1	535.0	593.8	529.7	493.7	286.6	167.7	84,483.6	
Graded Crushed Stone Shoulder	m3	42,485.7	291.5	318.8	286.8	270.3	98.5	55.3	43,806.9	
Tack Coat	m2	801,802.6	4,234.4	4,794.4	4,234.4	3,884.4	2,590.0	1,554.0	823,094.2	
Prime Coat	m2	400,901.3	2,117.2	2,397.2	2,117.2	1,942.2	1,295.0	777.0	411,547.1	
Double Surface Dressing	m2	119,570.2	858.6	966.6	858.6	791.1	833.5	500.1	124,378.7	
Single Surface Dressing	m2								0.0	
Gravel Wearing Course	m3								0.0	
Filling	m3	9,750.8					398.4	215.0	10,364.2	
Grassing	m2	26,728.9							26,728.9	

COMPUTATION OF QUANTITIES FOR PAVEMENT

MAIN ROAD

1. ASPHALT CONCRETE WEARING COURSE

$400,901.32\text{m}^2 \times 0.040 = 16,036.05\text{m}^3$

2. ASPHALT CONCRETE BINDER COURE

$400,901.32 \times 0.080 = 32,072.11\text{m}^3$

3. LEAN CONCRETE BASE

Main $400,901.32 \text{ m}^2 \times 0.200 = 80,180.26\text{m}^3$

Shoulder Type-1 $45,295.90 \text{ m} \times 0.072 = 3,261.30\text{m}^3$

Shoulder Type-2 $7,766.10 \text{ m} \times 0.072 = 559.16\text{m}^3$

Shoulder Type-3 $140.00 \text{ m} \times 0.070 = 9.8\text{m}^3$

Shoulder Type-4 $10,760.00 \text{ m} \times 0.072 = 774.72\text{m}^3$

Shoulder Type-13 $14,995.90 \text{ m} \times 0.070 = 1,049.71\text{m}^3$

Shoulder Type-14 $14,995.90 \text{ m} \times 0.070 = 1,049.71\text{m}^3$

Shoulder Type-15 $256.00 \text{ m} \times -$

Shoulder Type-25 $7,822.00 \text{ m} \times 0.143 = 1,118.55\text{m}^3$

Total 88,003.21m³

4. GRADED CRUSHED STONE BASE

5. GRADED CRUSHED STONE SUBBASE

Main $400,901.32 \text{ m}^2 \times 0.150 = 60,135.20\text{m}^3$

Shoulder Type-1 $45,295.90 \text{ m} \times 0.354 = 16,034.75\text{m}^3$

Shoulder Type-2 $7,766.10 \text{ m} \times 0.320 = 2,485.15\text{m}^3$

Shoulder Type-3 $140.00 \text{ m} \times 0.079 = 11.06\text{m}^3$

Shoulder Type-4 $10,760.00 \text{ m} \times 0.279 = 3,002.04\text{m}^3$

Shoulder Type-13 $14,995.90 \text{ m} \times 0.209 = 3,134.14\text{m}^3$

Shoulder Type-14 $14,995.90 \text{ m} \times 0.229 = 3,434.06\text{m}^3$

Shoulder Type-15 $256.00 \text{ m} \times 0.045 = 11.52\text{m}^3$

Shoulder Type-25 $7,822.00 \text{ m} \times 0.445 = 3,480.79\text{m}^3$

Deduction of Subbase volume on Hard Rock $- 9,851.61\text{m}^3$

Total 81,877.1m³

6. GRADED CRUSHED STONE SHOULDER

Shoulder Type-1 $45,295.90 \text{ m} \times 0.469 = 21,243.78\text{m}^3$

Shoulder Type-2 $7,766.10 \text{ m} \times 0.439 = 3,409.32\text{m}^3$

Shoulder Type-3 $140.00 \text{ m} \times -$

Shoulder Type-4 $10,760.00 \text{ m} \times 0.319 = 3,432.44\text{m}^3$

Shoulder Type-13 $14,995.90 \text{ m} \times 0.261 = 3,913.93\text{m}^3$

Shoulder Type-14 $14,995.90 \text{ m} \times 0.210 = 3,149.14\text{m}^3$

Shoulder Type-15 $256.00 \text{ m} \times -$

Shoulder Type-25 $7,822.00 \text{ m} \times 0.938 = 7,337.04\text{m}^3$

Total 42,485.65m³

7. TACK COAT

400,901.32m²

8. PRIME COAT

400,901.32m²

9. FILLING

Shoulder Type-13	14,995.90 m x 0.242 = 3,629.01m ³		
Shoulder Type-14	14,995.90 m x 0.113 = 1,694.54m ³		
Shoulder Type-25	7,822.00 m x 0.566 = 4,427.25m ³	Total	9,750.80m ³

10. DOUBLE SURFACE DRESSING

Shoulder Type-1	45,295.90 m x 1.350 = 61,149.47m ²		
Shoulder Type-2	7,766.10 m x 1.350 = 10,484.24m ²		
Shoulder Type-3	140.00 -		
Shoulder Type-4	10,760.00 m x 0.850 = 9,146.00m ²		
Shoulder Type-13	14,995.90 m x 0.850 = 12,746.52m ²		
Shoulder Type-14	14,995.90 m x 0.850 = 12,746.52m ²		
Shoulder Type-15	256.00 -		
Shoulder Type-25	7,822.00 m x 1.700 = 13,297.40m ²	Total	119,570.15m ²

11. GRASSING

Shoulder Type-13	14,995.90 m x 0.75 = 11,246.93m ²		
Shoulder Type-14	14,995.90 m x 0.25 = 3,748.98m ²		
Shoulder Type-25	7,822.00 m x 1.50 = 11,733.00m ²	Total	26,728.91m ²

CALCULATION OF DEDUCTION FOR SUBBASE ON HARD ROCK

ASSUMED HARD ROCK SECTION

SECTION	LENGTH (m)
7 + 890 ~ 8 + 150	260
8 + 555 ~ 8 + 840	285
10 + 345 ~ 11 + 160	815
11 + 340 ~ 11 + 650	310
12 + 100 ~ 12 + 410	310
15 + 755 ~ 16 + 60	305
21 + 100 ~ 21 + 580	480
21 + 940 ~ 22 + 210	270
TOTAL	3,035m

SUBBASE VOLUME

$$3,035\text{m} \times 7.0\text{m} \times 2 \times 0.150 = 6,373.50\text{m}^3$$

SHOULDER TYPE-1

$$3,035\text{m} \times 0.354 \times 2 = 2,148.78\text{m}^3$$

SHOULDER TYPE-13,14

$$3,035\text{m} \times (0.209 + 0.229) = 1,329.33\text{m}^3$$

TOTAL 9,851.61m³

SCHEDULE OF PAVING AREA AND SHOULDER LENGTH

MAIN ROAD

DESCRIPTION	UNIT	RIGHT SIDE	CENTRAL RESERVE	LEFT SIDE	TOTAL
PAVING AREA	m ²	201,707.95		199,193.37	400,901.32
SHOULDER					
TYPE-1	m	22,847.00		22,448.90	45,295.90
TYPE-2	m	3,659.00		4,107.10	7,766.10
TYPE-3	m	80.00		60.00	140.00
TYPE-4	m		10,760.00		10,760.00
TYPE-13	m		14,995.90		14,995.90
TYPE-14	m		14,995.90		14,995.90
TYPE-15	m	128.00		128.00	256.00
TYPE-25	m		7,822.00		7,822.00

COMPUTATION OF PAVING AREA
 MAIN ROAD (RIGHT SIDE)

STATION	DISTANCE (m)	WIDTH (m)	AVE. WIDTH (m)	AREA (m ²)	REMARKS
0 + 0.000		3.500			
0 + 20.000	20.000	3.500	3.500	70.000	
0 + 60.000	40.000	7.000	5.250	210.000	
0 + 207.733	147.733	7.000	7.000	1,034.131	
0 + 230.000	22.267	9.109	8.055	179.350	
0 + 244.687	14.687	10.867	9.988	146.694	
0 + 244.687	0.000	5.367	8.117	0.000	
0 + 254.687	10.000	5.617	5.492	54.920	
0 + 254.687	0.000	4.117	4.867	0.000	
0 + 270.000	15.313	4.500	4.309	65.976	
0 + 270.000	0.000	3.500	4.000	0.000	
0 + 297.565	27.565	3.500	3.500	96.478	
0 + 297.565	0.000	5.000	4.250	0.000	
0 + 307.565	10.000	5.000	5.000	50.000	
0 + 307.565	0.000	10.500	7.750	0.000	
0 + 350.615	43.050	7.000	8.750	376.688	
0 + 368.600	17.985	7.000	7.000	125.895	
0 + 426.600	58.000	7.000			BRIDGE
0 + 457.040	30.440	7.000	7.000	213.080	
0 + 516.072	59.032	14.000	10.500	619.836	
0 + 516.072	0.000	8.500	11.250	0.000	
0 + 526.072	10.000	8.500	8.500	85.000	
0 + 526.072	0.000	7.000	7.750	0.000	
0 + 601.720	75.648	7.000	7.000	529.536	
0 + 601.720	0.000	8.500	7.750	0.000	
0 + 611.720	10.000	8.500	8.500	85.000	
0 + 611.720	0.000	14.000	11.250	0.000	
0 + 631.092	19.372	10.500	12.250	237.307	
0 + 660.000	28.908	10.500	10.500	303.534	
0 + 700.000	40.000	7.000	8.750	350.000	
0 + 800.000	100.000	7.000	7.000	700.000	
1 + 80.000	280.000	7.000	7.000	1,960.000	
1 + 200.000	120.000	7.000	7.000	840.000	
1 + 261.000	61.000	7.000	7.000	427.000	
5 + 900.000	4,639.000	7.000	7.000	32,473.000	
6 + 230.000	330.000	7.000	7.000	2,310.000	
6 + 280.000	50.000	10.500	8.750	437.500	
6 + 300.000	20.000	10.500	10.500	210.000	
6 + 363.556	63.556	10.500	10.500	667.338	
6 + 462.691	99.135	14.000	12.250	1,214.404	
6 + 462.691	0.000	8.500	11.250	0.000	
6 + 472.691	10.000	8.500	8.500	85.000	
6 + 472.691	0.000	7.000	7.750	0.000	

COMPUTATION OF PAVING AREA
MAIN ROAD (RIGHT SIDE)

STATION	DISTANCE (m)	WIDTH (m)	AVE. WIDTH (m)	AREA (m ²)	REMARKS
6 + 675.690	202.999	7.000	7.000	1,420.993	
6 + 714.690	39.000	7.000			BRIDGE
6 + 959.957	245.267	7.000	7.000	1,716.869	
6 + 959.957	0.000	8.500	7.750	0.000	
6 + 969.967	10.010	8.500	8.500	85.085	
6 + 969.967	0.000	14.000	11.250	0.000	
7 + 69.957	99.990	7.000	10.500	1,049.895	
7 + 300.000	230.043	7.000	7.000	1,610.301	
14 + 0.000	6,700.000	7.000	7.000	46,900.000	
15 + 384.000	1,568.875	7.000	7.000	10,982.125	
15 + 384.000	0.000	8.500	7.750	0.000	
15 + 416.000	32.000	8.500	8.500	272.000	
15 + 416.000	0.000	7.000	7.750	0.000	
15 + 800.000	384.000	7.000	7.000	2,688.000	
15 + 800.000	0.000	7.000	7.000	0.000	
20 + 744.000	4,944.000	7.000	7.000	34,608.000	
20 + 744.000	0.000	8.500	7.750	0.000	
20 + 776.000	32.000	8.500	8.500	272.000	
20 + 776.000	0.000	7.000	7.750	0.000	
21 + 0.000	224.000	7.000	7.000	1,568.000	
23 + 404.000	2,404.000	7.000	7.000	16,828.000	
23 + 404.000	0.000	8.500	7.750	0.000	
23 + 436.000	32.000	8.500	8.500	272.000	
23 + 436.000	0.000	7.000	7.750	0.000	
26 + 584.000	3,148.000	7.000	7.000	22,036.000	
26 + 584.000	0.000	8.500	7.750	0.000	
26 + 616.000	32.000	8.500	8.500	272.000	
26 + 616.000	0.000	7.000	7.750	0.000	
28 + 110.000	1,494.000	7.000	7.000	10,458.000	
28 + 110.000	0.000	8.500	7.750	0.000	
28 + 120.000	10.000	8.500	8.500	85.000	
28 + 120.000	0.000	14.000	11.250	0.000	
28 + 230.000	110.000	7.000	10.500	1,155.000	
28 + 298.146	68.146	7.000	7.000	477.022	
28 + 380.000	81.854	7.000	7.000	572.978	
28 + 380.000	0.000	8.750	7.875	0.000	
28 + 416.085	36.085	3.500	6.125	221.021	
TOTAL	28600.96			201707.9537	

COMPUTATION OF PAVING AREA

MAIN ROAD (LEFT SIDE)

STATION	DISTANCE (m)	WIDTH (m)	AVE. WIDTH (m)	AREA (m ²)	REMARKS
0 + 0.000		3.500			
0 + 101.588	101.588	3.500	3.500	355.558	
0 + 201.588	100.000	10.500	7.000	700.000	
0 + 201.588	0.000	5.000	7.750	0.000	
0 + 211.588	10.000	5.000	5.000	50.000	
0 + 211.588	0.000	3.500	4.250	0.000	
0 + 230.000	18.412	3.500	3.500	64.442	
0 + 270.000	40.000	4.500	4.000	160.000	
0 + 270.000	0.000	3.500	4.000	0.000	
0 + 368.600	98.600	3.500	3.500	345.100	
0 + 426.600	58.000	3.500			BRIDGE
0 + 440.000	13.400	3.500	3.500	46.900	
0 + 480.000	40.000	7.000	5.250	210.000	
0 + 505.849	25.849	7.000	7.000	180.943	
0 + 537.587	31.738	10.500	8.750	277.708	
0 + 537.587	0.000	5.000	7.750	0.000	
0 + 547.587	10.000	5.000	5.000	50.000	
0 + 547.587	0.000	3.500	4.250	0.000	
0 + 682.078	134.491	3.500	3.500	470.719	
0 + 682.078	0.000	5.000	4.250	0.000	
0 + 692.078	10.000	5.000	5.000	50.000	
0 + 692.078	0.000	10.500	7.750	0.000	
0 + 760.000	67.922	7.000	8.750	594.318	
0 + 800.000	40.000	7.000	7.000	280.000	
6 + 299.957	5,499.957	7.000	7.000	38,499.699	
6 + 429.957	130.000	14.000	10.500	1,365.000	
6 + 429.957	0.000	8.500	11.250	0.000	
6 + 439.957	10.000	8.500	8.500	85.000	
6 + 439.957	0.000	7.000	7.750	0.000	
6 + 675.690	235.733	7.000	7.000	1,650.131	
6 + 714.690	39.000	7.000			BRIDGE
6 + 959.957	245.267	7.000	7.000	1,716.869	
6 + 959.957	0.000	8.500	7.750	0.000	
6 + 969.957	10.000	8.500	8.500	85.000	
6 + 969.957	0.000	14.000	11.250	0.000	
7 + 42.235	72.278	10.500	12.250	885.405	
7 + 130.000	87.765	10.500	10.500	921.533	
7 + 170.000	40.000	7.000	8.750	350.000	
7 + 300.000	130.000	7.000	7.000	910.000	
14 + 0.000	6,700.000	7.000	7.000	46,900.000	
15 + 424.000	1,608.875	7.000	7.000	11,262.125	
15 + 424.000	0.000	8.500	7.750	0.000	
15 + 456.000	32.000	8.500	8.500	272.000	

COMPUTATION OF PAVING AREA

MAIN ROAD (LEFT SIDE)

STATION	DISTANCE (m)	WIDTH (m)	AVE. WIDTH (m)	AREA (m ²)	REMARKS
15 + 456.000	0.000	7.000	7.750	0.000	
20 + 624.000	5,168.000	7.000	7.000	36,176.000	
20 + 624.000	0.000	8.500	7.750	0.000	
20 + 656.000	32.000	8.500	8.500	272.000	
20 + 656.000	0.000	7.000	7.750	0.000	
21 + 0.000	344.000	7.000	7.000	2,408.000	
23 + 404.000	2,404.000	7.000	7.000	16,828.000	
23 + 404.000	0.000	8.500	7.750	0.000	
23 + 436.000	32.000	8.500	8.500	272.000	
23 + 436.000	0.000	7.000	7.750	0.000	
27 + 254.000	3,818.000	7.000	7.000	26,726.000	
27 + 254.000	0.000	8.500	7.750	0.000	
27 + 286.000	32.000	8.500	8.500	272.000	
27 + 286.000	0.000	7.000	7.750	0.000	
28 + 160.738	874.738	7.000	7.000	6,123.166	
28 + 244.064	83.326	10.500	8.750	729.102	
28 + 244.064	0.000	5.000	7.750	0.000	
28 + 254.064	10.000	5.000	5.000	50.000	
28 + 254.064	0.000	3.500	4.250	0.000	
28 + 380.000	125.936	3.500	3.500	440.776	
28 + 380.000	0.000	5.250	4.375	0.000	
28 + 416.085	36.085	3.500	4.375	157.872	
TOTAL	28,600.960			199,193.365	

COMPUTATION OF SHOULDER LENGTH
MAIN ROAD (RIGHT SIDE)

SECTION	SHOULDER LENGTH				REMARKS
	TYPE-1 (m)	TYPE-2 (m)	TYPE-3 (m)	TYPE-15 (m)	
0 + 0.000 ~ 0 + 224.687	224.7				
0 + 224.687 ~ 0 + 234.687			10.0		
0 + 234.687 ~ 0 + 297.565		62.9			
0 + 297.565 ~ 0 + 307.565			10.0		
0 + 307.565 ~ 0 + 368.600		61.0			
0 + 368.600 ~ 0 + 426.600					Bridge
0 + 426.600 ~ 0 + 516.072		89.5			
0 + 516.072 ~ 0 + 526.072			10.0		
0 + 526.072 ~ 0 + 601.720		75.6			
0 + 601.720 ~ 0 + 611.720			10.0		
0 + 611.720 ~ 0 + 660.000		48.3			
0 + 660.000 ~ 0 + 800.000	140.0				
0 + 800.000 ~ 1 + 200.000	400.0				
1 + 200.000 ~ 1 + 261.000					Busstop(1:2)
1 + 261.000 ~ 6 + 200.000	4,939.0				
6 + 200.000 ~ 6 + 240.000	40.0				
6 + 240.000 ~ 6 + 462.691		222.7			
6 + 462.691 ~ 6 + 472.691			10.0		
6 + 472.691 ~ 6 + 540.000	67.3				
6 + 540.000 ~ 6 + 675.690		135.7			
6 + 675.690 ~ 6 + 714.690					Bridge
6 + 714.690 ~ 6 + 959.957		245.3			
6 + 959.957 ~ 6 + 969.957			10.0		
6 + 969.957 ~ 7 + 100.000		130.0			
7 + 100.000 ~ 7 + 300.000	200.0				
7 + 300.000 ~ 7 + 361.000					Busstop(1:2)
7 + 361.000 ~ 8 + 240.000	879.0				
8 + 240.000 ~ 8 + 380.000		140.0			
8 + 380.000 ~ 8 + 960.000	580.0				
8 + 960.000 ~ 9 + 40.000		80.0			
9 + 40.000 ~ 9 + 280.000	240.0				
9 + 280.000 ~ 9 + 780.000		500.0			
9 + 780.000 ~ 14 + 0.000	4,220.0				
14 + 0.000 ~ 14 + 100.000		100.0			
14 + 100.000 ~ 14 + 900.000	800.0				
14 + 900.000 ~ 14 + 980.000		80.0			
14 + 980.000 ~ 15 + 354.875	374.9				
15 + 354.875 ~ 15 + 384.000					Acce.Lane
15 + 384.000 ~ 15 + 416.000				32.0	
15 + 416.000 ~ 15 + 520.000					Dece.Lane
15 + 520.000 ~ 15 + 640.000		120.0			
15 + 640.000 ~ 15 + 701.000					Busstop(1:2)

COMPUTATION OF SHOULDER LENGTH

MAIN ROAD (RIGHT SIDE)

SECTION	SHOULDER LENGTH				REMARKS
	TYPE-1 (m)	TYPE-2 (m)	TYPE-3 (m)	TYPE-15 (m)	
15 + 701.000 ~ 15 + 800.000	99.0				
15 + 800.000 ~ 18 + 320.000	2,520.0				
18 + 320.000 ~ 18 + 420.000		100.0			
18 + 420.000 ~ 18 + 460.000	40.0				
18 + 460.000 ~ 18 + 521.000					Busstop(1:2)
18 + 521.000 ~ 19 + 40.000	519.0				
19 + 40.000 ~ 19 + 200.000		160.0			
19 + 200.000 ~ 19 + 440.000	240.0				
19 + 440.000 ~ 19 + 700.000		260.0			
19 + 700.000 ~ 20 + 530.000	830.0				
20 + 530.000 ~ 20 + 744.000					Acce.Lane
20 + 744.000 ~ 20 + 776.000				32.0	
20 + 776.000 ~ 20 + 910.000					Dece.Lane
20 + 910.000 ~ 20 + 980.000		70.0			
20 + 980.000 ~ 21 + 0.000					Busstop(1.5)
21 + 0.000 ~ 21 + 41.000					Busstop(1.5)
21 + 41.000 ~ 21 + 60.000		19.0			
21 + 60.000 ~ 22 + 880.000	1,820.0				
22 + 880.000 ~ 23 + 80.000		200.0			
23 + 80.000 ~ 23 + 141.000					Busstop(1.5)
23 + 141.000 ~ 23 + 190.000		49.0			
23 + 190.000 ~ 23 + 404.000					Acce.Lane
23 + 404.000 ~ 23 + 436.000				32.0	
23 + 436.000 ~ 23 + 540.000					Dece.Lane
23 + 540.000 ~ 23 + 660.000	120.0				
23 + 660.000 ~ 23 + 880.000		220.0			
23 + 880.000 ~ 24 + 400.000	520.0				
24 + 400.000 ~ 24 + 460.000		60.0			
24 + 460.000 ~ 24 + 920.000	460.0				
24 + 920.000 ~ 25 + 60.000		140.0			
25 + 60.000 ~ 25 + 100.000	40.0				
25 + 100.000 ~ 25 + 161.000					Busstop(1:2)
25 + 161.000 ~ 25 + 400.000	239.0				
25 + 400.000 ~ 25 + 460.000		60.0			
25 + 460.000 ~ 26 + 220.000	760.0				
26 + 220.000 ~ 26 + 370.000		150.0			
26 + 370.000 ~ 26 + 584.000					Acce.Lane
26 + 584.000 ~ 26 + 616.000				32.0	
26 + 616.000 ~ 26 + 720.000					Dece.Lane
26 + 720.000 ~ 27 + 60.000	340.0				
27 + 60.000 ~ 27 + 121.000					Busstop(1:2)
27 + 121.000 ~ 28 + 0.000	879.0				

COMPUTATION OF SHOULDER LENGTH
 MAIN ROAD (RIGHT SIDE)

SECTION	SHOULDER LENGTH				REMARKS
	TYPE-1 (m)	TYPE-2 (m)	TYPE-3 (m)	TYPE-15 (m)	
28 + 0.000 ~ 28 + 110.000	110.0				
28 + 110.000 ~ 28 + 120.000			10.0		
28 + 120.000 ~ 28 + 140.000	20.0				
28 + 140.000 ~ 28 + 220.000		80.0			
28 + 220.000 ~ 28 + 330.000	110.0				
28 + 330.000 ~ 28 + 340.000			10.0		
28 + 340.000 ~ 28 + 416.085	76.1				
TOTAL	22,847.0	3,659.0	80.0	128.0	

COMPUTATION OF SHOULDER LENGTH
MAIN ROAD (LEFT SIDE)

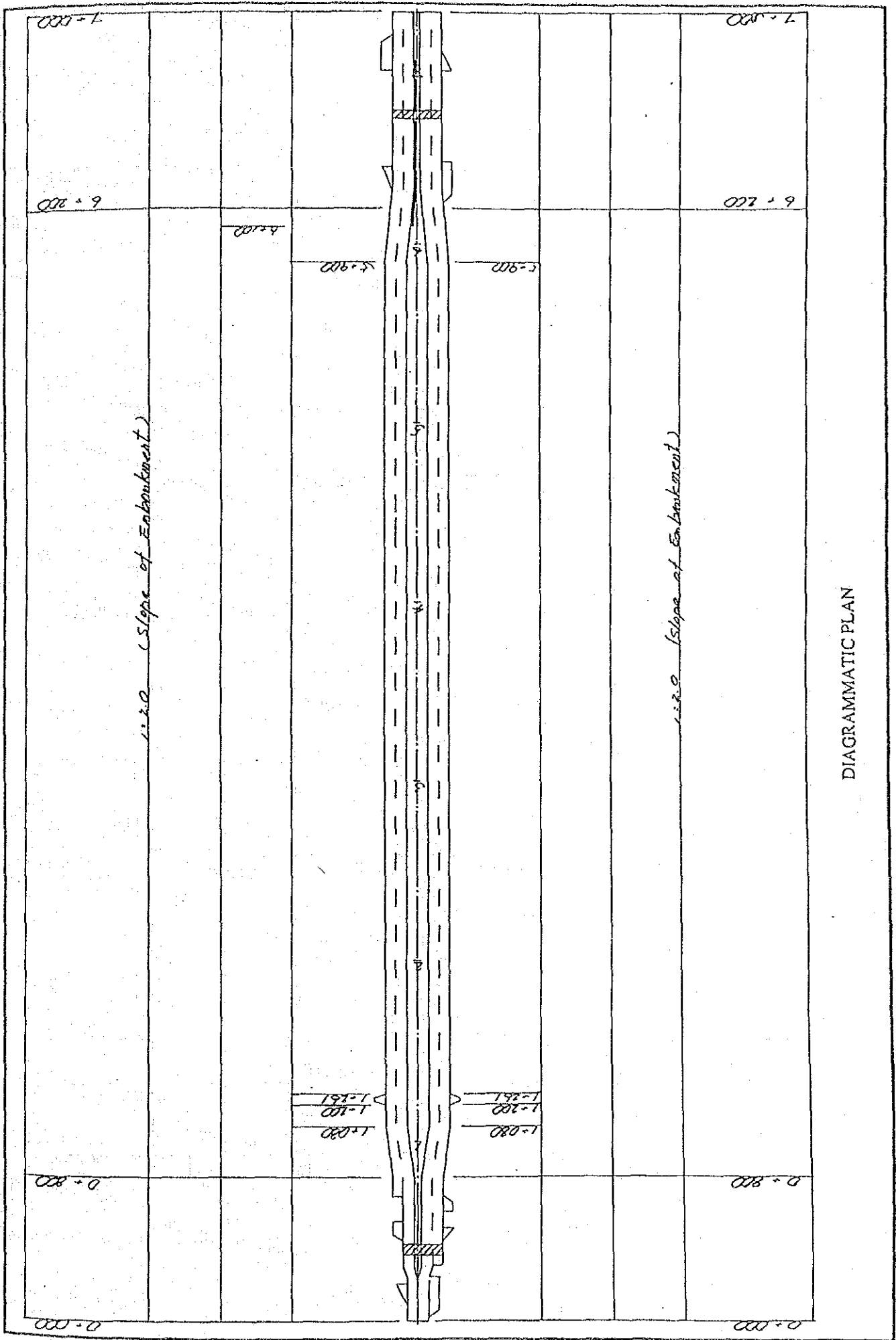
SECTION	SHOULDER LENGTH				REMARKS
	TYPE-1 (m)	TYPE-2 (m)	TYPE-3 (m)	TYPE-15 (m)	
0 + 0.000 ~ 0 + 201.588	201.6				
0 + 201.588 ~ 0 + 211.588			10.0		
0 + 211.588 ~ 0 + 240.000	28.4				
0 + 240.000 ~ 0 + 368.600		128.6			
0 + 368.600 ~ 0 + 426.600					Bridge
0 + 426.600 ~ 0 + 537.587		111.0			
0 + 537.587 ~ 0 + 547.587			10.0		
0 + 547.587 ~ 0 + 682.078		134.5			
0 + 682.078 ~ 0 + 692.078			10.0		
0 + 692.078 ~ 0 + 800.000	107.9				
0 + 800.000 ~ 1 + 200.000	400.0				
1 + 200.000 ~ 1 + 261.000					Busstop(1:2)
1 + 261.000 ~ 6 + 200.000	4,939.0				
6 + 200.000 ~ 6 + 429.957	230.0				
6 + 429.957 ~ 6 + 439.957			10.0		
6 + 439.957 ~ 6 + 540.000	100.0				
6 + 540.000 ~ 6 + 675.690		135.7			
6 + 675.690 ~ 6 + 714.690					Bridge
6 + 714.690 ~ 6 + 860.000		145.3			
6 + 860.000 ~ 6 + 960.000	100.0				
6 + 960.000 ~ 6 + 969.957			10.0		
6 + 969.957 ~ 7 + 60.000		90.0			
7 + 60.000 ~ 7 + 300.000	240.0				
7 + 300.000 ~ 7 + 361.000					Busstop(1:2)
7 + 361.000 ~ 8 + 920.000	1,559.0				
8 + 920.000 ~ 9 + 40.000		120.0			
9 + 40.000 ~ 13 + 820.000	4,780.0				
13 + 820.000 ~ 14 + 0.000	180.0				
14 + 0.000 ~ 14 + 120.000		120.0			
14 + 120.000 ~ 14 + 900.000	780.0				
14 + 900.000 ~ 15 + 15.000		115.0			
15 + 15.000 ~ 15 + 320.000	489.9				
15 + 320.000 ~ 15 + 424.000					Dece.Lane
15 + 424.000 ~ 15 + 456.000				32.0	
15 + 456.000 ~ 15 + 670.000					Acce.Lane
15 + 670.000 ~ 15 + 699.000		29.0			
15 + 699.000 ~ 15 + 760.000					Busstop(1:2)
15 + 760.000 ~ 15 + 800.000	40.0				
15 + 800.000 ~ 17 + 320.000	1,520.0				
17 + 320.000 ~ 17 + 540.000		220.0			
17 + 540.000 ~ 18 + 40.000	500.0				
18 + 40.000 ~ 18 + 460.000		420.0			

COMPUTATION OF SHOULDER LENGTH
MAIN ROAD (LEFT SIDE)

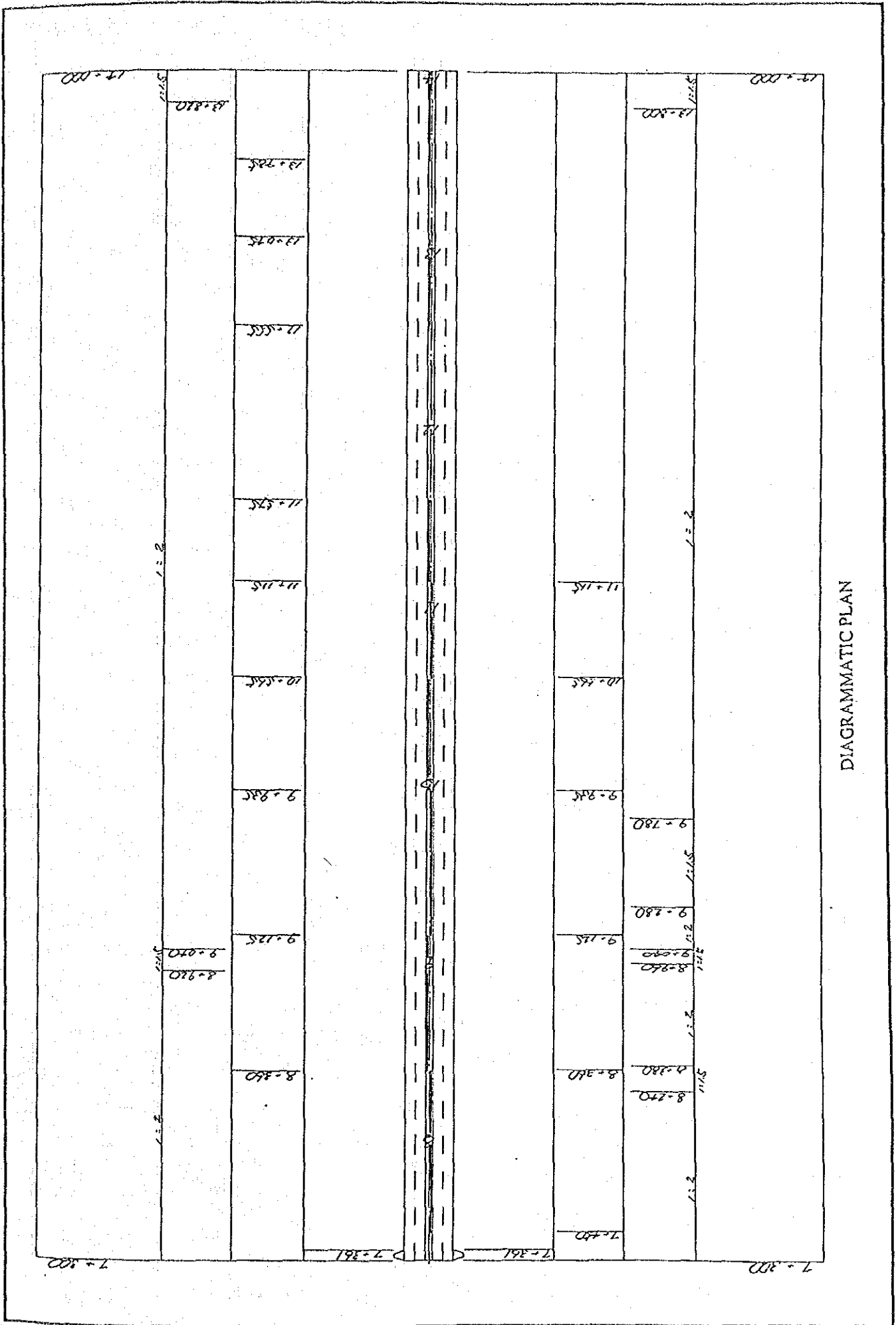
SECTION	SHOULDER LENGTH				REMARKS
	TYPE-1 (m)	TYPE-2 (m)	TYPE-3 (m)	TYPE-15 (m)	
18 + 460.000 ~ 18 + 521.000					Busstop(1.5)
18 + 521.000 ~ 18 + 540.000		19.0			
18 + 540.000 ~ 19 + 0.000	460.0				
19 + 0.000 ~ 19 + 220.000		220.0			
19 + 220.000 ~ 19 + 400.000	180.0				
19 + 400.000 ~ 19 + 740.000		340.0			
19 + 740.000 ~ 20 + 180.000	440.0				
20 + 180.000 ~ 20 + 320.000		140.0			
20 + 320.000 ~ 20 + 520.000	200.0				
20 + 520.000 ~ 20 + 624.000					Dece.Lane
20 + 624.000 ~ 20 + 656.000				32.0	
20 + 656.000 ~ 20 + 920.000					Acce.Lane
20 + 920.000 ~ 20 + 980.000		60.0			
20 + 980.000 ~ 21 + 0.000					Busstop
21 + 0.000 ~ 21 + 41.000					Busstop(1.5)
21 + 41.000 ~ 22 + 860.000	1,819.0				
22 + 860.000 ~ 23 + 200.000		340.0			
23 + 200.000 ~ 23 + 261.000					Busstop(1.5)
23 + 261.000 ~ 23 + 300.000		39.0			
23 + 300.000 ~ 23 + 404.000					Dece.Lane
23 + 404.000 ~ 23 + 436.000				32.0	
23 + 436.000 ~ 23 + 650.000					Acce.Lane
23 + 650.000 ~ 23 + 880.000		230.0			
23 + 880.000 ~ 24 + 380.000	500.0				
24 + 380.000 ~ 24 + 460.000		80.0			
24 + 460.000 ~ 24 + 800.000	340.0				
24 + 800.000 ~ 25 + 80.000		280.0			
25 + 80.000 ~ 25 + 100.000	20.0				
25 + 100.000 ~ 25 + 161.000					Busstop(1:2)
25 + 161.000 ~ 25 + 420.000	259.0				
25 + 420.000 ~ 25 + 480.000		60.0			
25 + 480.000 ~ 26 + 240.000	760.0				
26 + 240.000 ~ 26 + 520.000		280.0			
26 + 520.000 ~ 27 + 60.000	540.0				
27 + 60.000 ~ 27 + 121.000					Busstop(1:2)
27 + 121.000 ~ 27 + 150.000	29.0				
27 + 150.000 ~ 27 + 254.000					Dece.Lane
27 + 254.000 ~ 27 + 286.000				32.0	
27 + 286.000 ~ 27 + 450.000					Acce.Lane
27 + 450.000 ~ 28 + 0.000	550.0				
28 + 0.000 ~ 28 + 80.000	80.0				
28 + 80.000 ~ 28 + 244.064		164.1			

COMPUTATION OF SHOULDER LENGTH
 MAIN ROAD (LEFT SIDE)

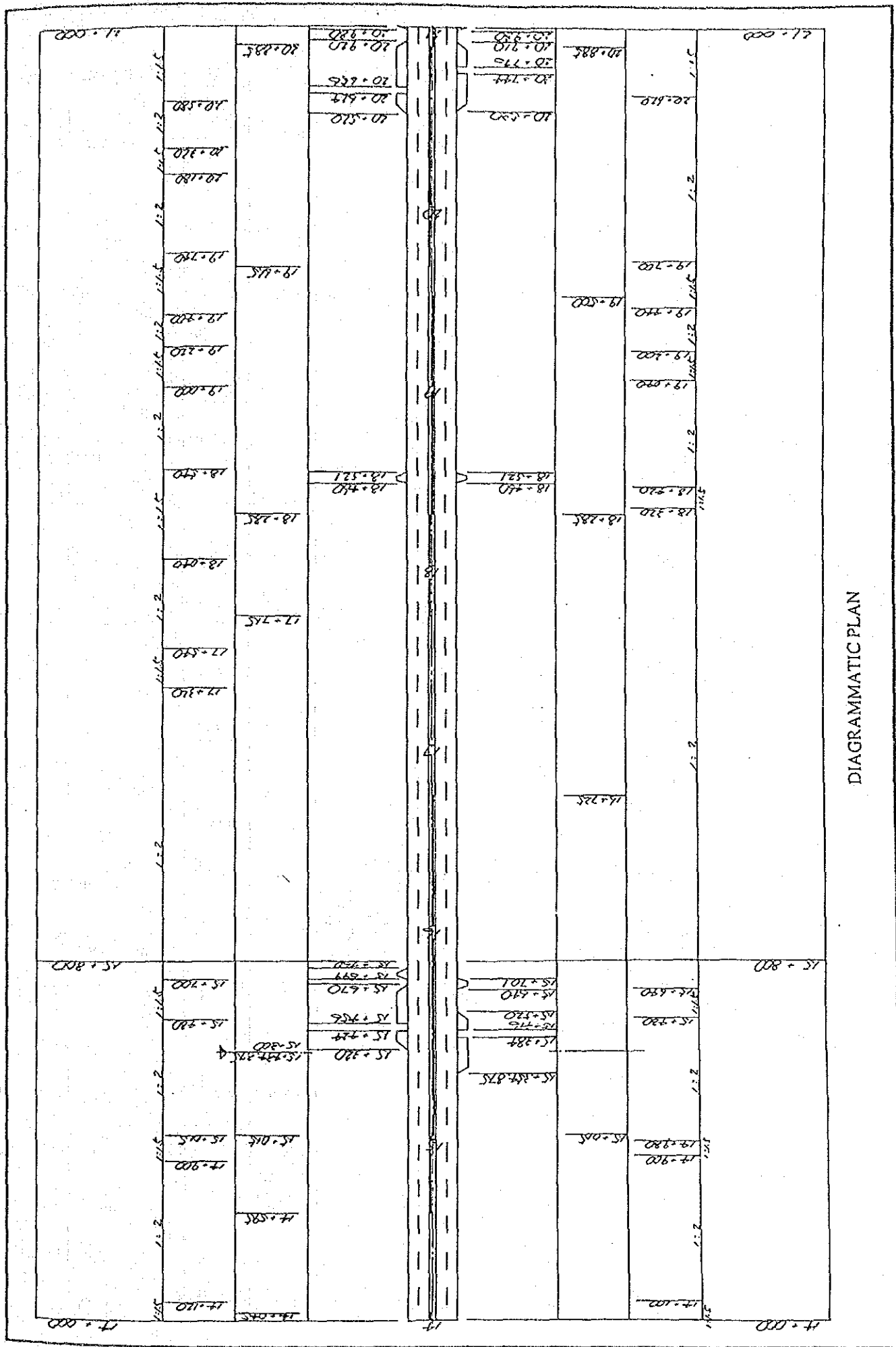
SECTION	SHOULDER LENGTH				REMARKS
	TYPE-1 (m)	TYPE-2 (m)	TYPE-3 (m)	TYPE-15 (m)	
28 + 244.064 ~ 28 + 254.064			10.0		
28 + 254.064 ~ 28 + 340.000		85.9			
28 + 340.000 ~ 28 + 416.085	76.1				
TOTAL	22,448.9	4,107.1	60.0	128.0	



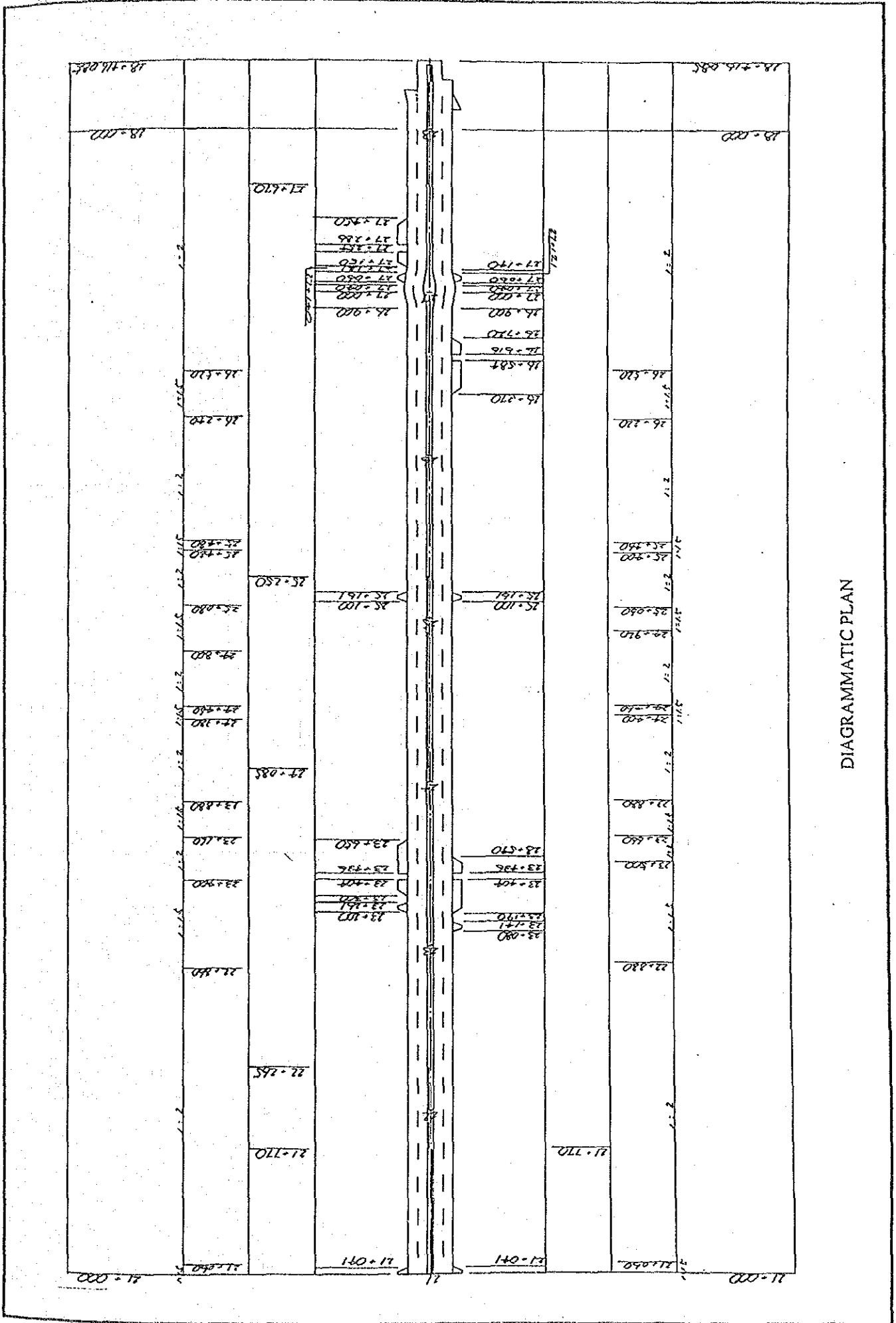
DIAGRAMMATIC PLAN



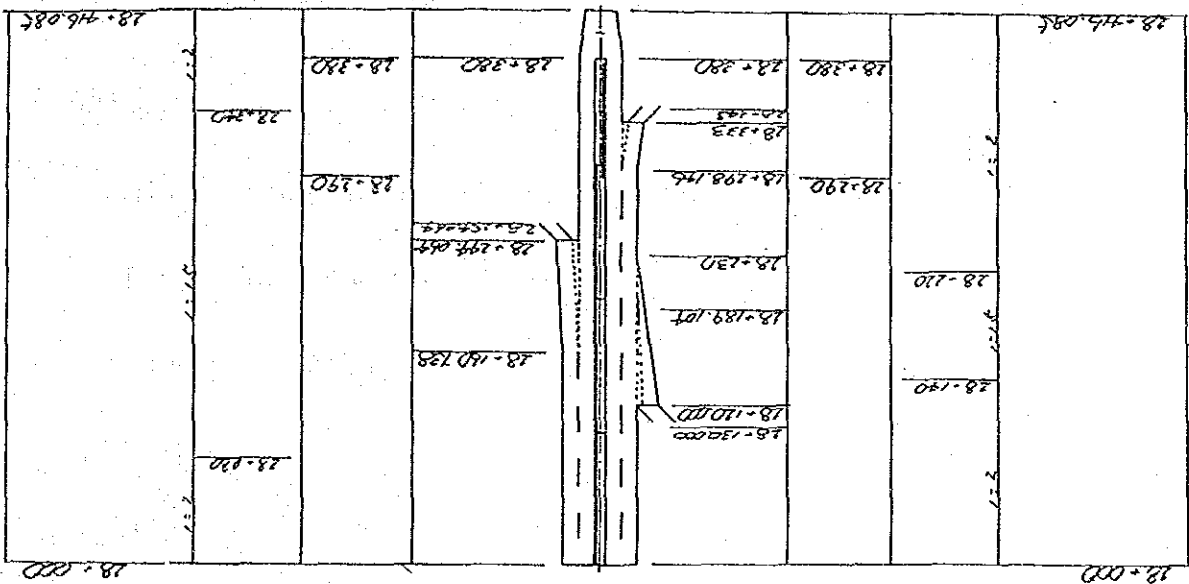
DIAGRAMMATIC PLAN



DIAGRAMMATIC PLAN



DIAGRAMMATIC PLAN



DIAGRAMMATIC PLAN

COMPUTATION OF QUANTITIES FOR PAVEMENT

NGONG ROAD JUNCTION A&B SLIP ROAD ACCELERATION & DECELERATION LANE

1. ASPHALT CONCRETE WEARING COURSE

$$2117.2\text{m}^2 \times 0.040 = 84.688\text{m}^3$$

2. ASPHALT CONCRETE BINDER COURSE

$$2117.2\text{m}^2 \times 0.080 = 169.376\text{m}^3$$

3. LEAN CONCRETE BASE

$$2117.2\text{m}^2 \times 0.200 + 410.0\text{m} \times 0.072 + 226.0\text{m} \times 0.072 = 469.232\text{m}^3$$

4. GRADED CRUSHED STONE BASE

5. GRADED CRUSHED STONE SUBBASE

$$2117.2\text{m}^2 \times 0.150 + 410.0\text{m} \times 0.354 + 226.0\text{m} \times 0.320 = 535.040\text{m}^3$$

6. GRADED CRUSHED STONE SHOULDER

$$410.0\text{m} \times 0.469 + 226.0\text{m} \times 0.439 = 291.504\text{m}^3$$

7. TACK COAT

$$2117.2\text{m}^2$$

8. PRIME COAT

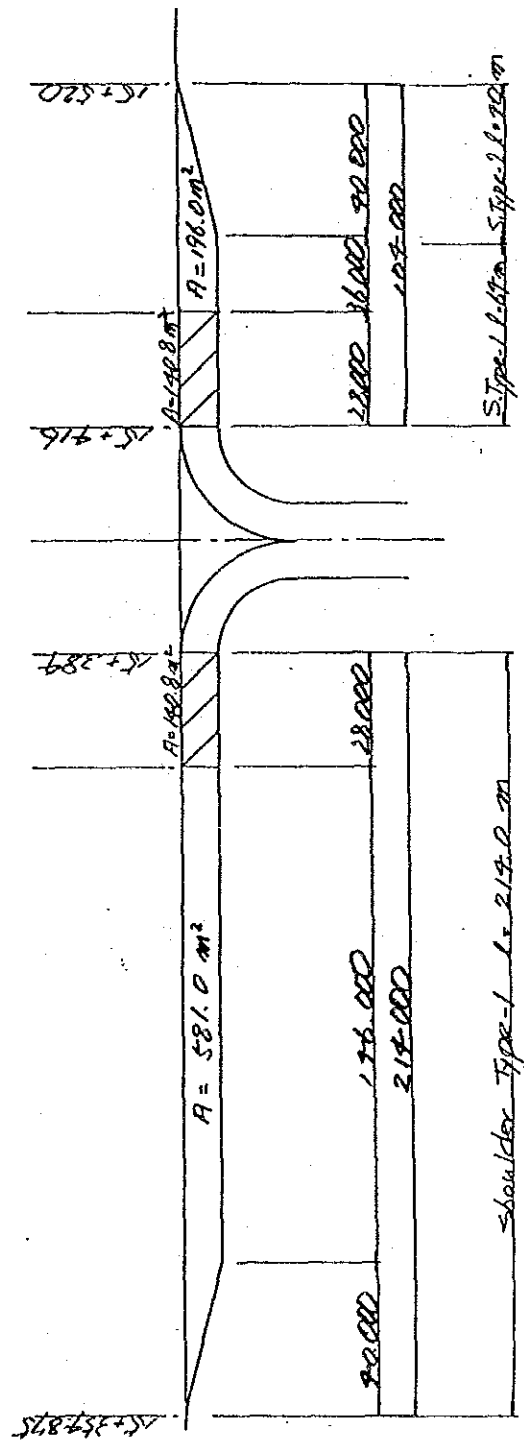
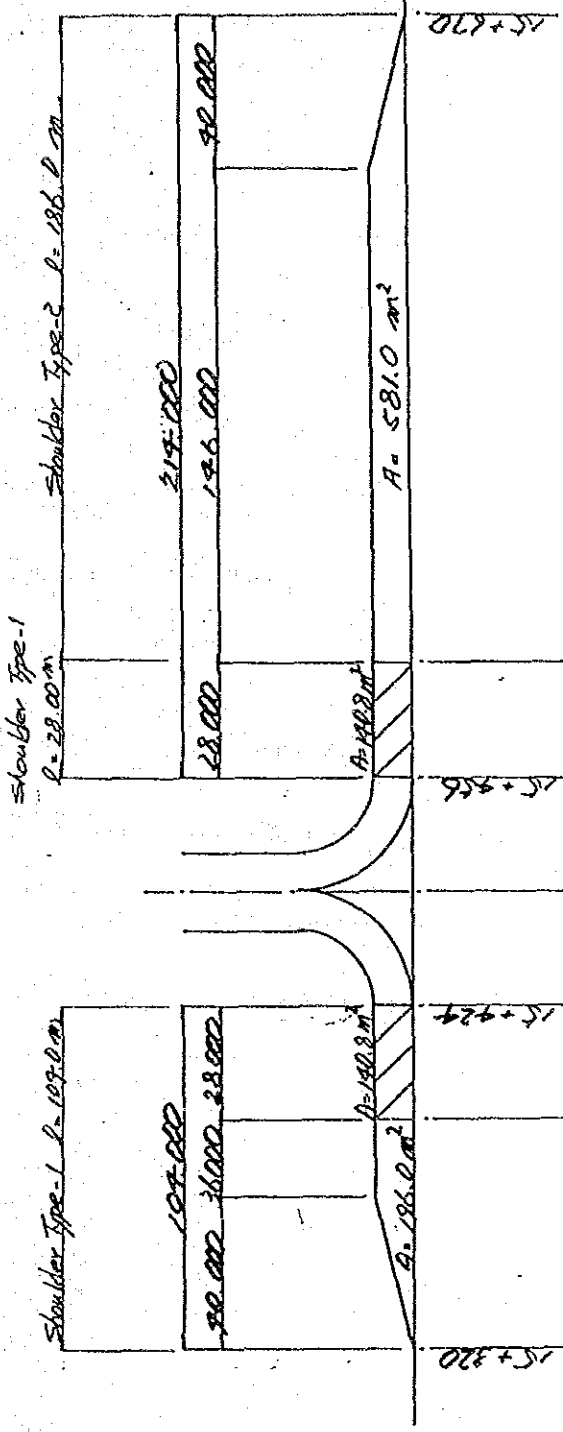
$$2117.2\text{m}^2$$

9. FILLING

10. DOUBLE SURFACE DRESSING

$$1.350\text{m} \times (410.0 + 226.0) = 858.6\text{m}^2$$

NGONG ROAD JUNCTION



Paving Area	2,117.2m ²
Shoulder Type-1	410.0m
Shoulder Type-2	226.0m

COMPUTATION OF QUANTITIES FOR PAVEMENT

DAGORETTI FOREST JUNCTION A&B SLIP ROAD ACCELERATION & DECELERATION LANE

1. ASPHALT CONCRETE WEARING COURSE

$$2397.2\text{m}^2 \times 0.040 = 95.888\text{m}^3$$

2. ASPHALT CONCRETE BINDER COURSE

$$2397.2\text{m}^2 \times 0.080 = 191.776\text{m}^3$$

3. LEAN CONCRETE BASE

$$2397.2\text{m}^2 \times 0.200 + 150.0\text{m} \times 0.072 + 566.0\text{m} \times 0.072 = 530.992\text{m}^3$$

4. GRADED CRUSHED STONE BASE

5. GRADED CRUSHED STONE SUBBASE

$$2397.2\text{m}^2 \times 0.150 + 150.0\text{m} \times 0.354 + 566.0\text{m} \times 0.320 = 593.800\text{m}^3$$

6. GRADED CRUSHED STONE SHOULDER

$$150.0\text{m} \times 0.469 + 566.0\text{m} \times 0.439 = 318.824\text{m}^3$$

7. TACK COAT

$$2397.2\text{m}^2$$

8. PRIME COAT

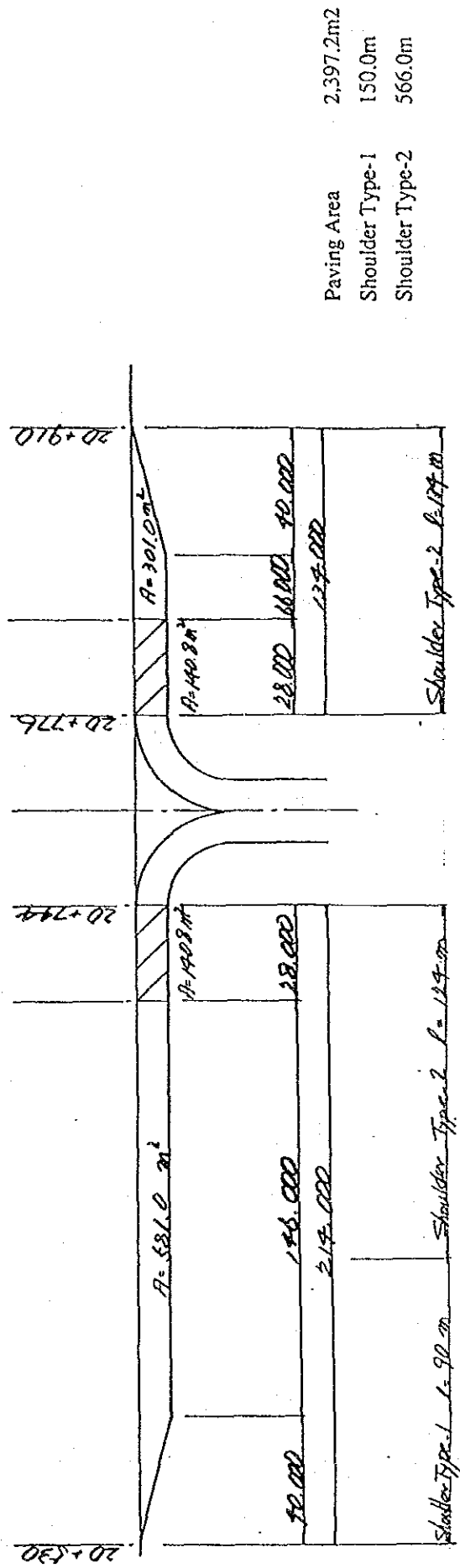
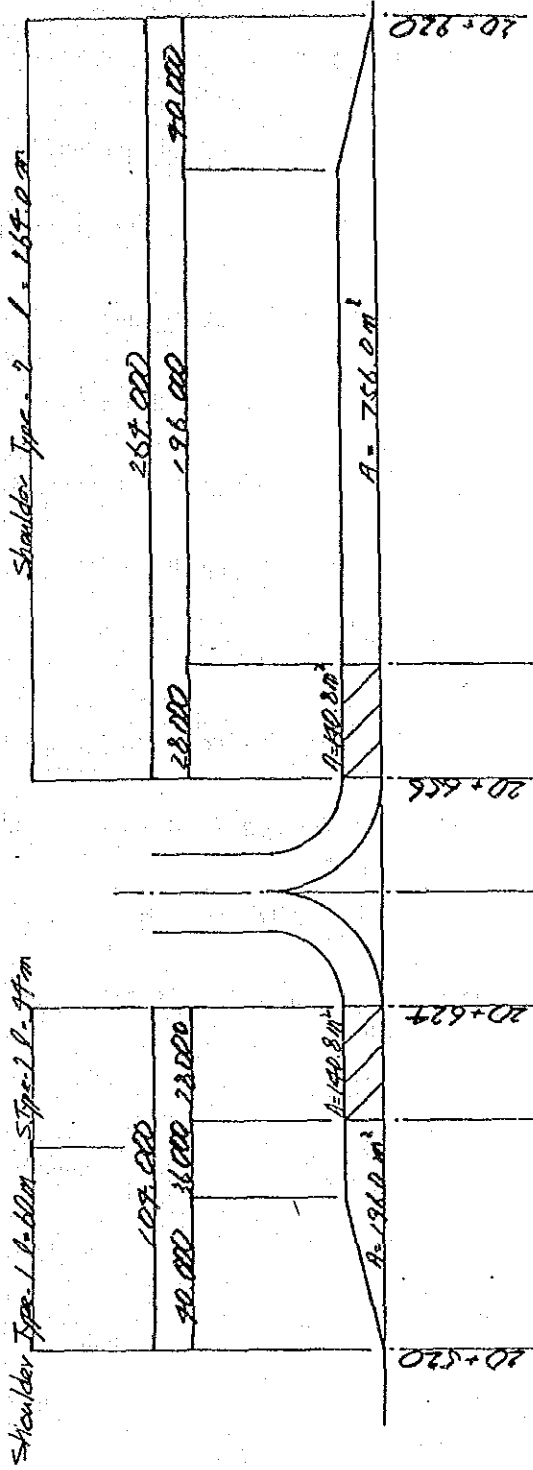
$$2397.2\text{m}^2$$

9. FILLING

10. DOUBLE SURFACE DRESSING

$$1.350\text{m} \times (150.0 + 566.0) = 966.6\text{m}^2$$

DAGORETTI FOREST JUNCTION



Paving Area 2,397.2m²
 Shoulder Type-1 150.0m
 Shoulder Type-2 566.0m

COMPUTATION OF QUANTITIES FOR PAVEMENT

THOGOTO JUNCTION A&B SLIP ROAD ACCELERATION & DECELERATION LANE

1. ASPHALT CONCRETE WEARING COURSE

$$2117.2\text{m}^2 \times 0.040 = 84.688\text{m}^3$$

2. ASPHALT CONCRETE BINDER COURSE

$$2117.2\text{m}^2 \times 0.080 = 169.376\text{m}^3$$

3. LEAN CONCRETE BASE

$$2117.2\text{m}^2 \times 0.200 + 254.0\text{m} \times 0.072 + 382.0\text{m} \times 0.072 = 469.232\text{m}^3$$

4. GRADED CRUSHED STONE BASE

5. GRADED CRUSHED STONE SUBBASE

$$2117.2\text{m}^2 \times 0.150 + 254.0\text{m} \times 0.354 + 382.0\text{m} \times 0.320 = 529.736\text{m}^3$$

6. GRADED CRUSHED STONE SHOULDER

$$254.0\text{m} \times 0.469 + 382.0\text{m} \times 0.439 = 286.824\text{m}^3$$

7. TACK COAT

$$2117.2\text{m}^2$$

8. PRIME COAT

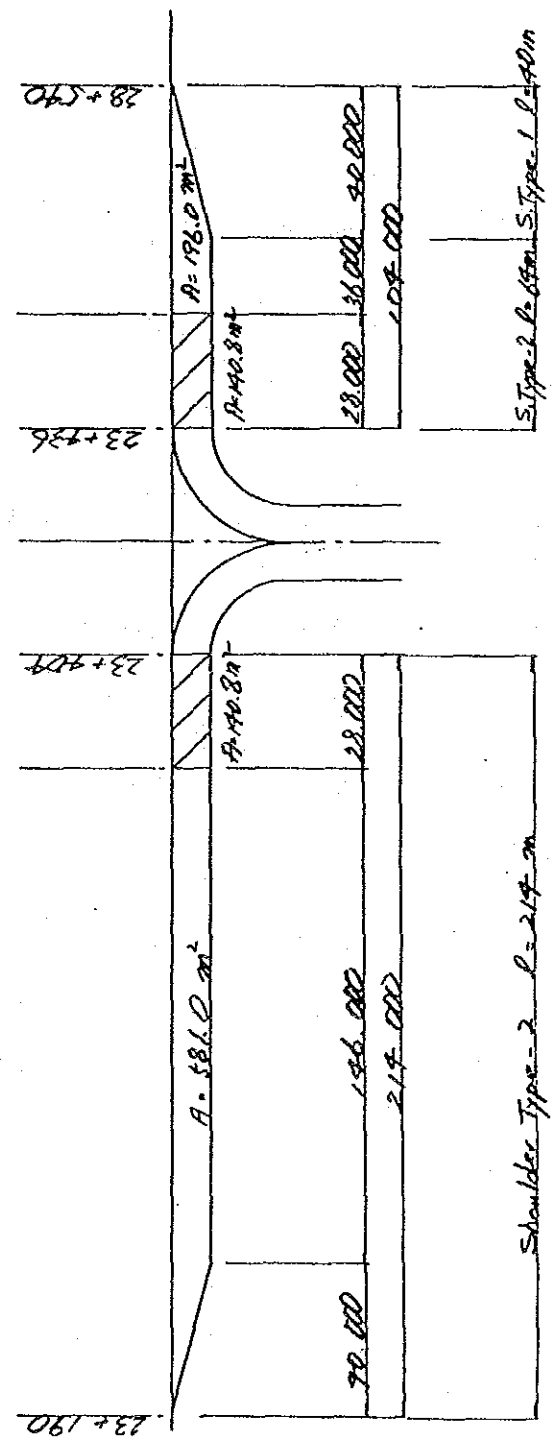
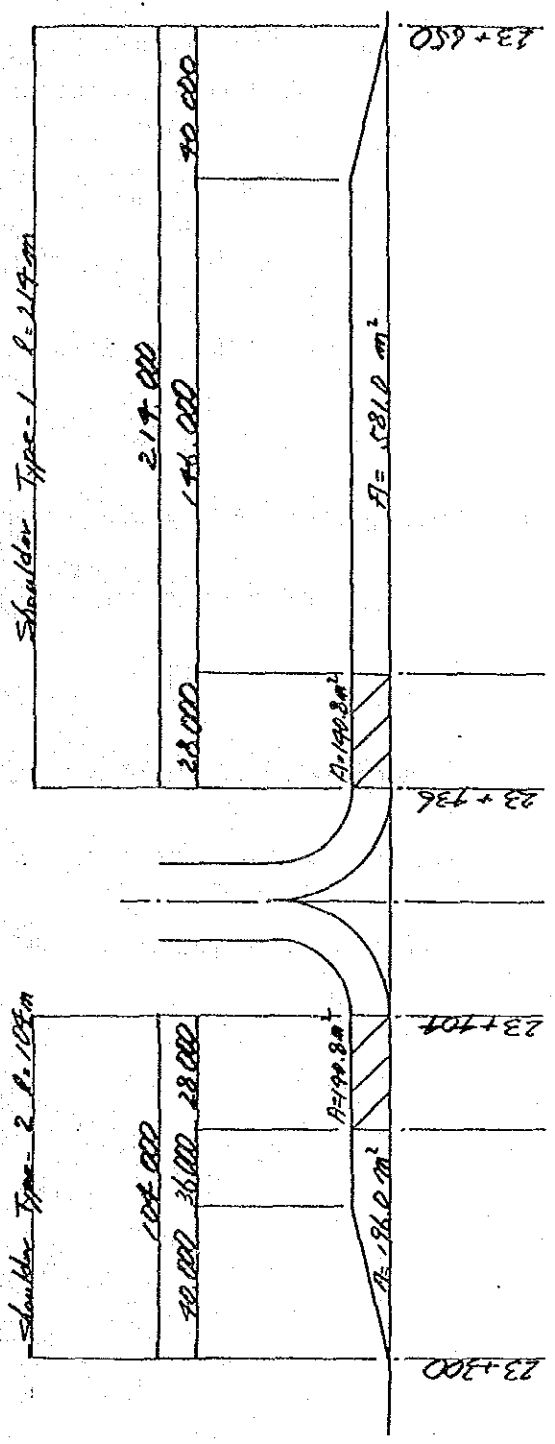
$$2117.2\text{m}^2$$

9. FILLING

10. DOUBLE SURFACE DRESSING

$$1.350\text{m} \times (254.0 + 382.0) = 858.6\text{m}^2$$

THOGOTO JUNCTION



Paving Area	2117.2m ²
Shoulder Type-1	254.0m
Shoulder Type-2	382.0m

COMPUTATION OF QUANTITIES FOR PAVEMENT

KIKUYU TOWN JUNCTION B&C SLIP ROAD ACCELERATION & DECELERATION LANE

1. ASPHALT CONCRETE WEARING COURSE

$$1942.2\text{m}^2 \times 0.040 = 77.688\text{m}^3$$

2. ASPHALT CONCRETE BINDER COURE

$$1942.2\text{m}^2 \times 0.080 = 155.376\text{m}^3$$

3. LEAN CONCRETE BASE

$$1942.2\text{m}^2 \times 0.200 + 436.0\text{m} \times 0.072 + 150.0\text{m} \times 0.072 = 430.632\text{m}^3$$

4. GRADED CRUSHED STONE BASE

5. GRADED CRUSHED STONE SUBBASE

$$1942.2\text{m}^2 \times 0.150 + 436.0\text{m} \times 0.354 + 150.0\text{m} \times 0.320 = 493.674\text{m}^3$$

6. GRADED CRUSHED STONE SHOULDER

$$436.0\text{m} \times 0.469 + 150.0\text{m} \times 0.439 = 270.334\text{m}^3$$

7. TACK COAT

$$1942.2\text{m}^2$$

8. PRIME COAT

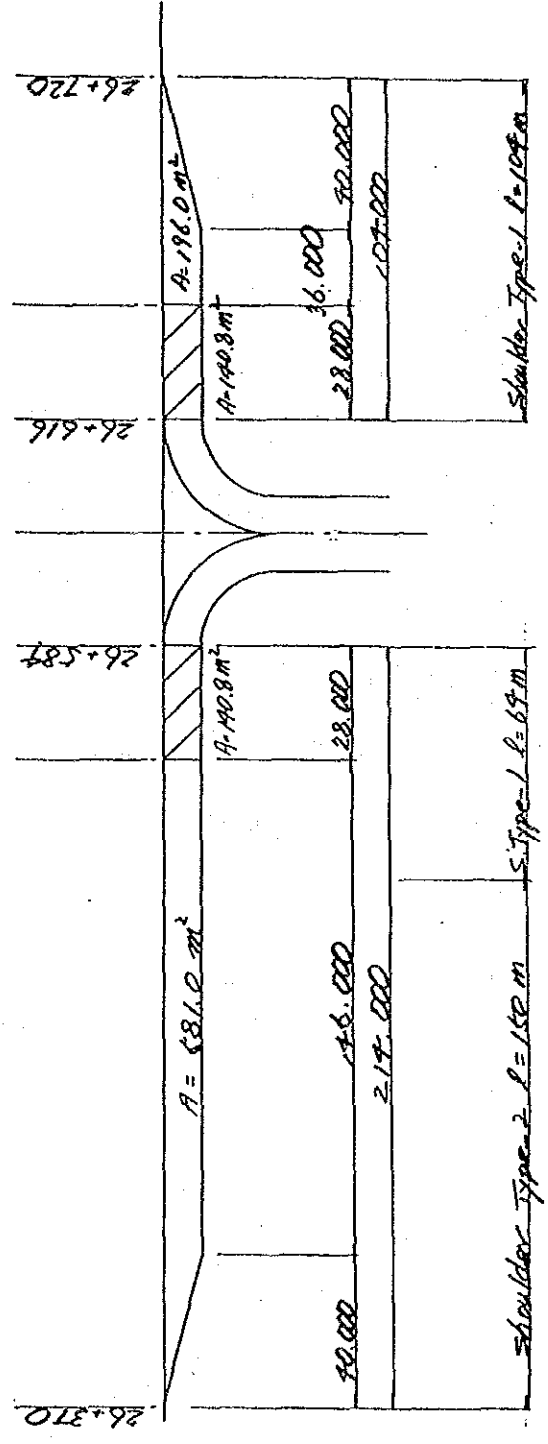
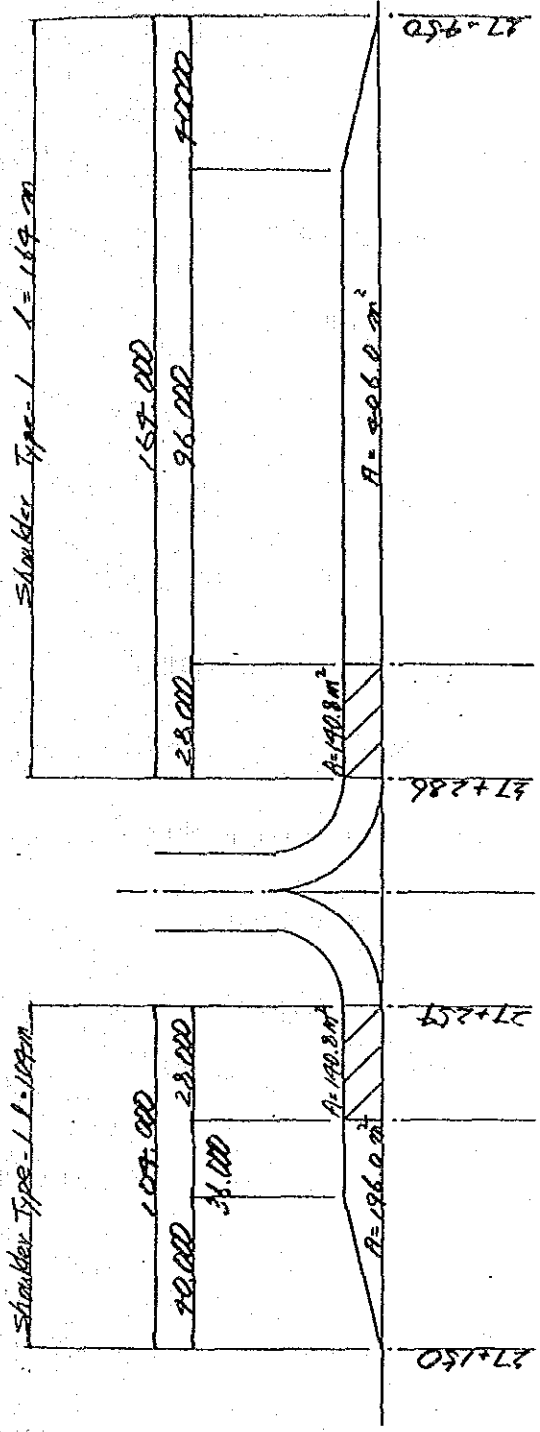
$$1942.2\text{m}^2$$

9. FILLING

10. DOUBLE SURFACE DRESSING

$$1.350\text{m} \times (436.0 + 150.0) = 791.11\text{m}^2$$

KIKUYU TOWN JUNCTION



Paving Area	1942.2m ²
Shoulder Type-1	436.0m
Shoulder Type-2	150.0m

COMPUTATION OF QUANTITIES FOR PAVEMENT

BUS-STOP (1:2)

10 SPOTS

1. ASPHALT CONCRETE WEARING COURSE

$$3.500 \times (15.0 + 13.0 + 9.0)\text{m} = 129.50\text{m}^2$$

$$129.50\text{m}^2 \times 0.040 \times 10 = 51.80\text{m}^3$$

2. ASPHALT CONCRETE BINDER COURSE

$$129.50\text{m}^2 \times 0.080 \times 10 = 103.60\text{m}^3$$

3. LEAN CONCRETE BASE

$$\{129.50\text{m}^2 \times 0.200 + 0.072 \times (13.0 + 8.0)\text{m}\} \times 10 = 274.12\text{m}^3$$

4. GRADED CRUSHED STONE BASE

$$0.074 \times 40.0\text{m} \times 10 = 29.60\text{m}^3$$

5. GRADED CRUSHED STONE SUBBASE

$$\{129.50\text{m}^2 \times 0.150 + 0.354 \times (13.0 + 8.0)\text{m} + 0.045 \times (2.0 + 36.0 + 2.0)\text{m}\} \times 10 = 286.59\text{m}^3$$

6. GRADED CRUSHED STONE SHOULDER

$$0.469 \times 21.0\text{m} \times 10 = 98.45\text{m}^3$$

7. TACK COAT

$$129.50\text{m}^2 \times 10 = 1295.0\text{m}^2$$

8. PRIME COAT

$$1295.0\text{m}^2$$

9. FILLING

$$0.996 \times 40.0\text{m} \times 10 = 398.40\text{m}^3$$

10. DOUBLE SURFACE DRESSING

$$\{1.350 \times 21.0\text{m} + 1.375 \times 40.0\text{m}\} \times 10 = 833.5\text{m}^2$$

COMPUTATION OF QUANTITIES FOR PAVEMENT

BUS-STOP (1:1.5) 6 SPOTS

1. ASPHALT CONCRETE WEARING COURSE

$$129.50\text{m}^2 \times 0.040 \times 6 = 31.08\text{m}^3$$

2. ASPHALT CONCRETE BINDER COURE

$$129.50\text{m}^2 \times 0.080 \times 6 = 62.16\text{m}^3$$

3. LEAN CONCRETE BASE

$$\{129.50\text{m}^2 \times 0.200 + 0.072 \times (13.0 + 8.0)\text{m}\} \times 6 = 164.47\text{m}^3$$

4. GRADED CRUSHED STONE BASE

$$0.072 \times 40.0\text{m} \times 6 = 17.28\text{m}^3$$

5. GRADED CRUSHED STONE SUBBASE

$$(129.50\text{m}^2 \times 0.150 + 0.320 \times 21.0\text{m} + 0.045 \times 40.0\text{m}) \times 6 = 167.67\text{m}^3$$

6. GRADED CRUSHED STONE SHOULDER

$$0.439 \times 21.0\text{m} \times 6 = 55.31\text{m}^3$$

7. TACK COAT

$$129.50\text{m}^2 \times 6 = 777.00\text{m}^2$$

8. PRIME COAT

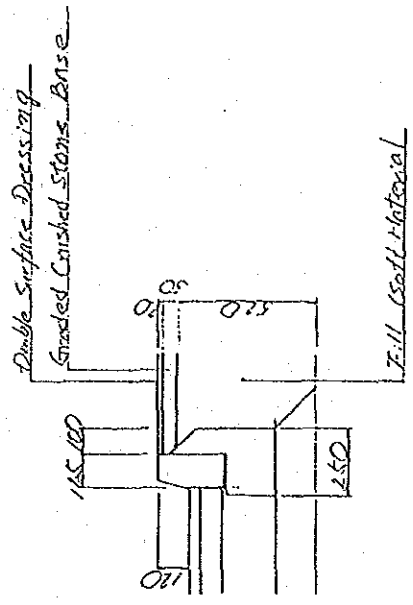
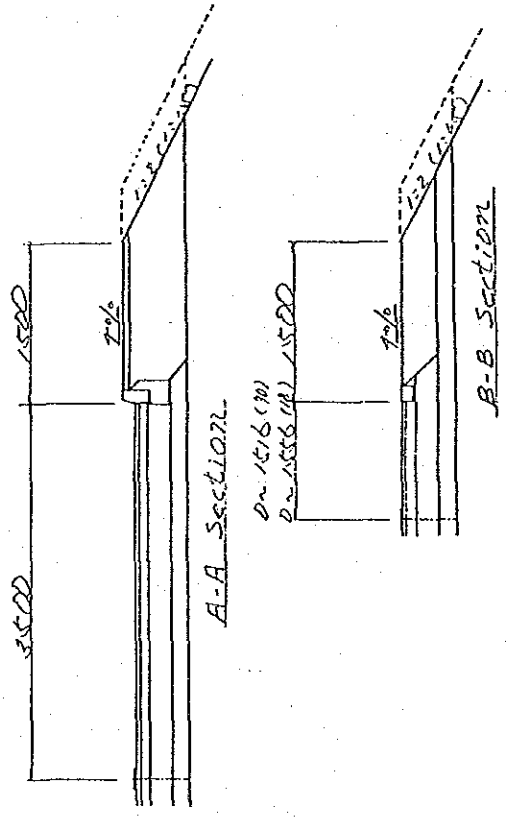
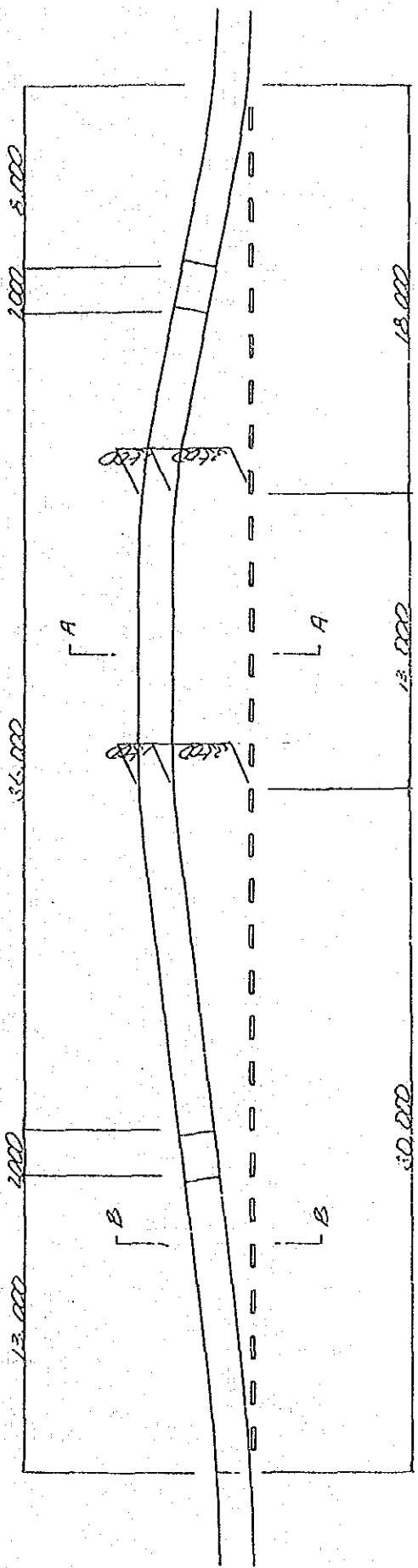
$$777.00\text{m}^2$$

9. FILLING

$$0.896 \times 40.0\text{m} \times 6 = 215.04\text{m}^3$$

10. DOUBLE SURFACE DRESSING

$$\{1.350 \times 21.0\text{m} + 1.375 \times 40.0\text{m}\} \times 6 = 500.10\text{m}^2$$



BUSSTOP TYPICAL PLAN & CROSS SECTION

