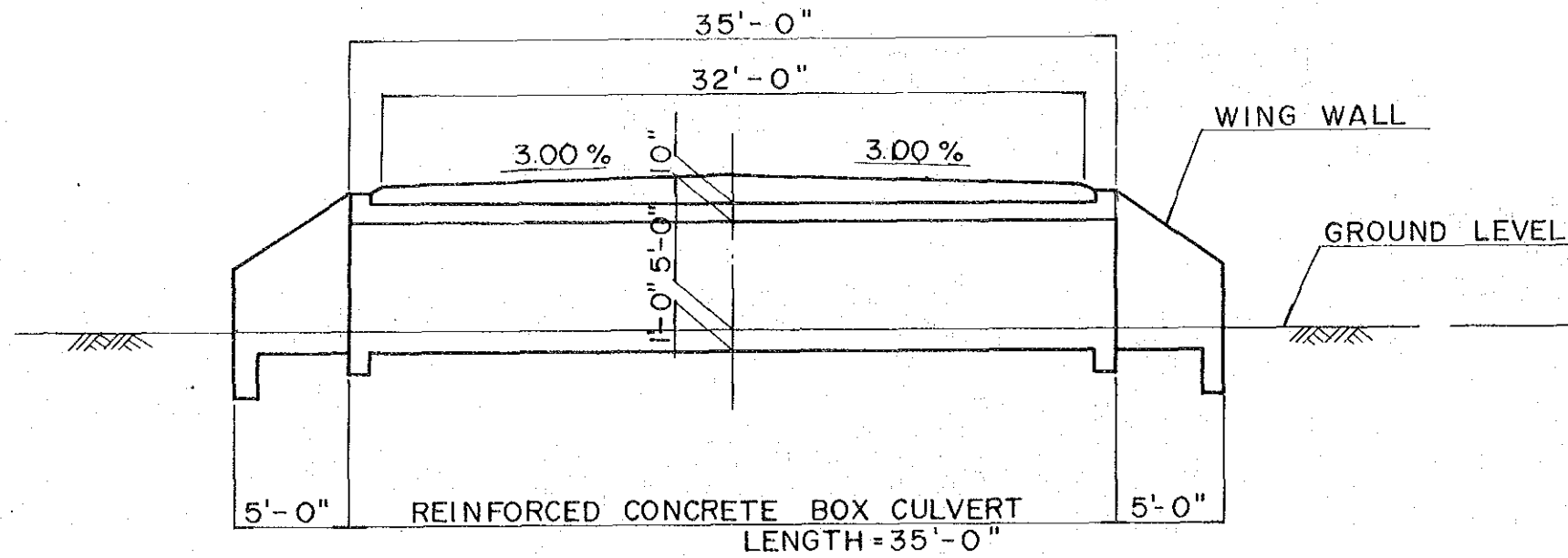
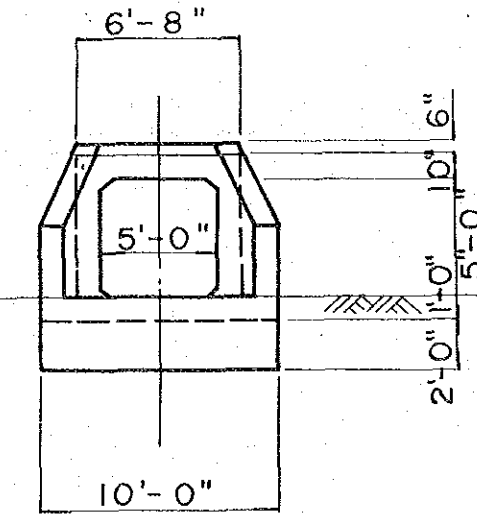


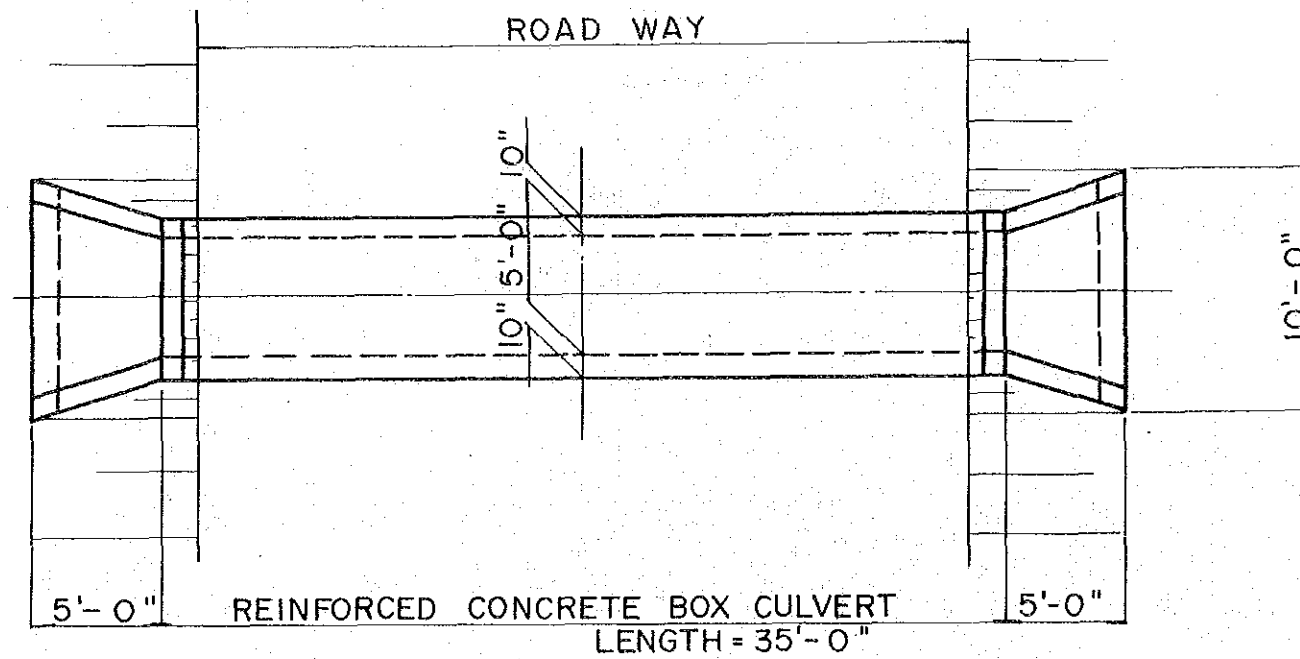
PROFILE



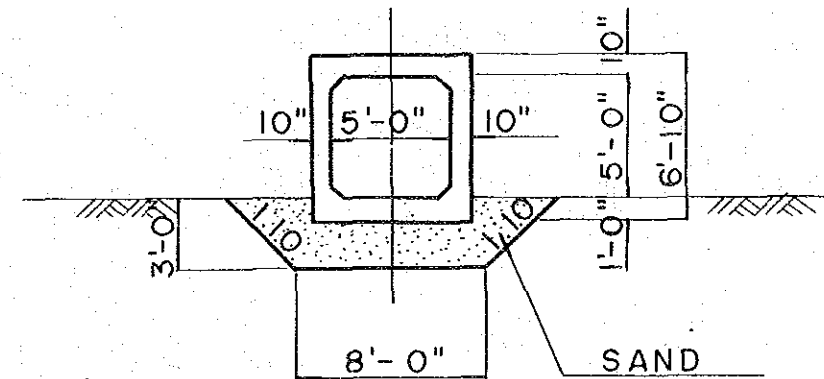
FRON VIEW

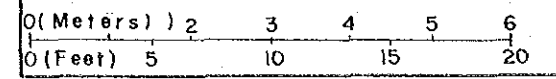


PLAN

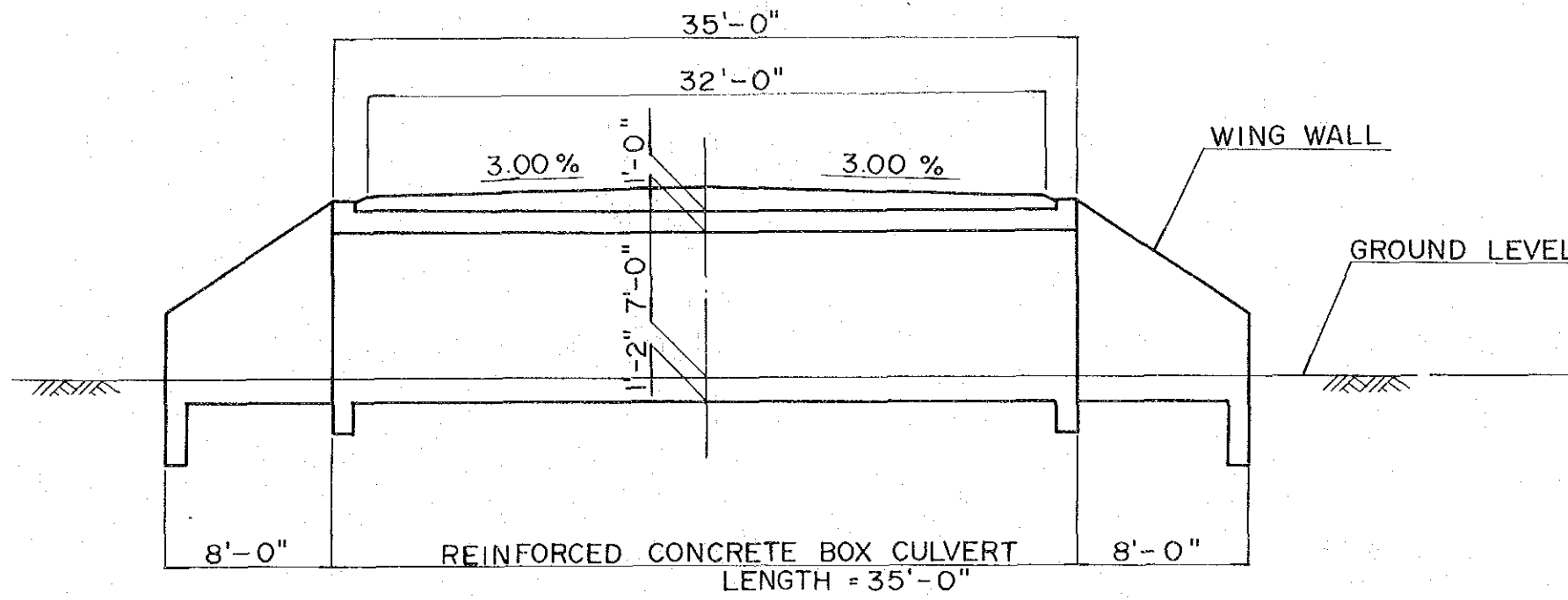


CROSS SECTION

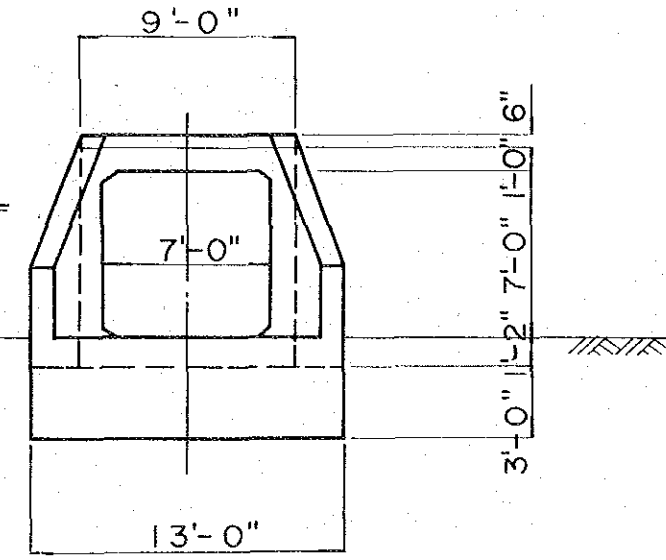




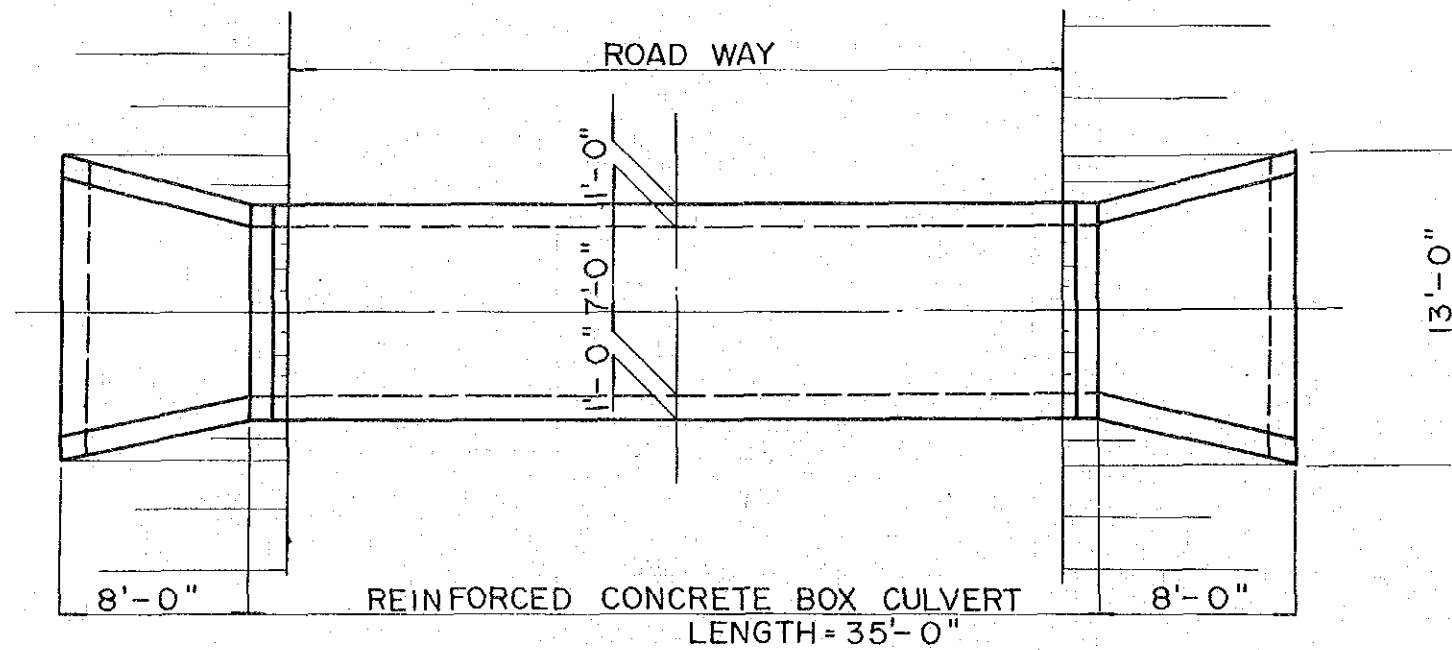
PROFILE



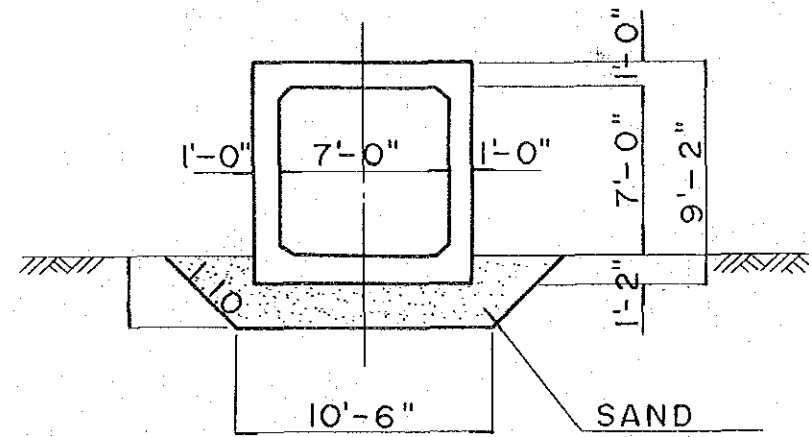
FRONT VIEW

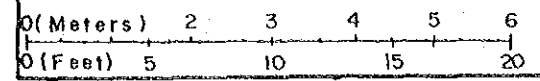


PLAN

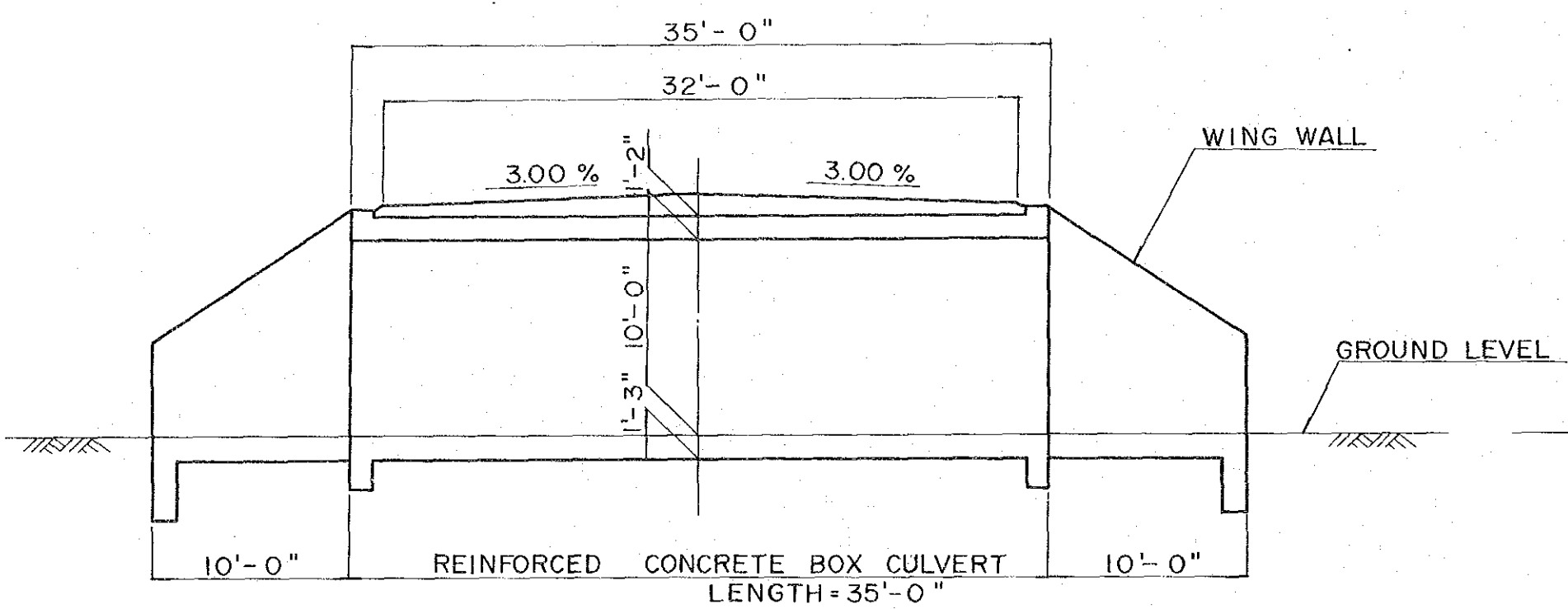


CROSS SECTION

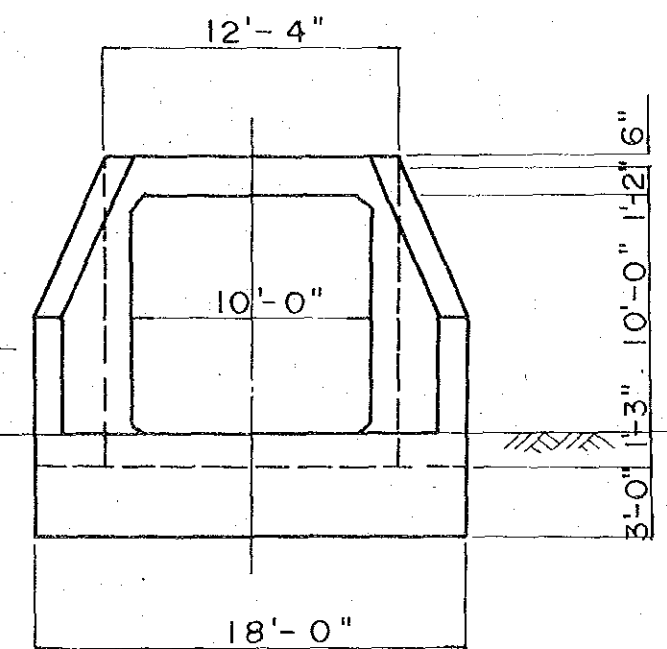




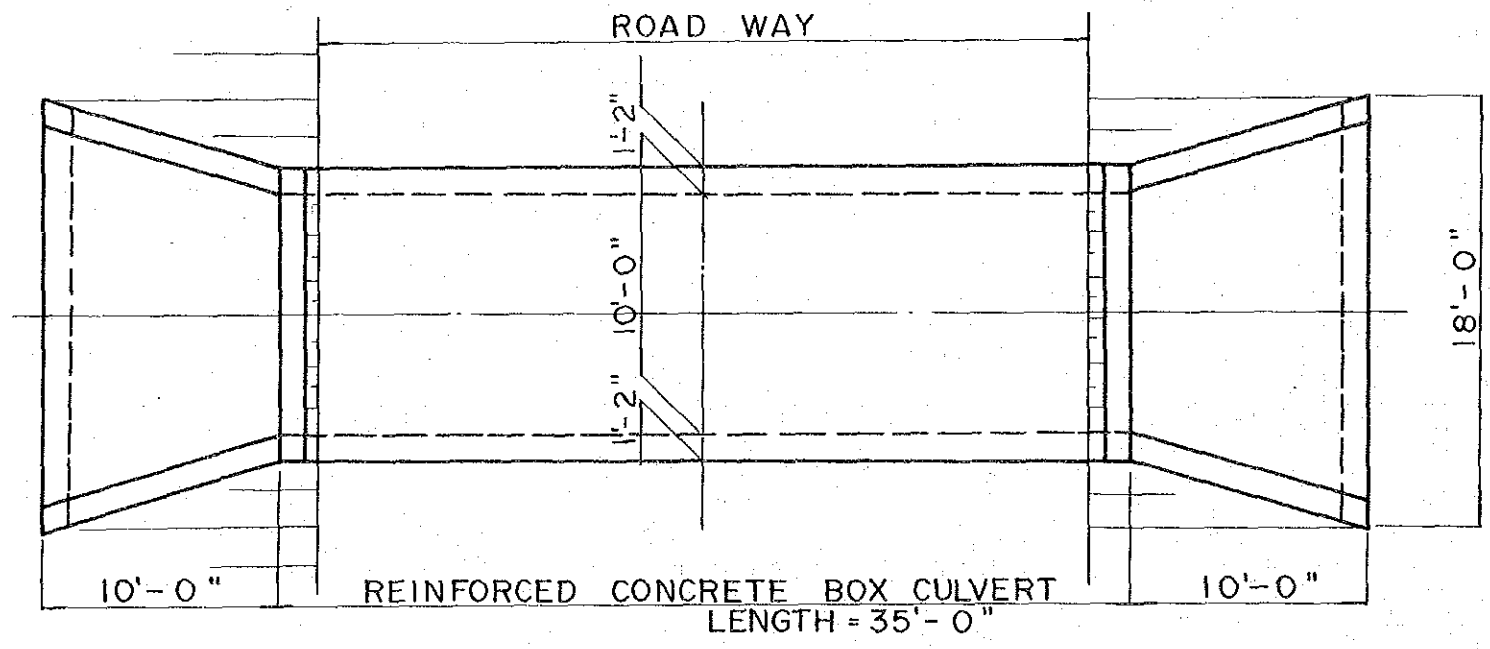
PROFILE



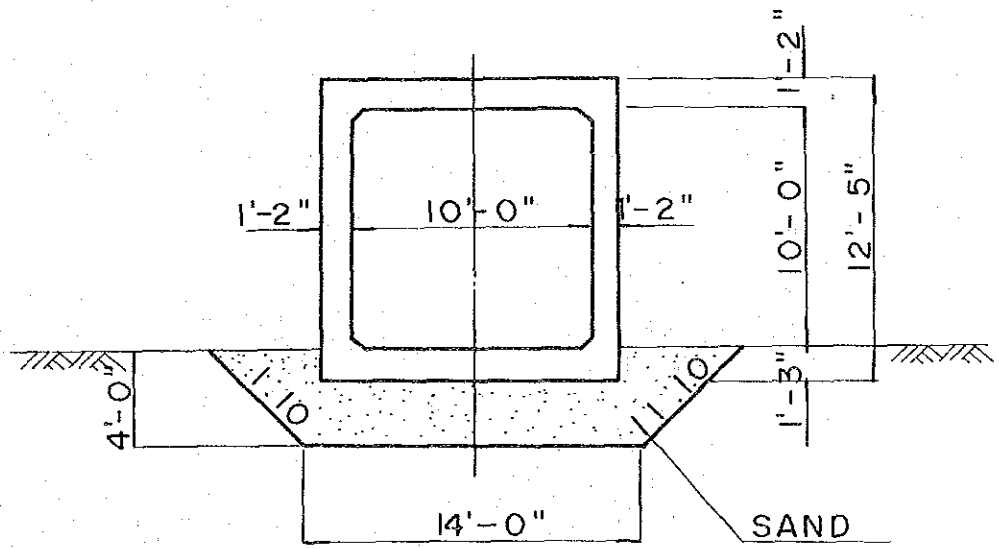
FRONT VIEW

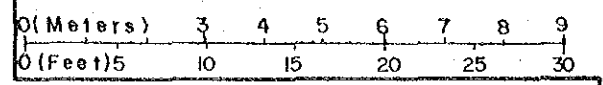


PLAN

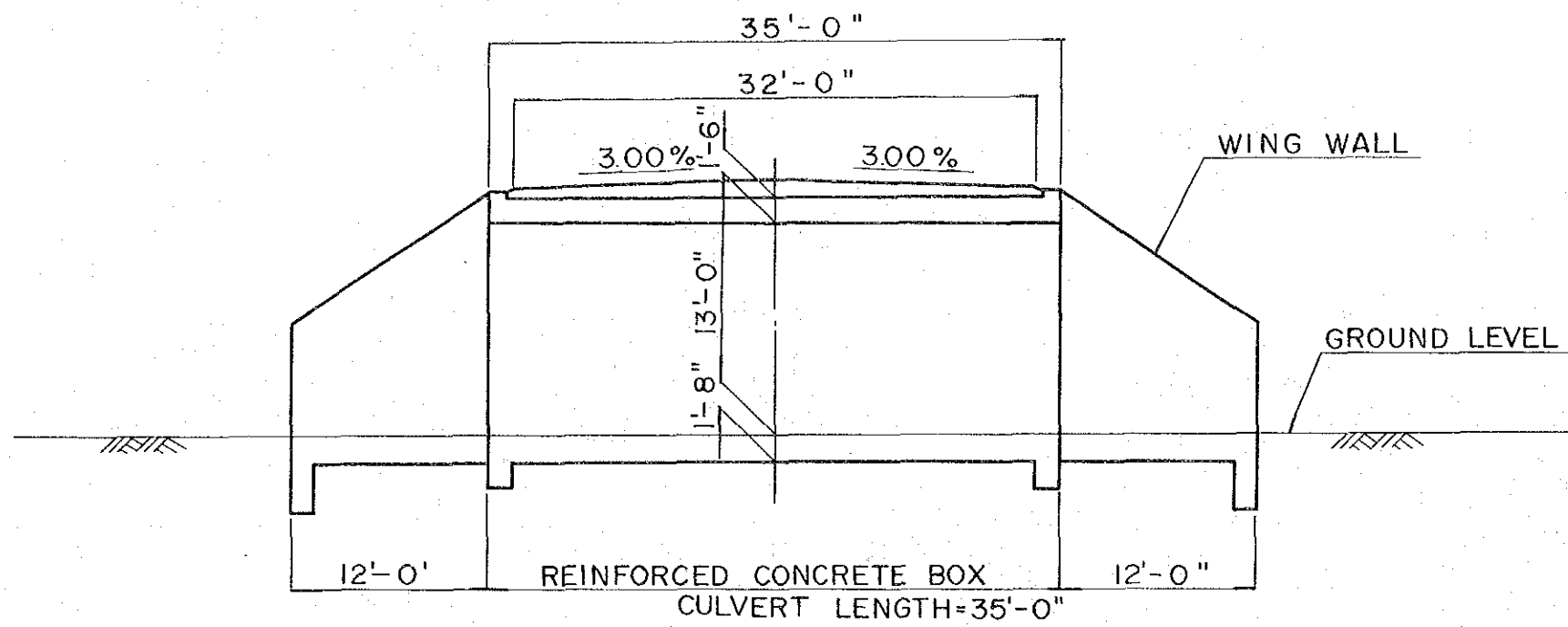


CROSS SECTION

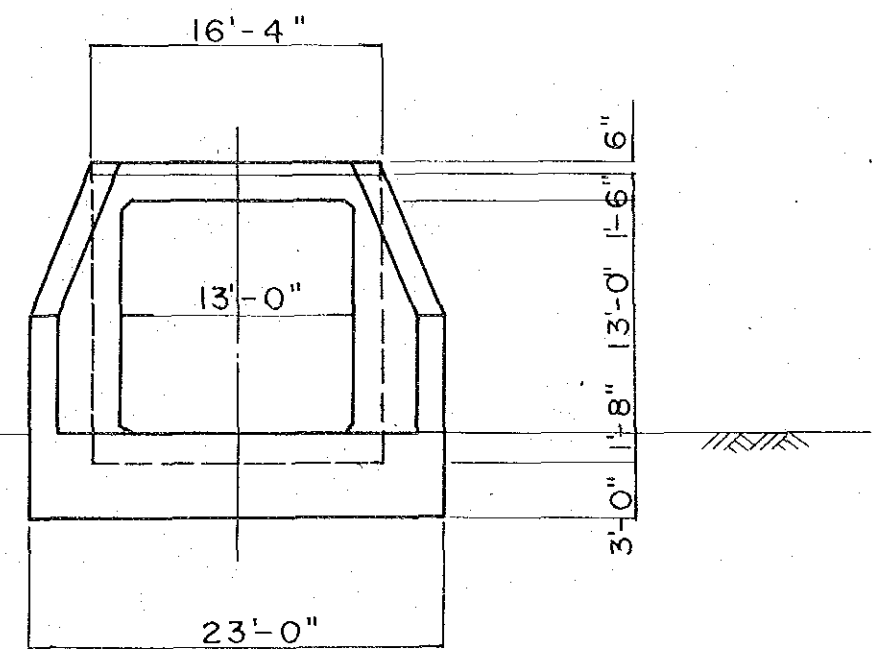




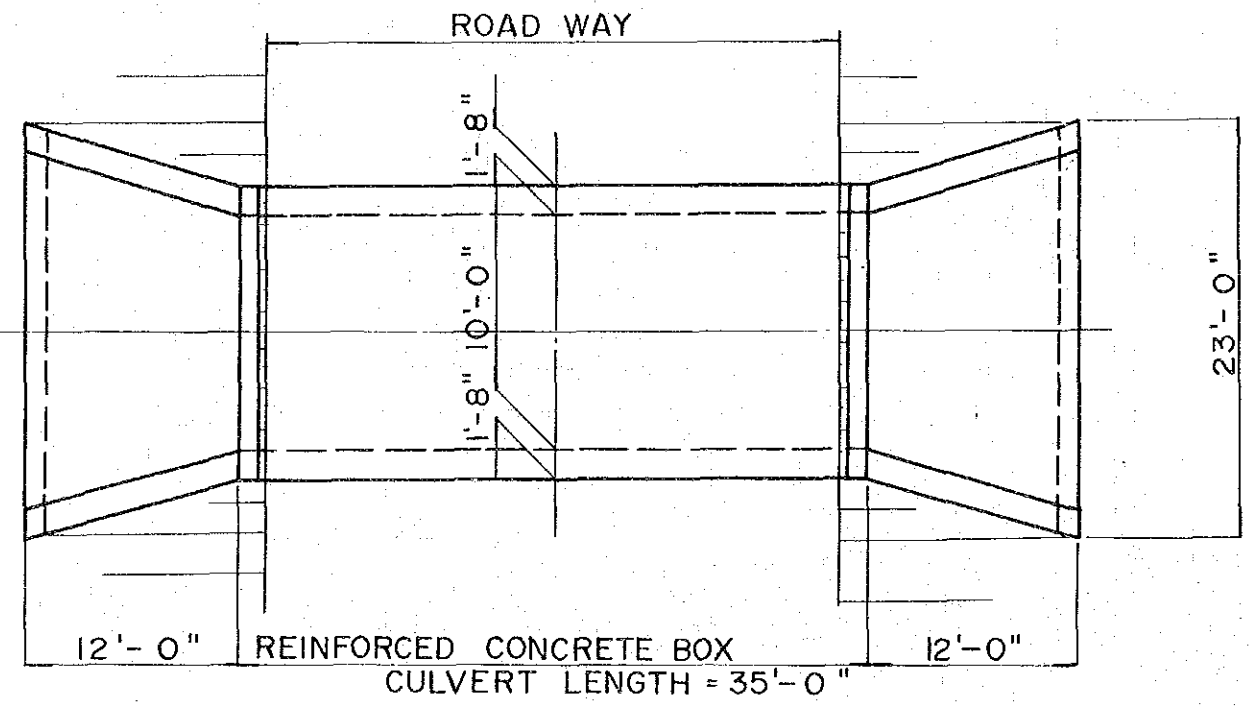
PROFILE



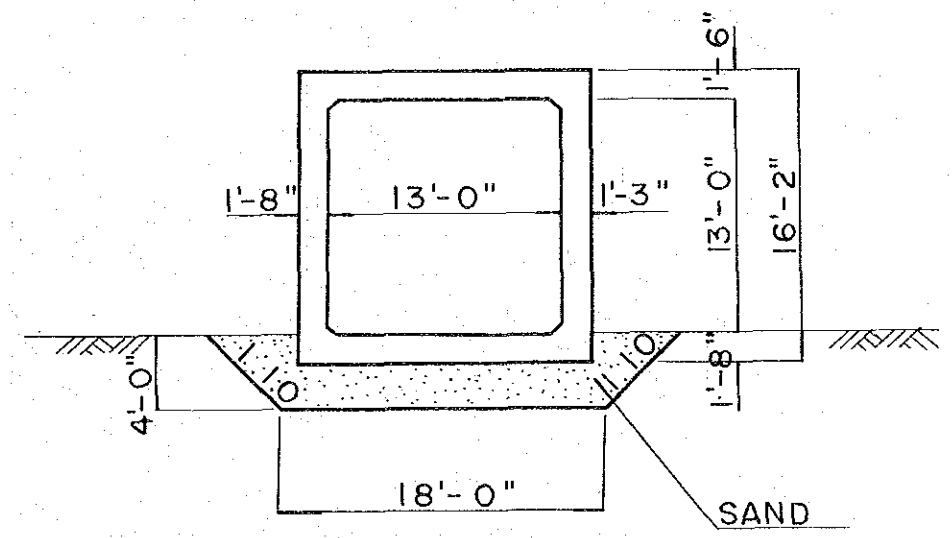
FRONT VIEW

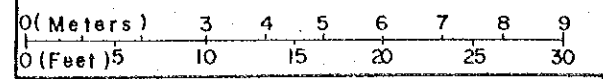


PLAN

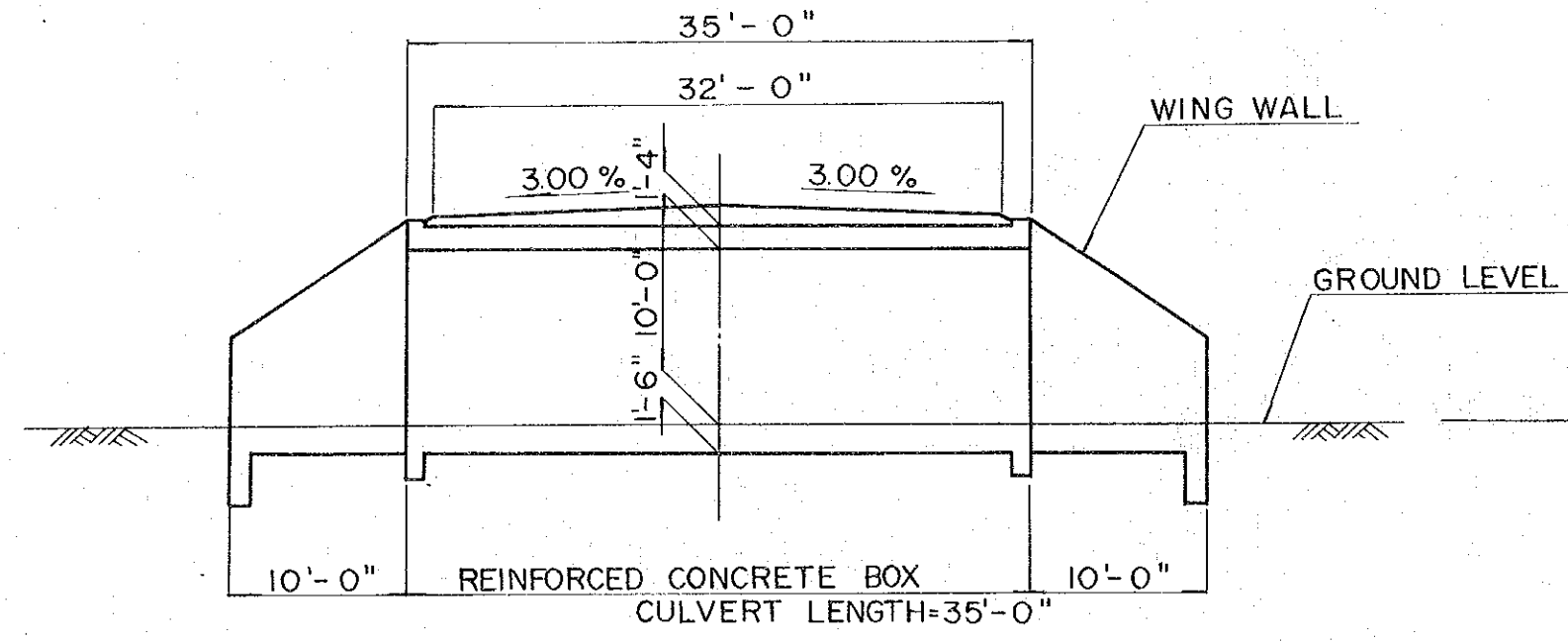


CROSS SECTION

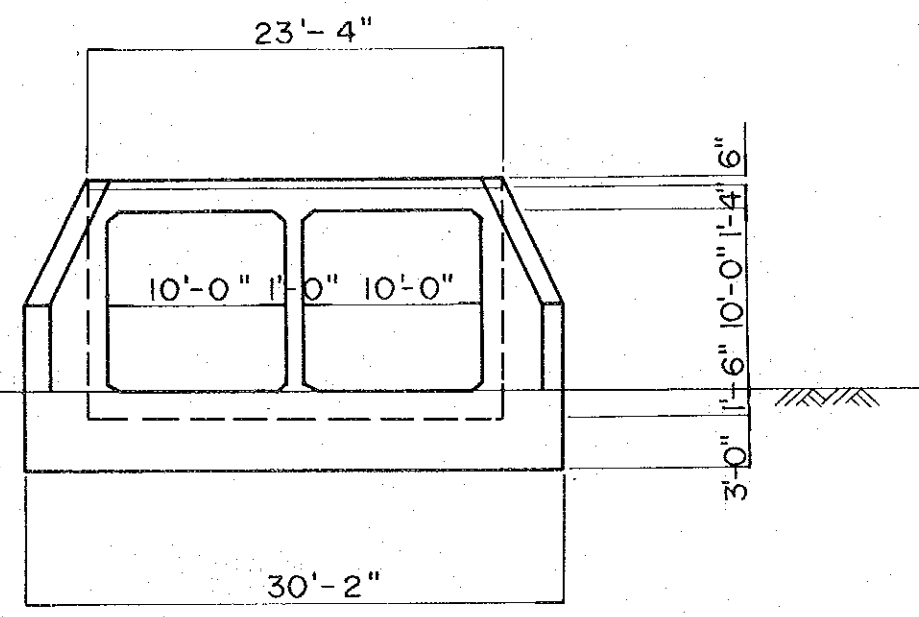




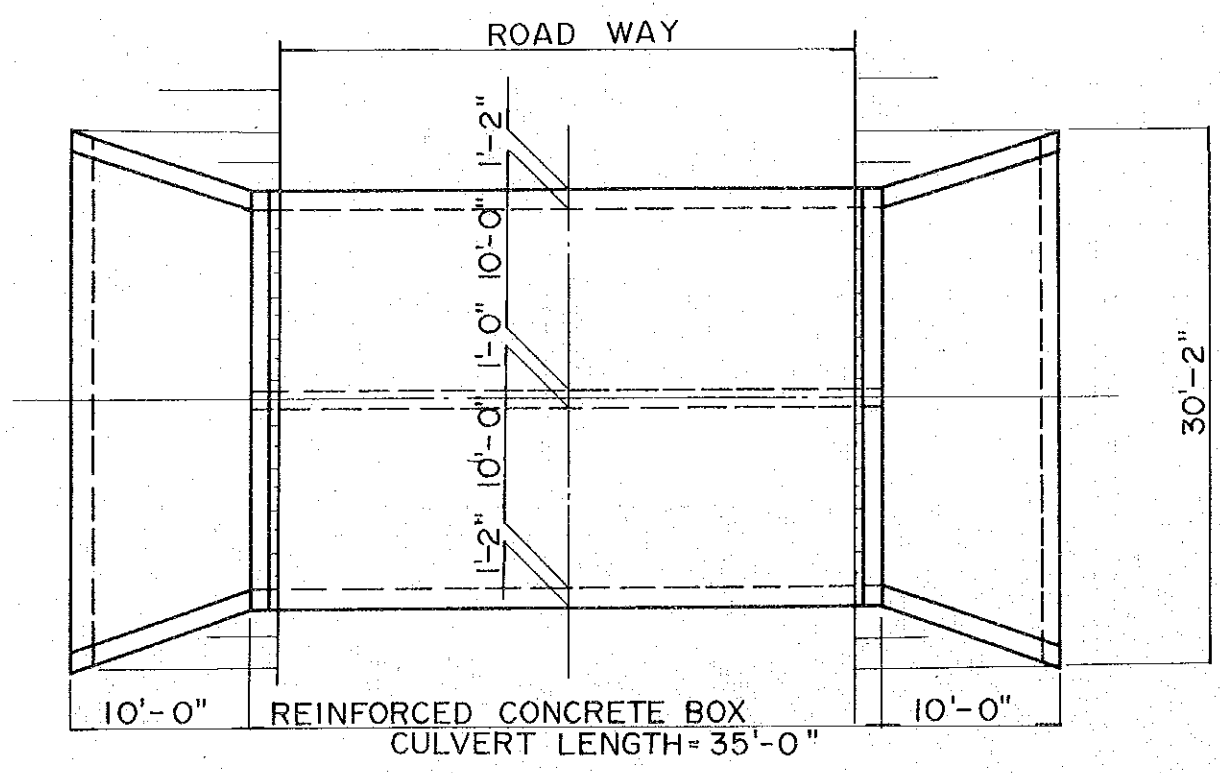
PROFILE



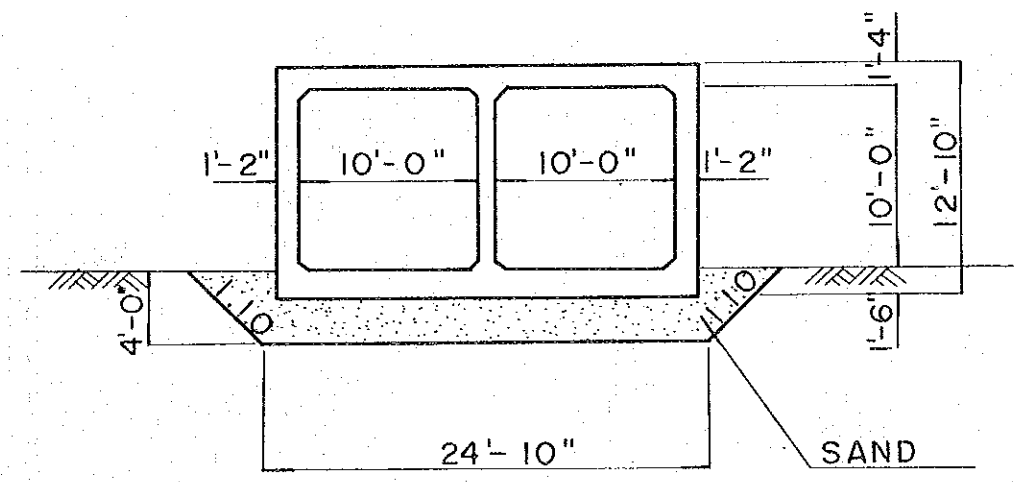
FRONT VIEW

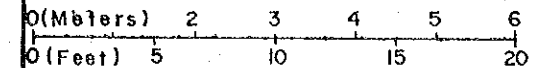


PLAN

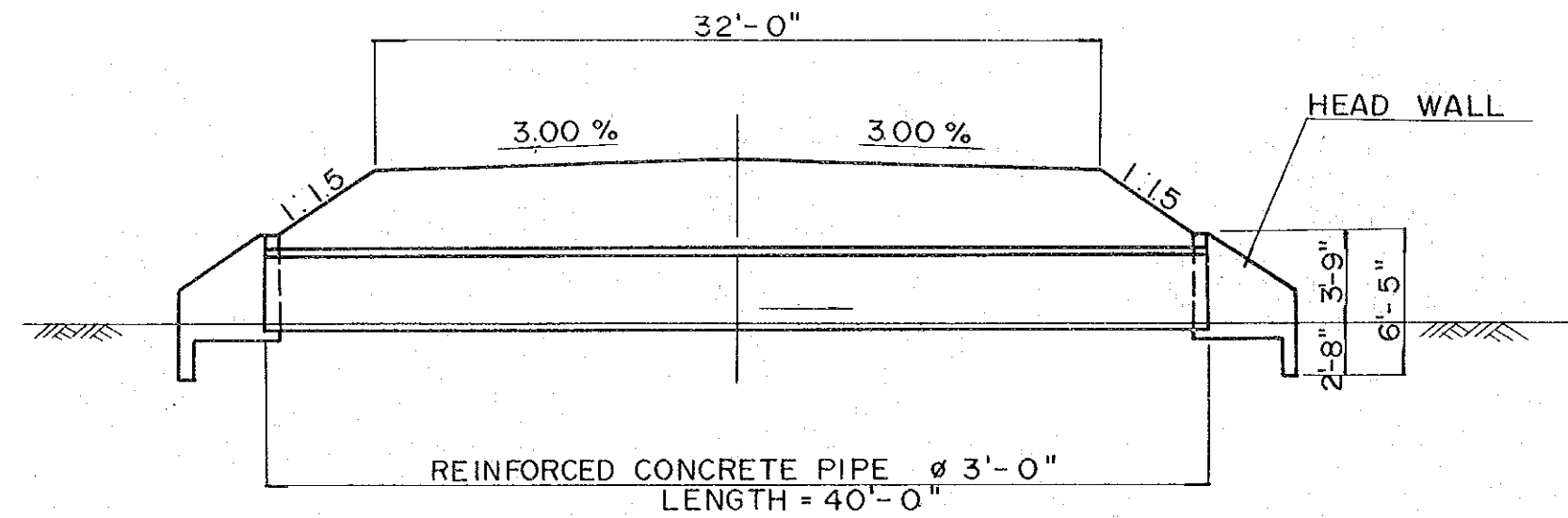


CROSS SECTION

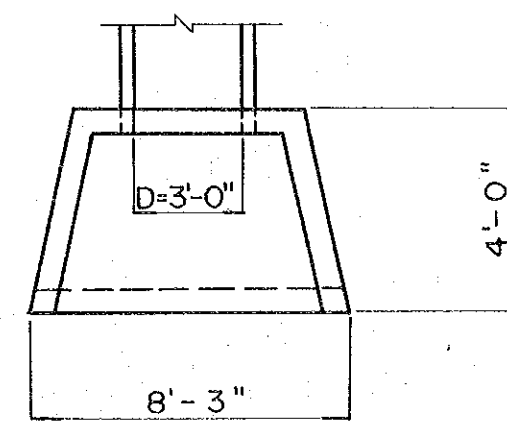




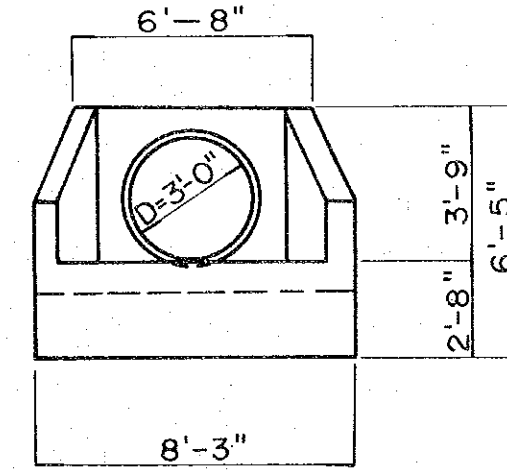
PROFILE



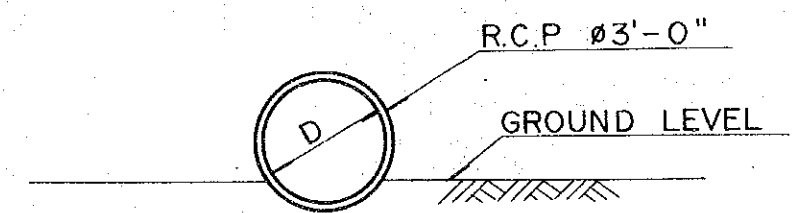
HEAD WALL



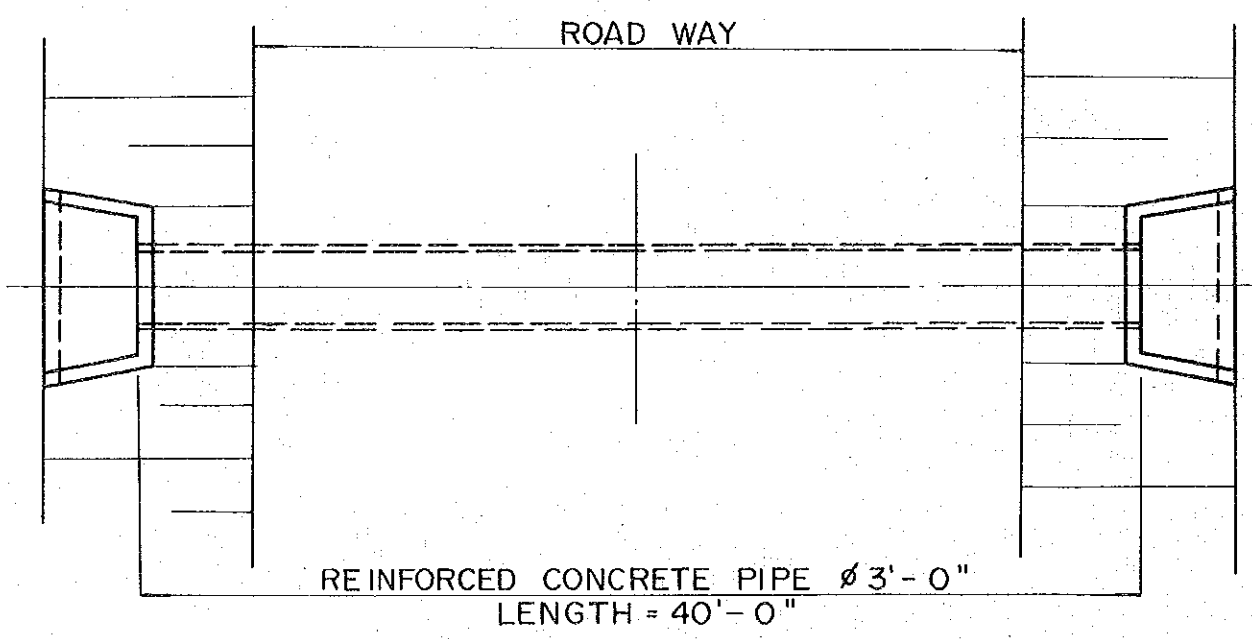
FRONT VIEW

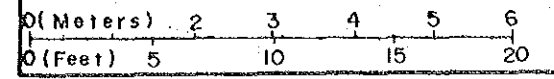


CROSS SECTION

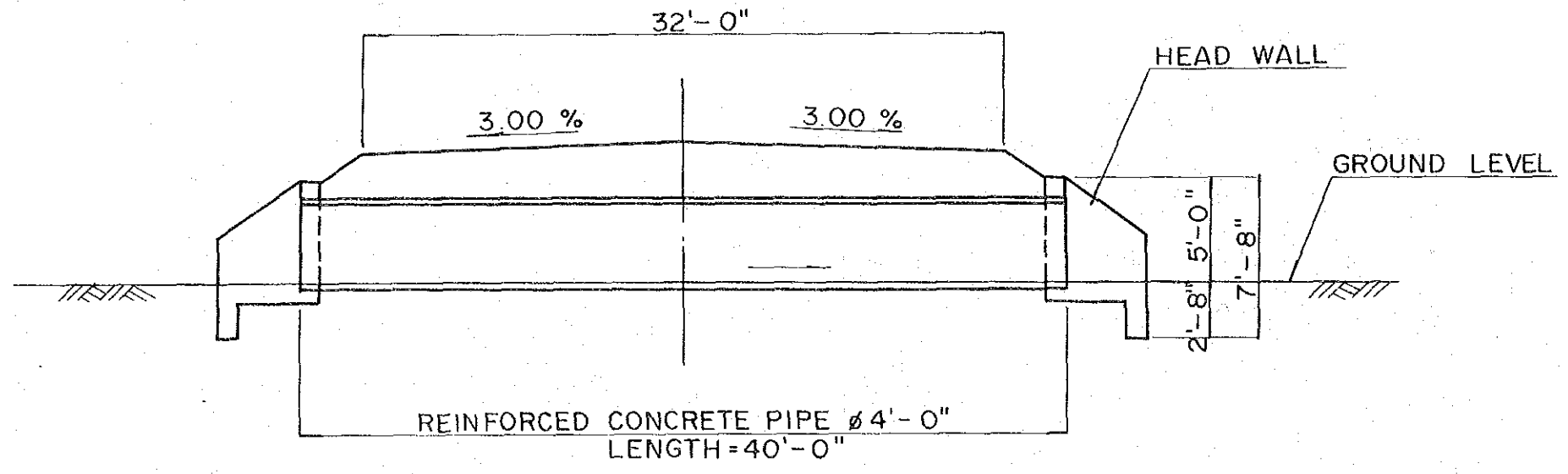


PLAN

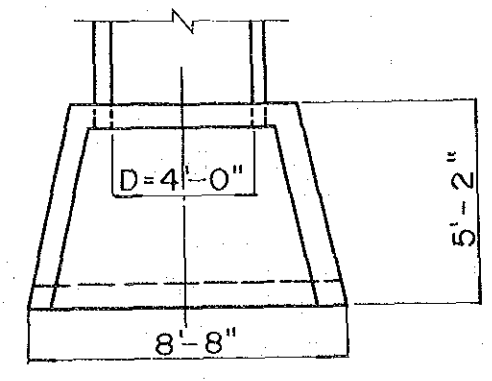




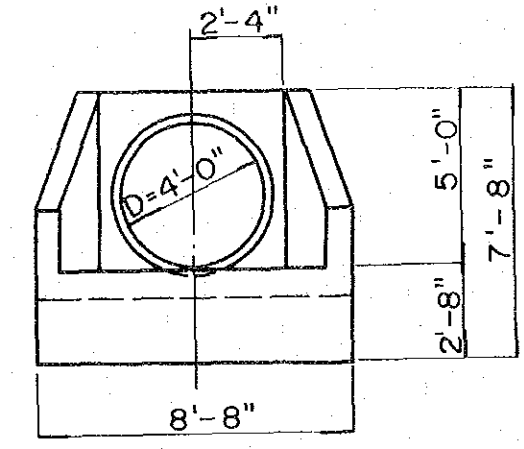
PROFILE



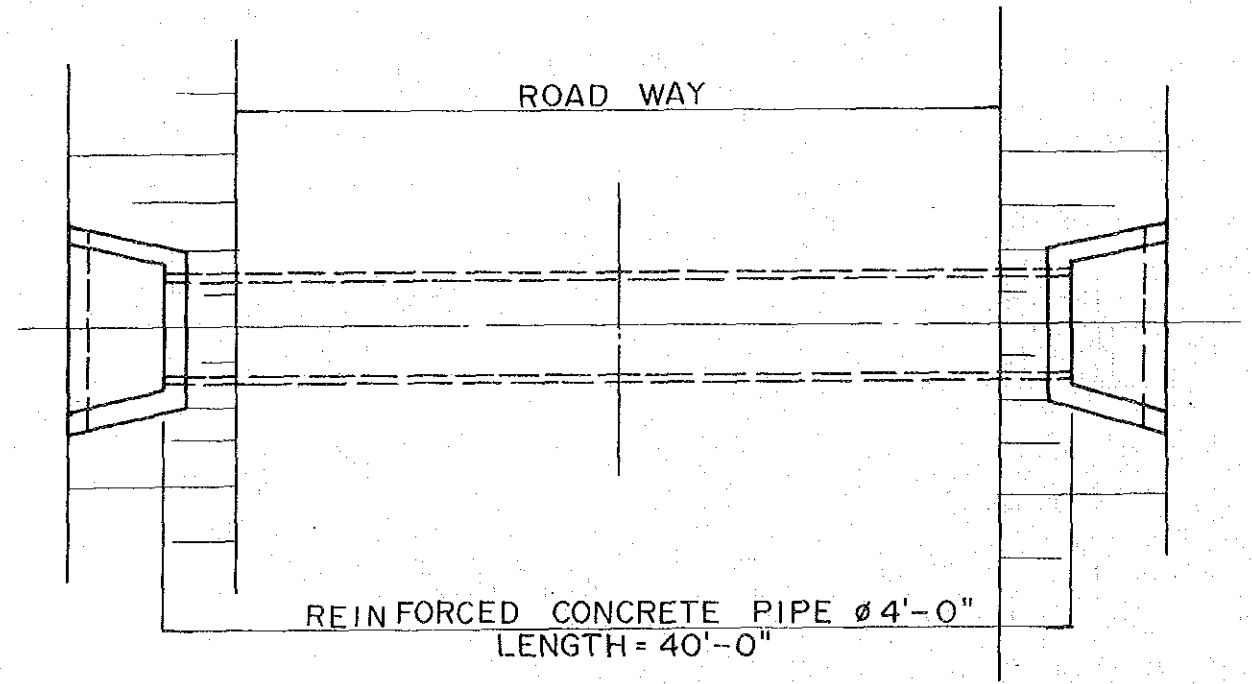
HEAD WALL



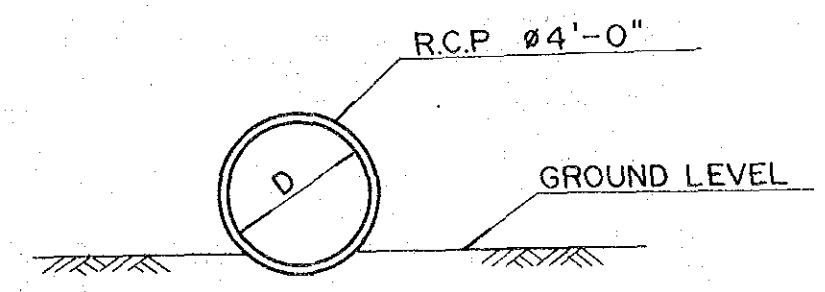
FRONT VIEW



PLAN



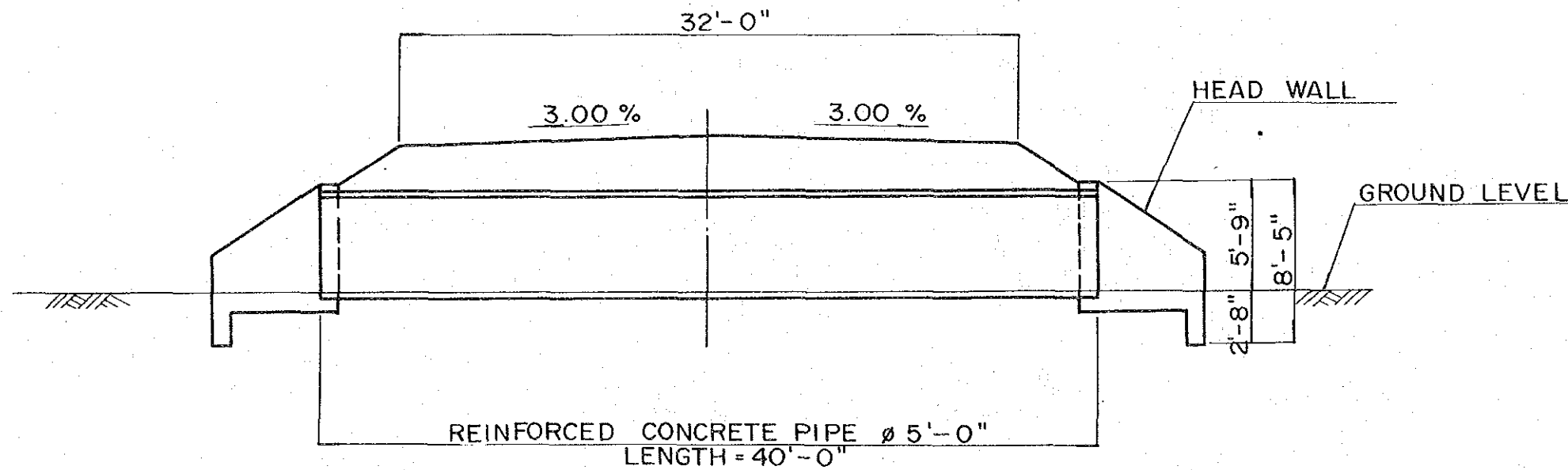
CROSS SECTION



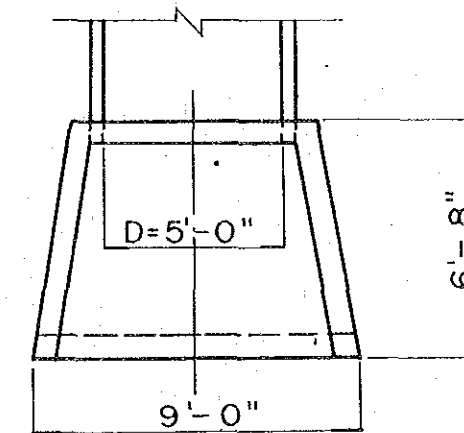
MAKENI-KAMAKWIE ROAD PROJECT			
FEASIBILITY STUDY			
PIPE CULVERT Ø 5FT			DWG-46
SHEET NO.	8		

0 (Meters)	2	3	4	5	6
0 (Feet)	5	10	15	20	

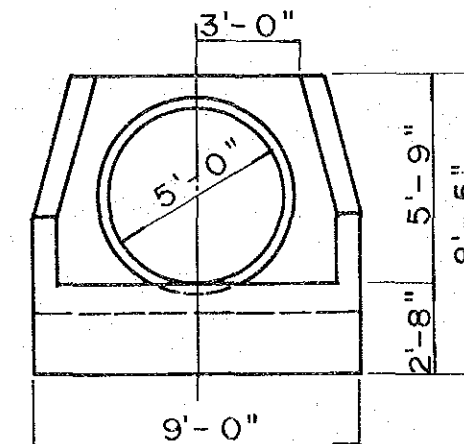
PROFILE



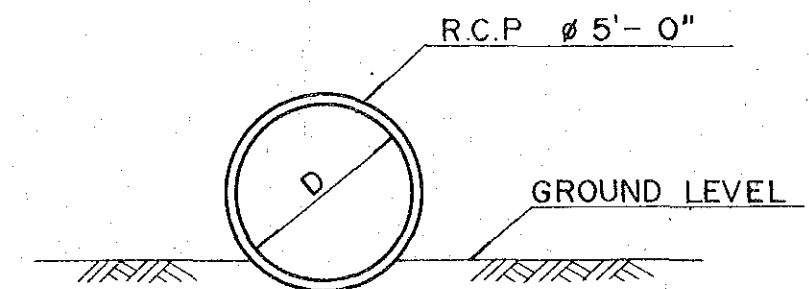
HEAD WALL



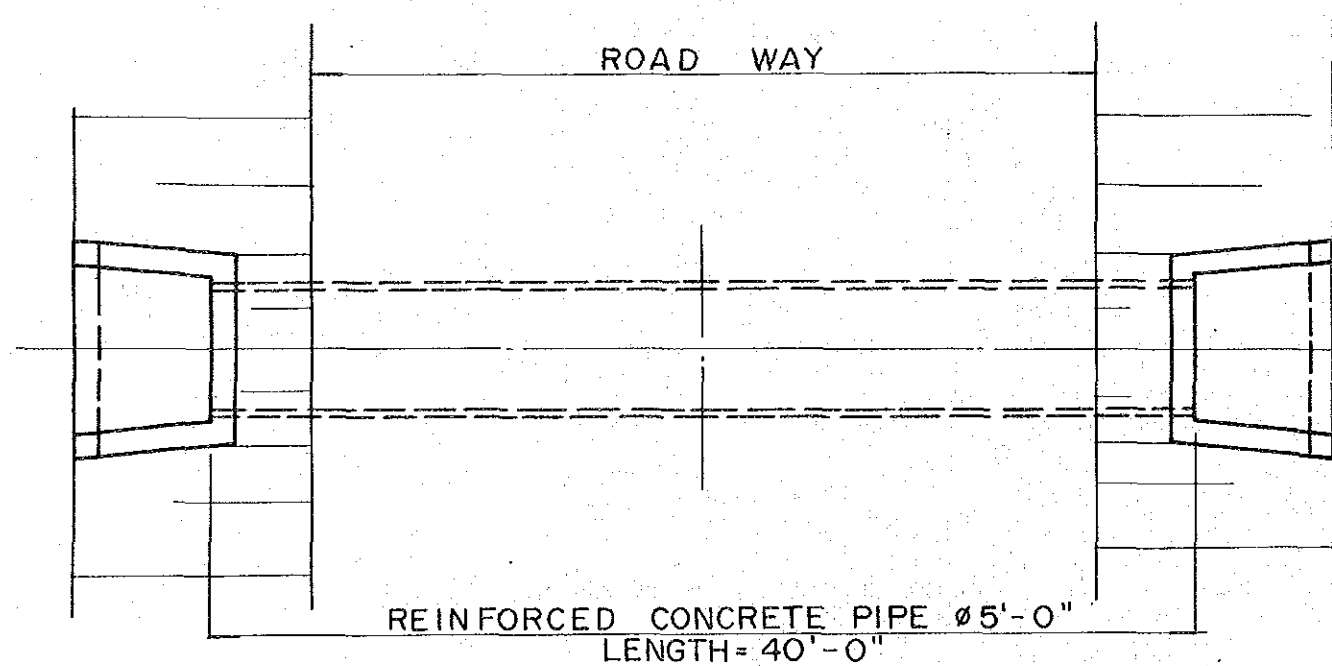
FRONT VIEW



CROSS SECTION

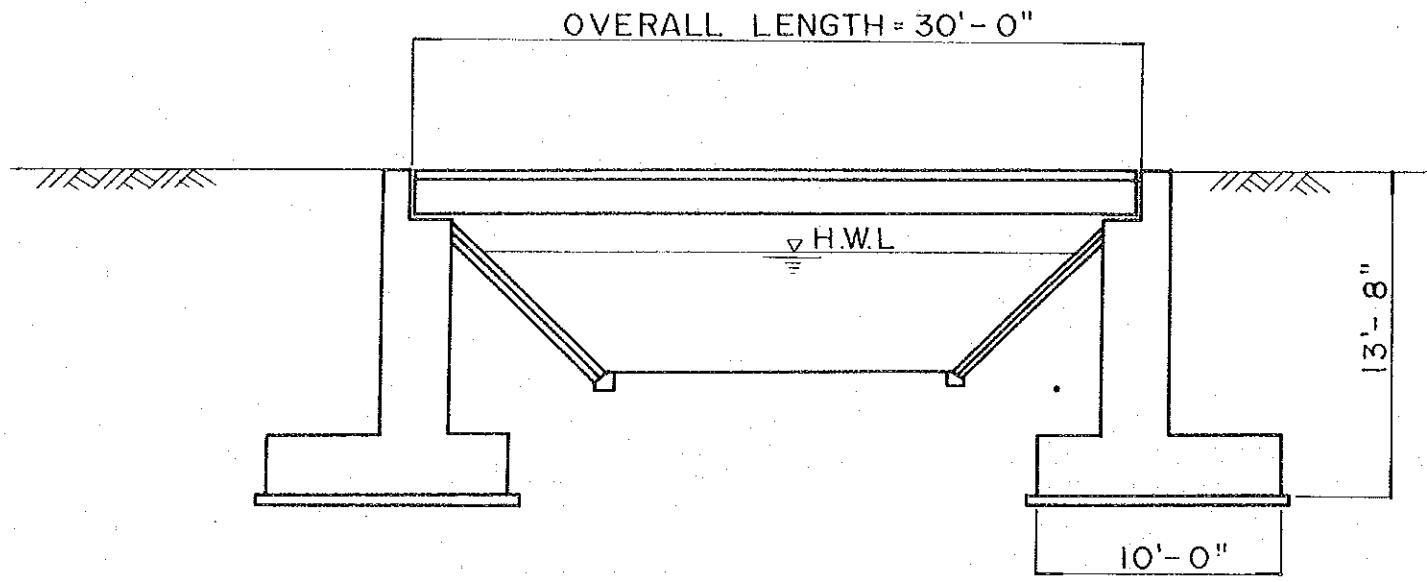


PLAN

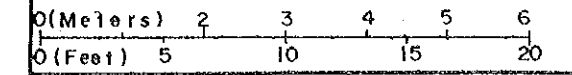
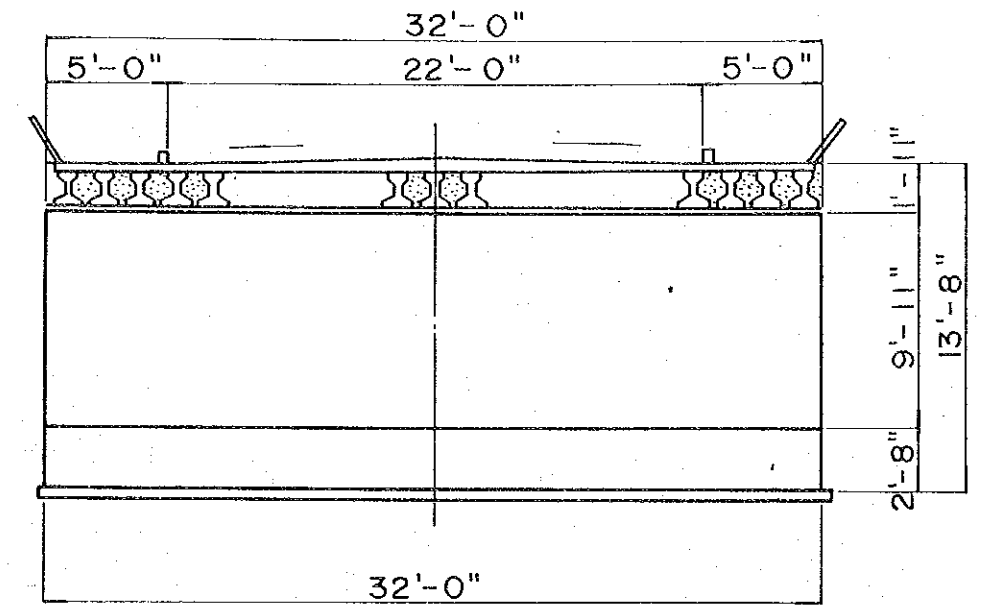


MAKENI-KAMAKWIE ROAD PROJECT			
FEASIBILITY STUDY			
STANDARD BRIDGE SPAN	30FT	DWG-46	
SHEET NO.	1		

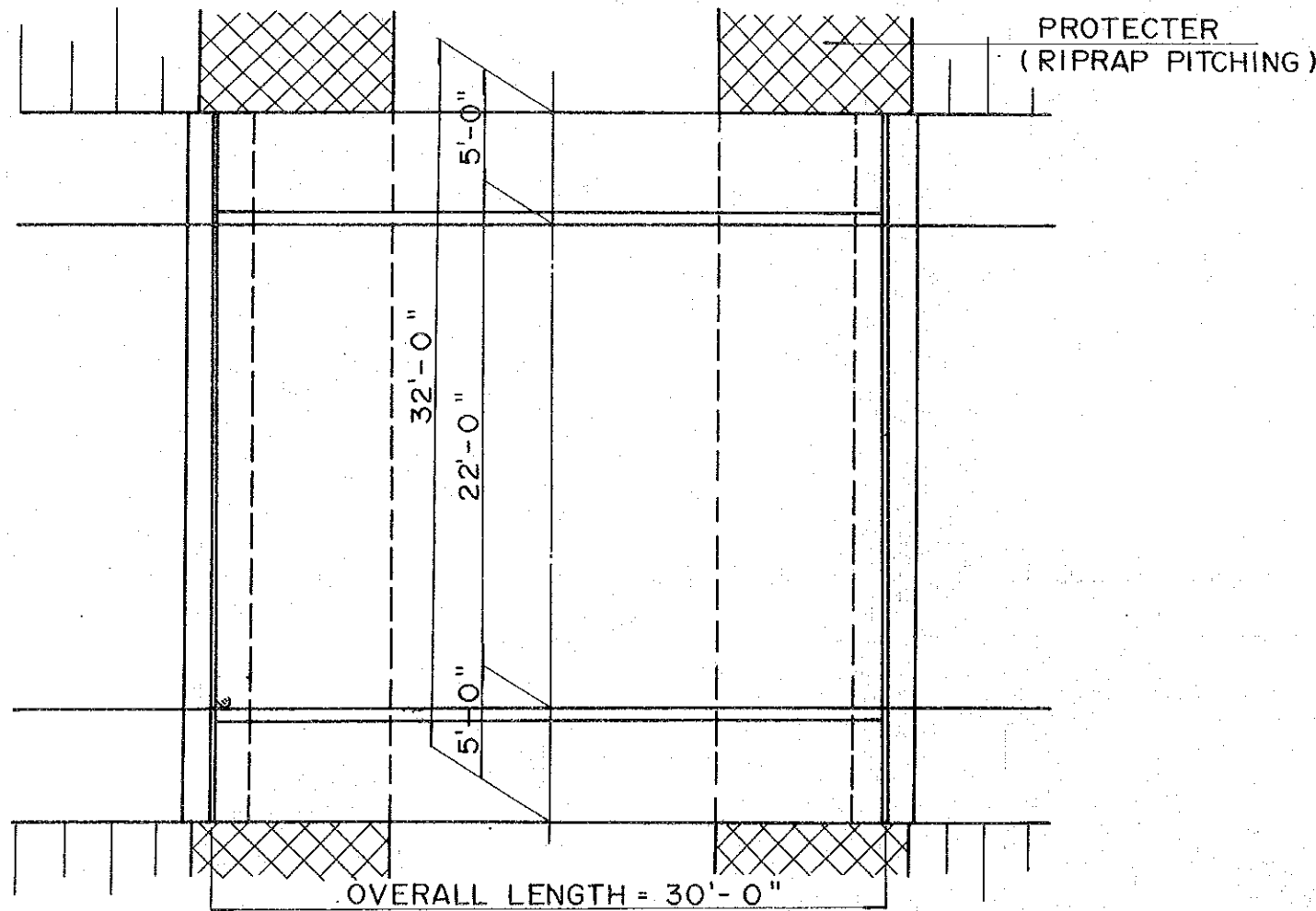
SIDE VIEW



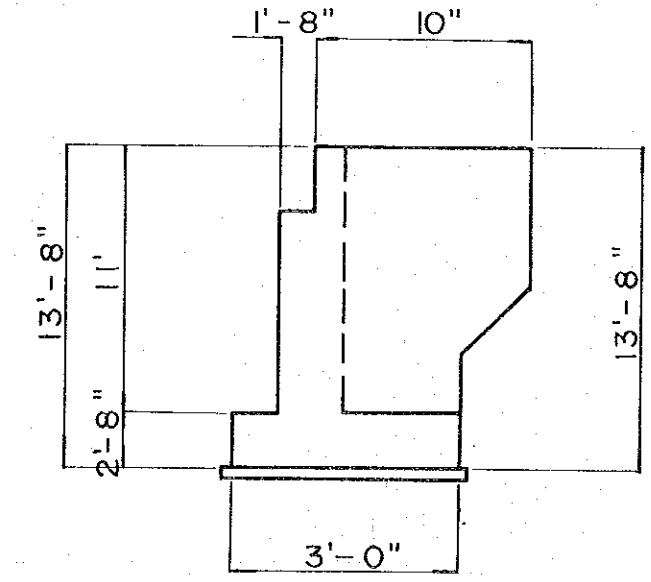
ABUTMENT

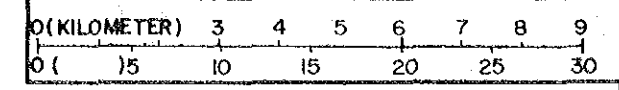


PLAN

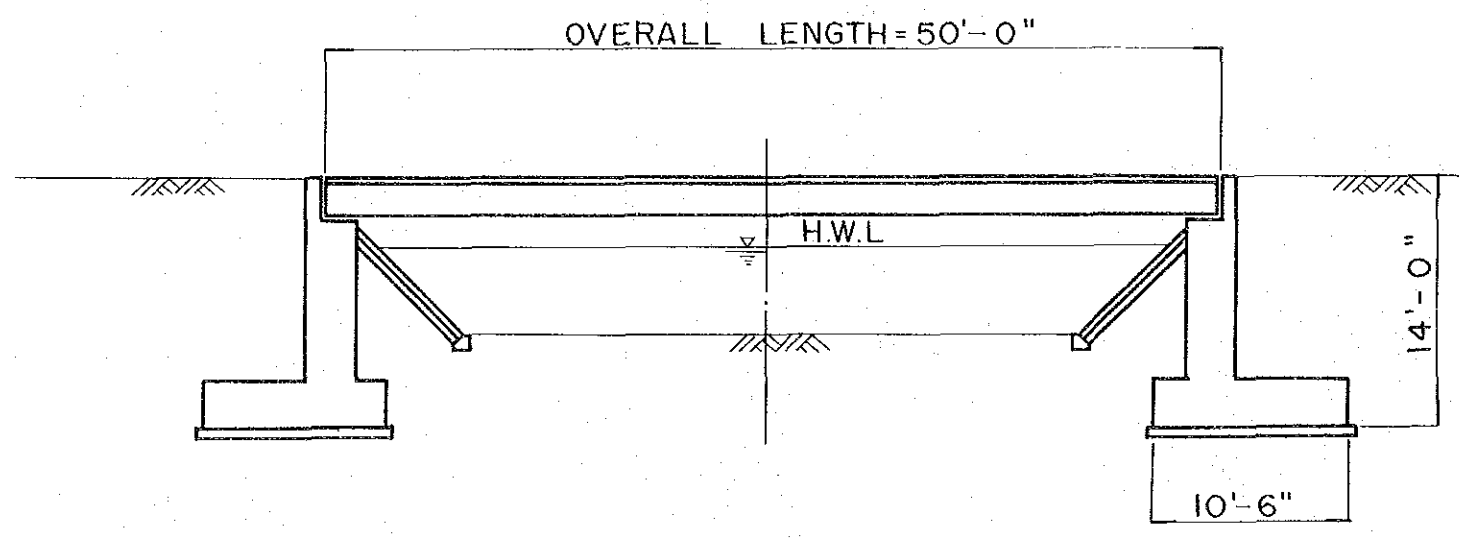


CROSS SECTION

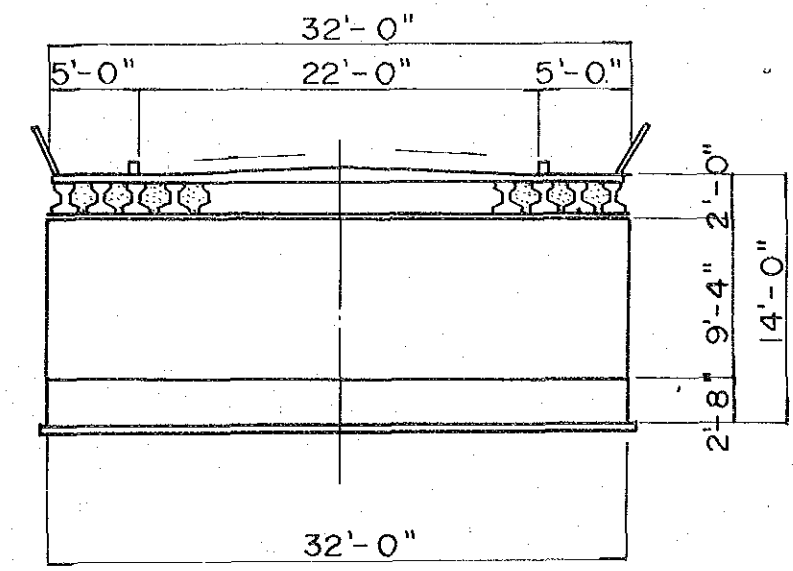




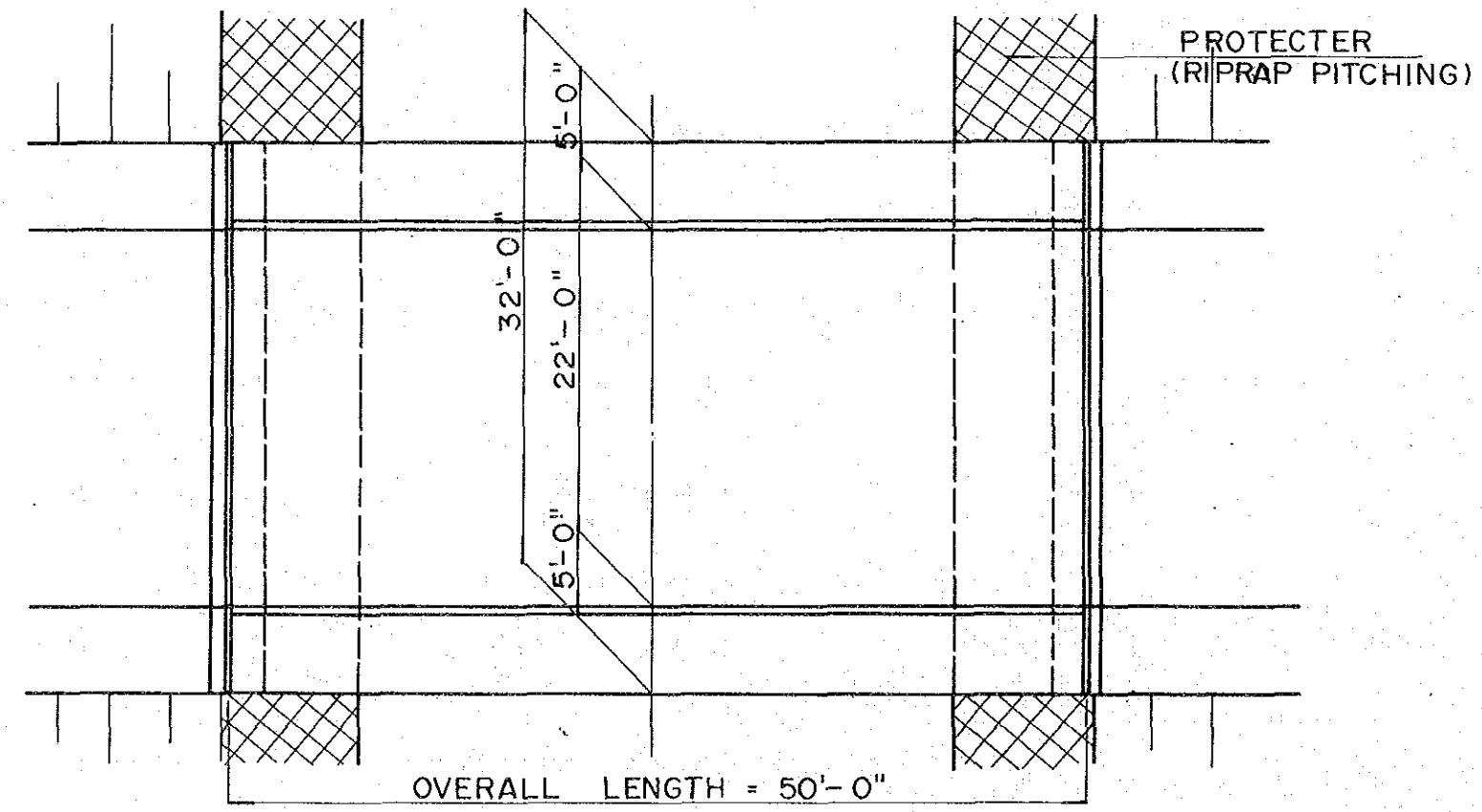
SIDE VIEW



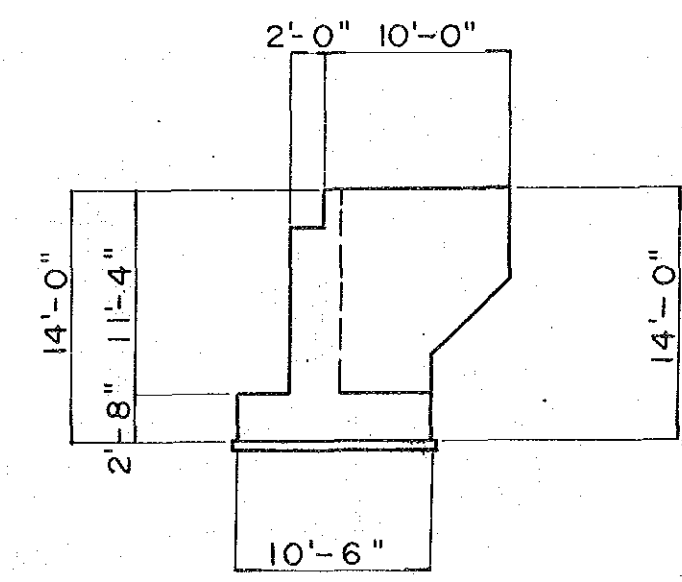
ABUTMENT



PLAN

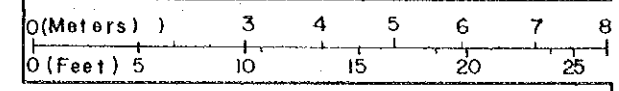


CROSS SECTION

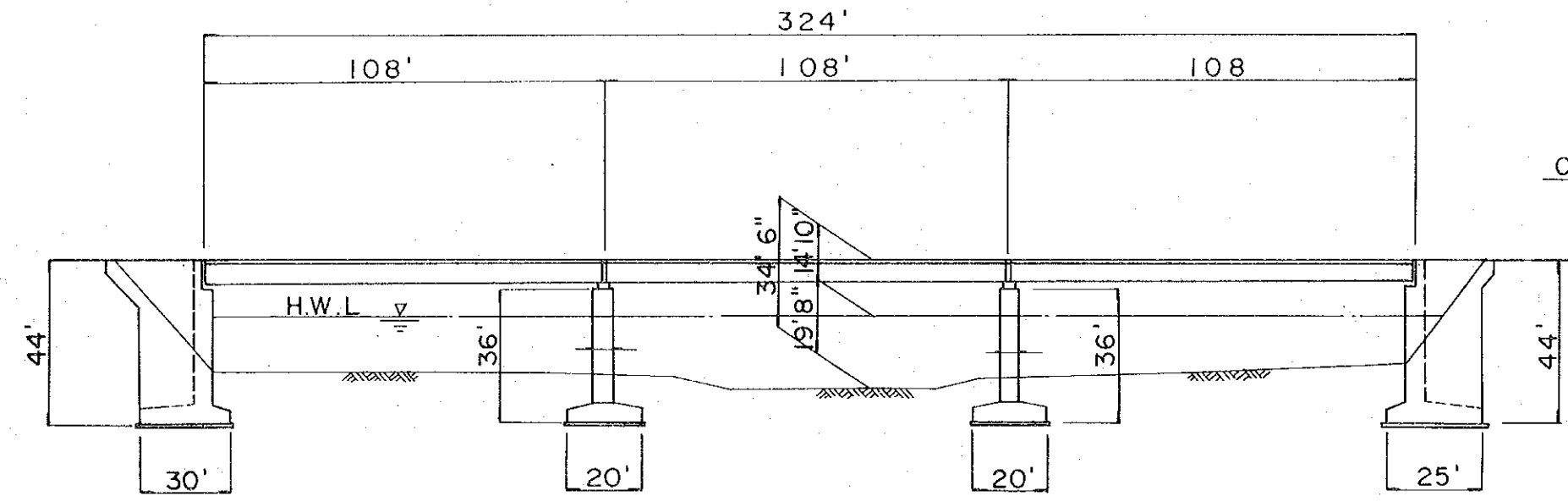


APPENDIX S-7 マボレ橋の代替案と一般図

Type of Bridge	Cross Section of Bridge	Structure	Work Item	Bill of Quantities	Direct Construction Cost
Post-tension concrete girder bridge		Superstructure Substructure Abutment Pier Total	- Reinforced concrete Excavation Temporary work Reinforced concrete Excavation Temporary work	1,152 Sq.Yd 420 Cu.Yd 1,260 Cu.Yd - 470 Cu.Yd 990 Cu.Yd -	Le. 403,680 68,040 2,280 26,880 76,080 1,800 30,120 608,880
Composed steel girder bridge		Superstructure Sub-structure Abutment Pier Total	- Reinforced concrete Excavation Temporary work Reinforced concrete Excavation Temporary work	1,152 Sq.Yd 371 Cu.Yd 1,061 Cu.Yd - 424 Cu.Yd 875 Cu.Yd -	Le. 489,360 59,800 1,920 22,200 68,350 1,580 24,840 668,050

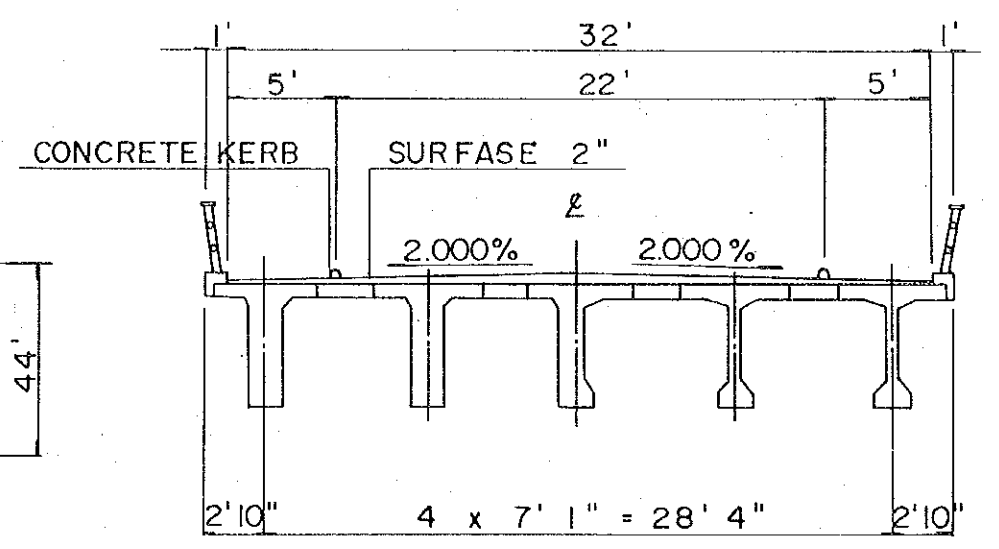


PROFIEL

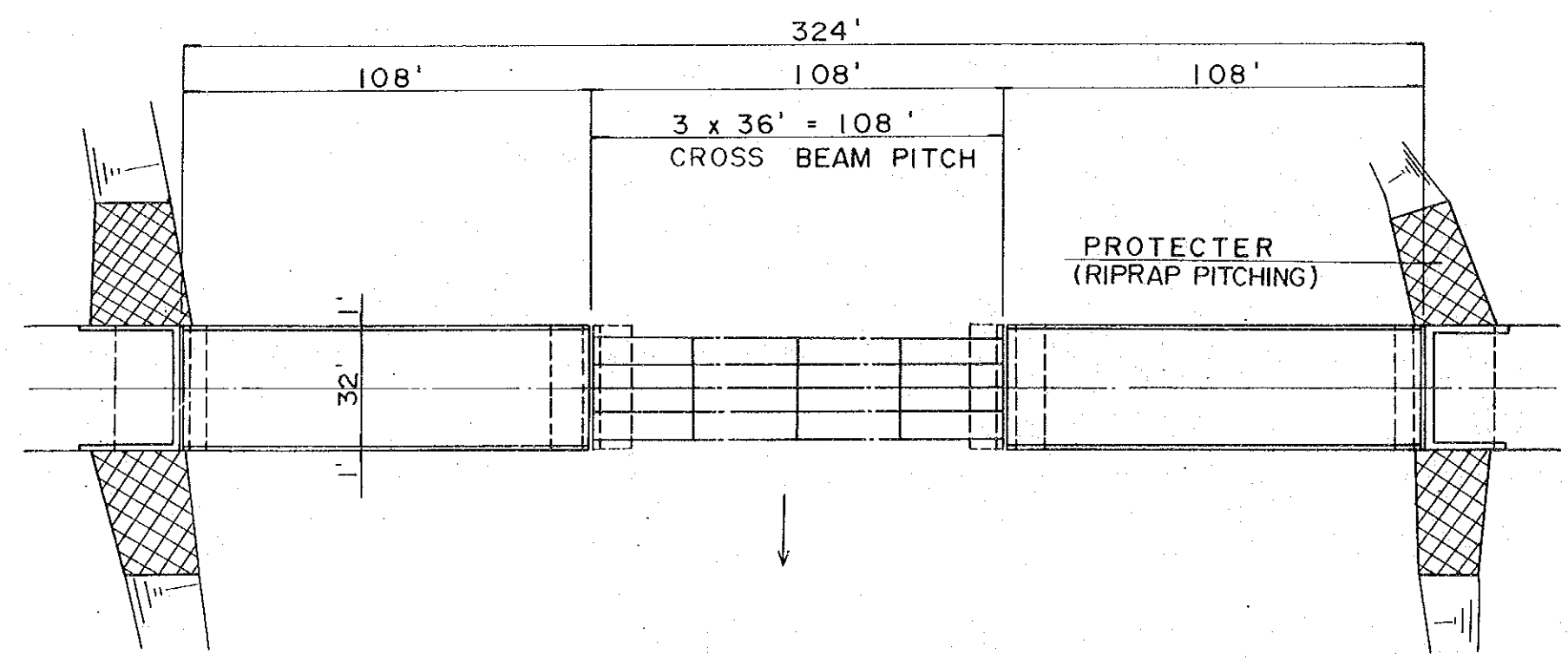


CROSS SECTION

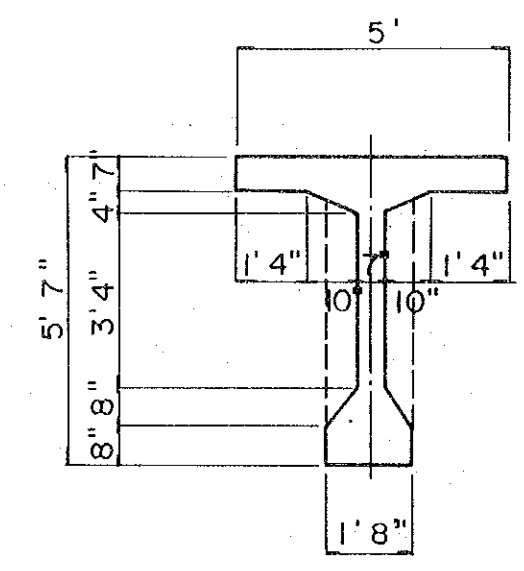
(PIER SECTION) (CENTER SECTION)



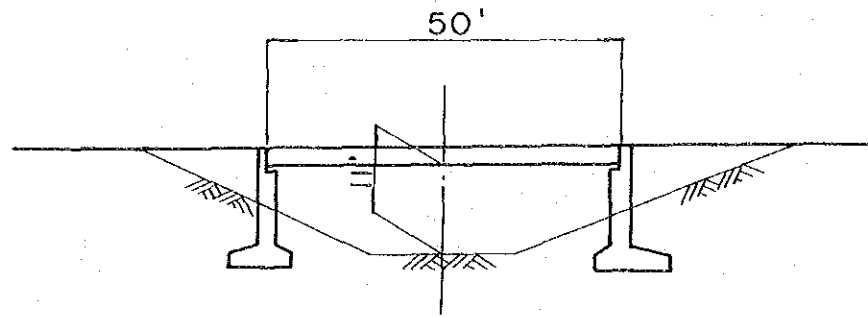
PLAN



SECTION OF POST-TENSION PRESTRESSED CONCRETE GIRDER

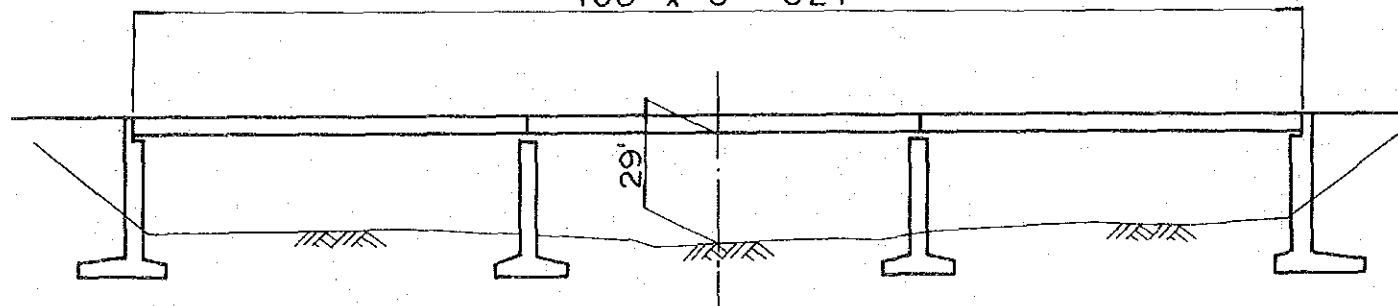


STA. 6+00
(3.7 MILES)

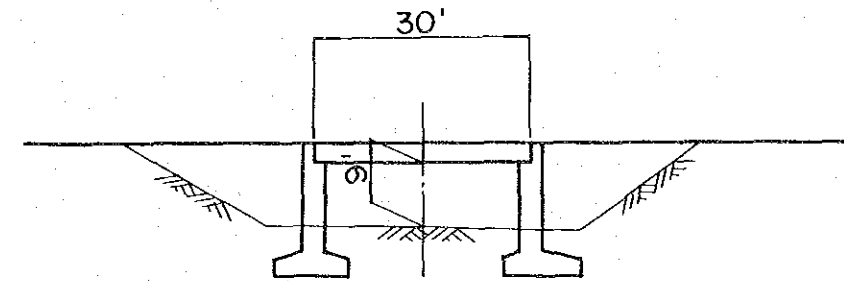


STA. 8+00
(5.0 MILES)

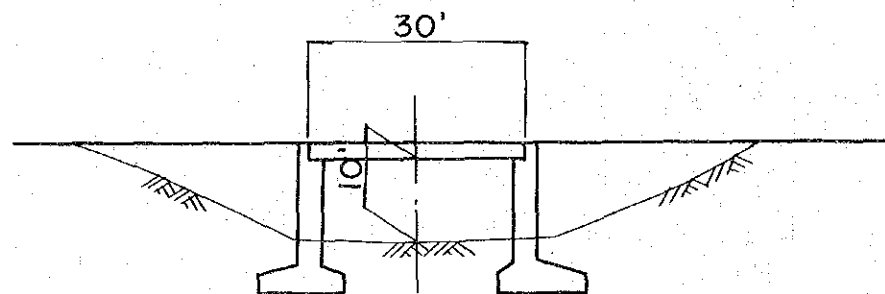
108' x 3 = 324'



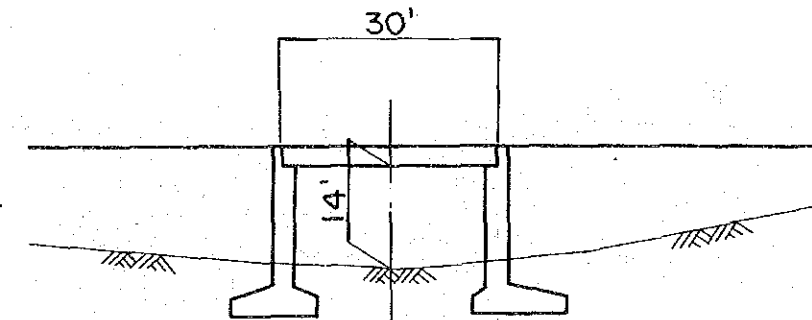
STA. 22+20
(13.9 MILES)



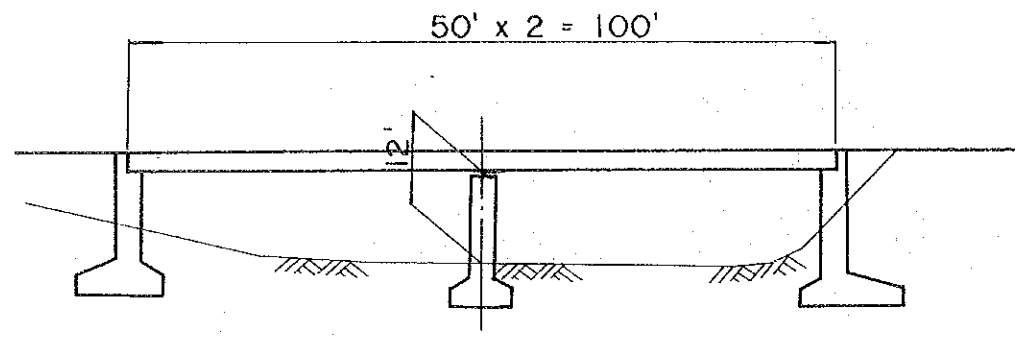
STA. 13+20
(8.3 MILES)



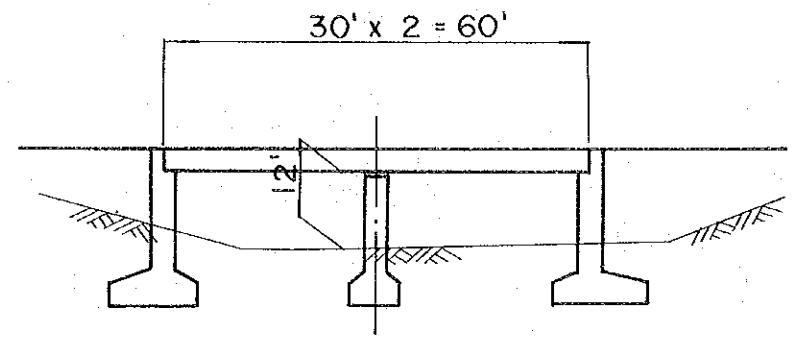
STA. 26+30
(16.4 MILES)



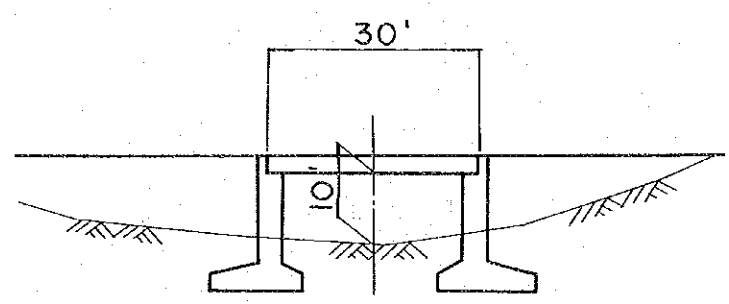
STA. 27+20
(17.0 MILES)



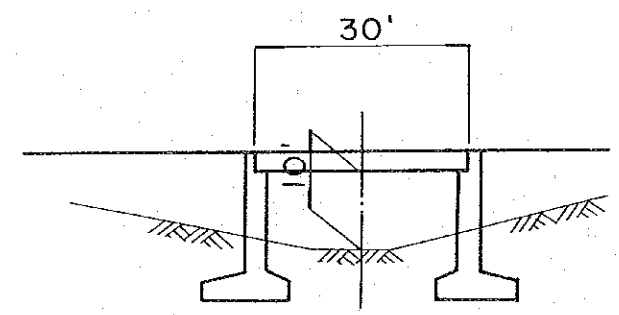
STA. 43+10
(26.6 MILES)



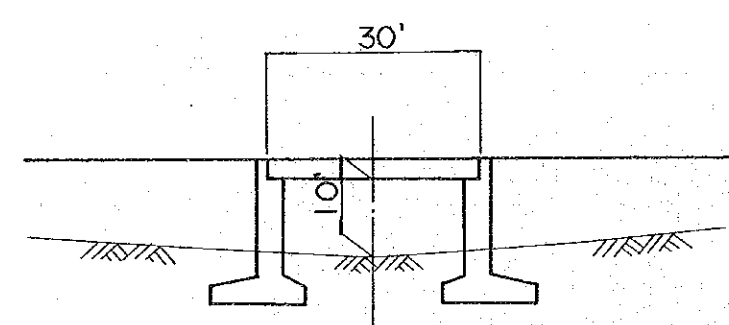
STA. 34+00
(21.3 MILES)



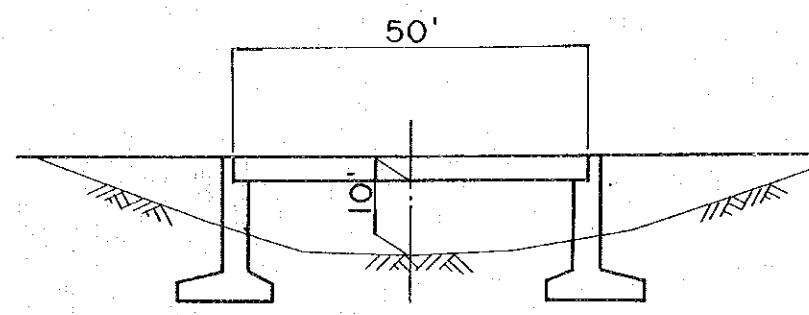
STA. 45+40
(28.4 MILES)



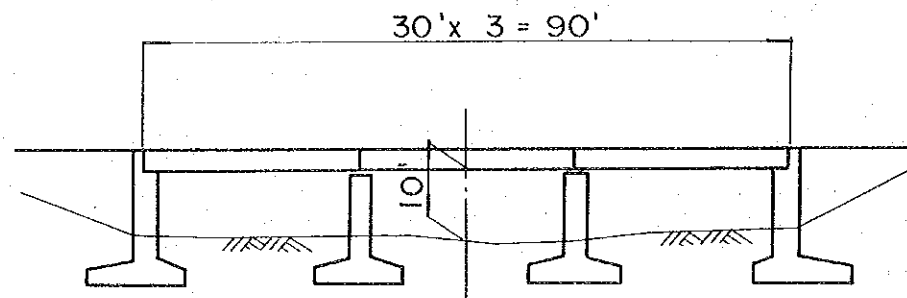
STA. 35+10
(21.9 MILES)



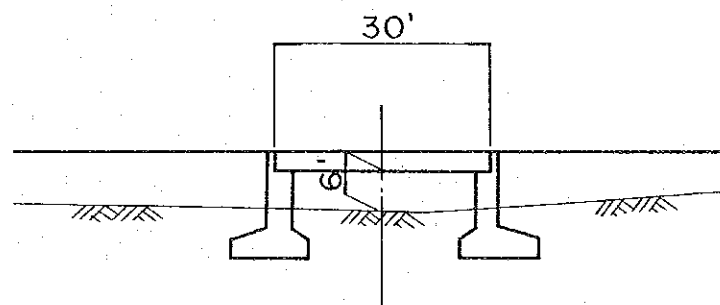
STA. 51+20
(32.0 MILES)



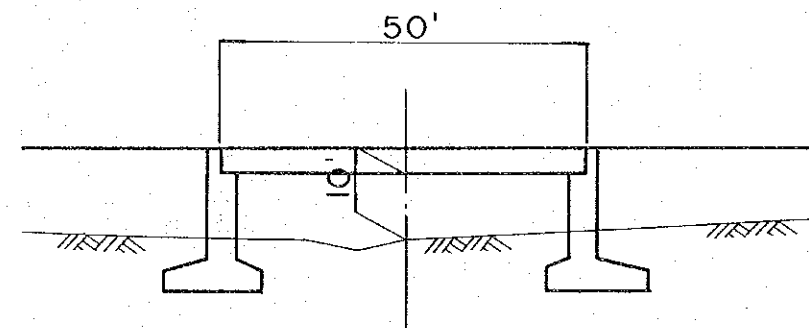
STA. 60 + 30
(37.7 MILES)



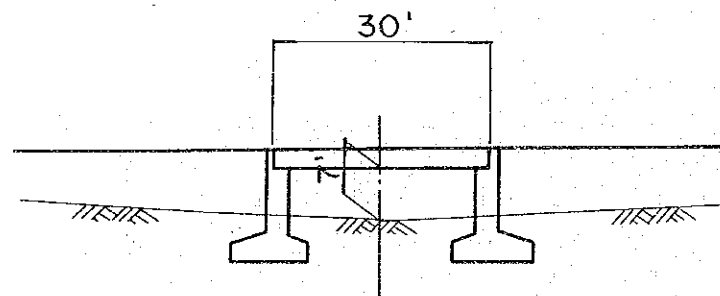
STA. 64 + 10
(40.0 MILES)



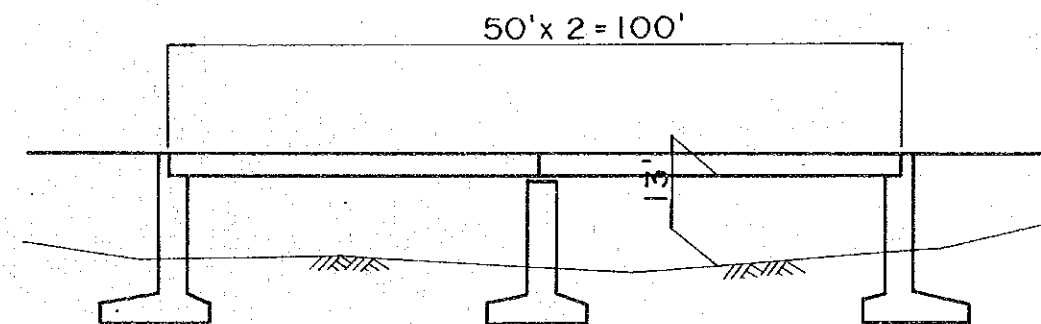
STA. 67 + 00
(41.90 MILES)



STA. 64 + 80
(40.5 MILES)



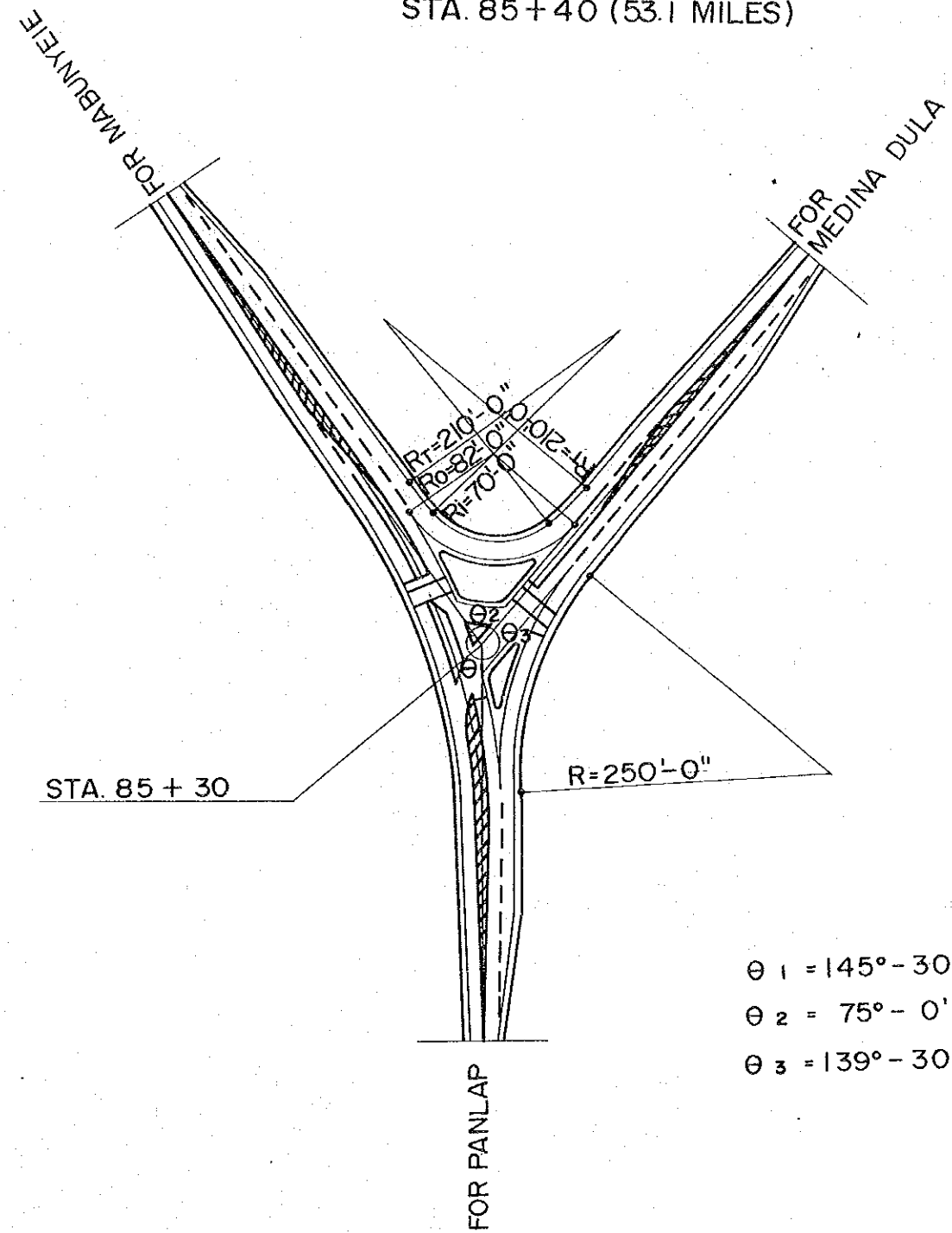
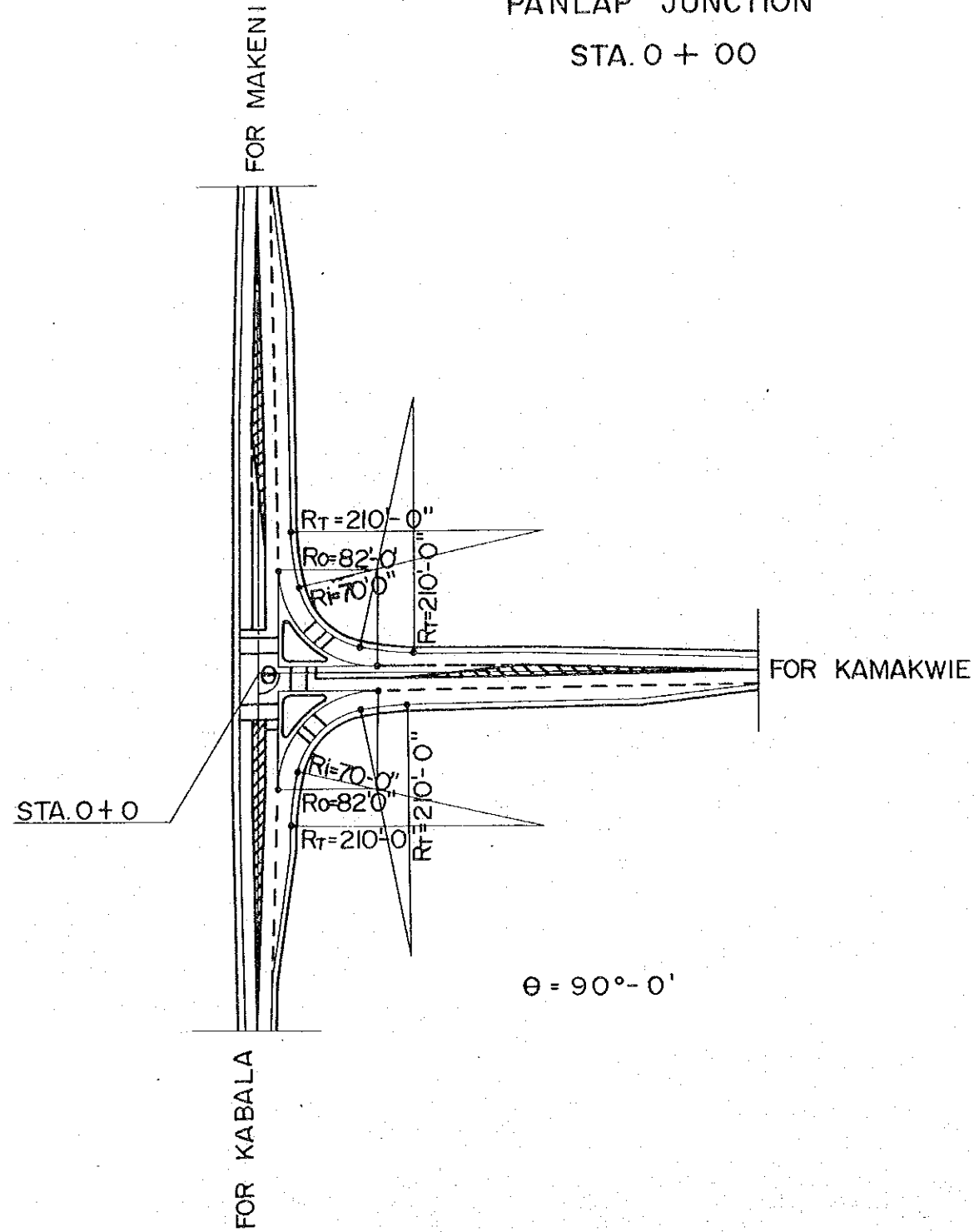
STA. 74 + 20
(46.4 MILES)



MAKENI-KAMAKWIE ROAD PROJECT FEASIBILITY STUDY	
JUNCTION	DWG-52
SHEET NO. 1	

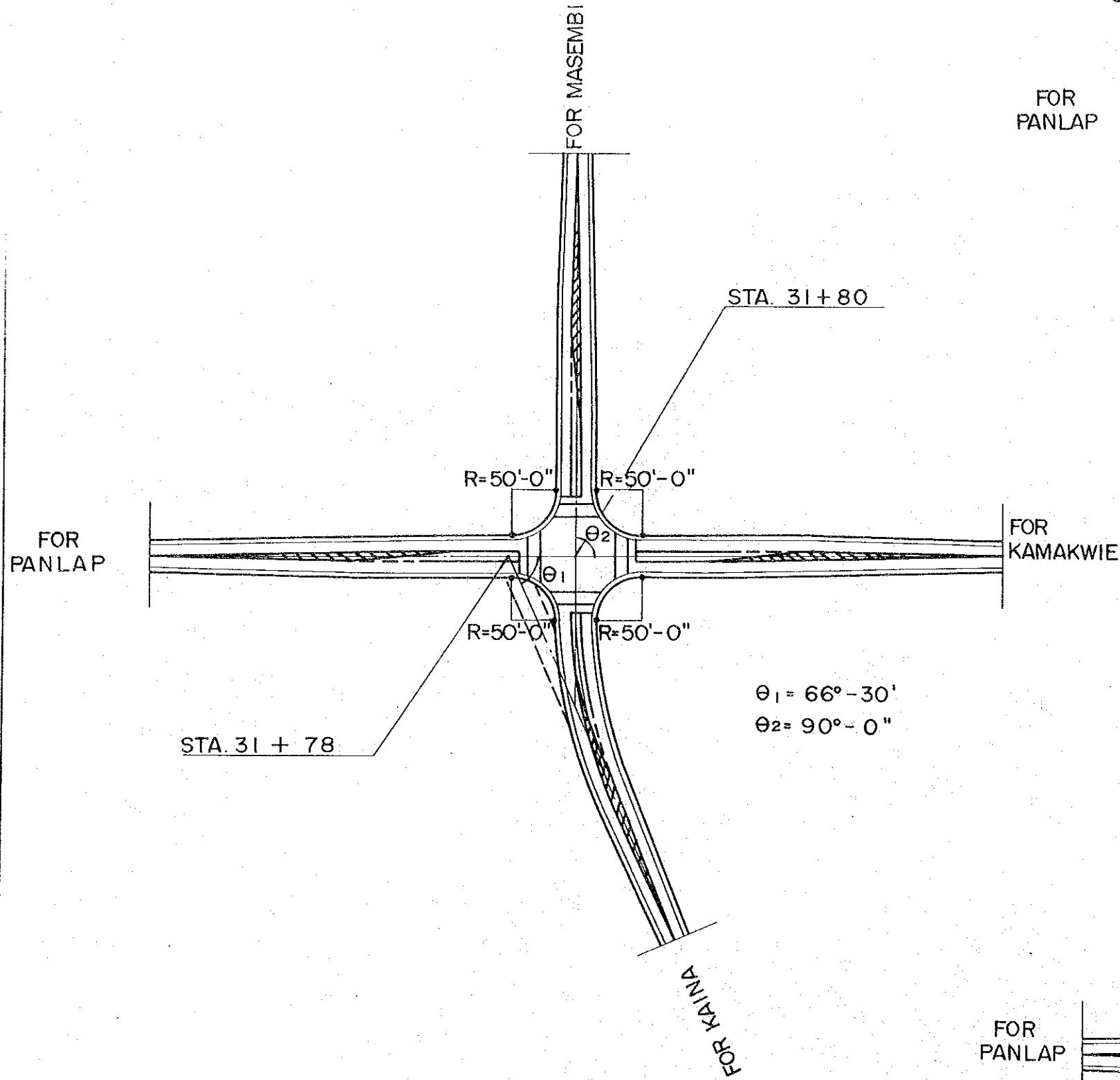
PANLAP JUNCTION
STA. 0 + 00

KAMAKWIE JUNCTION
STA. 85 + 40 (53.1 MILES)

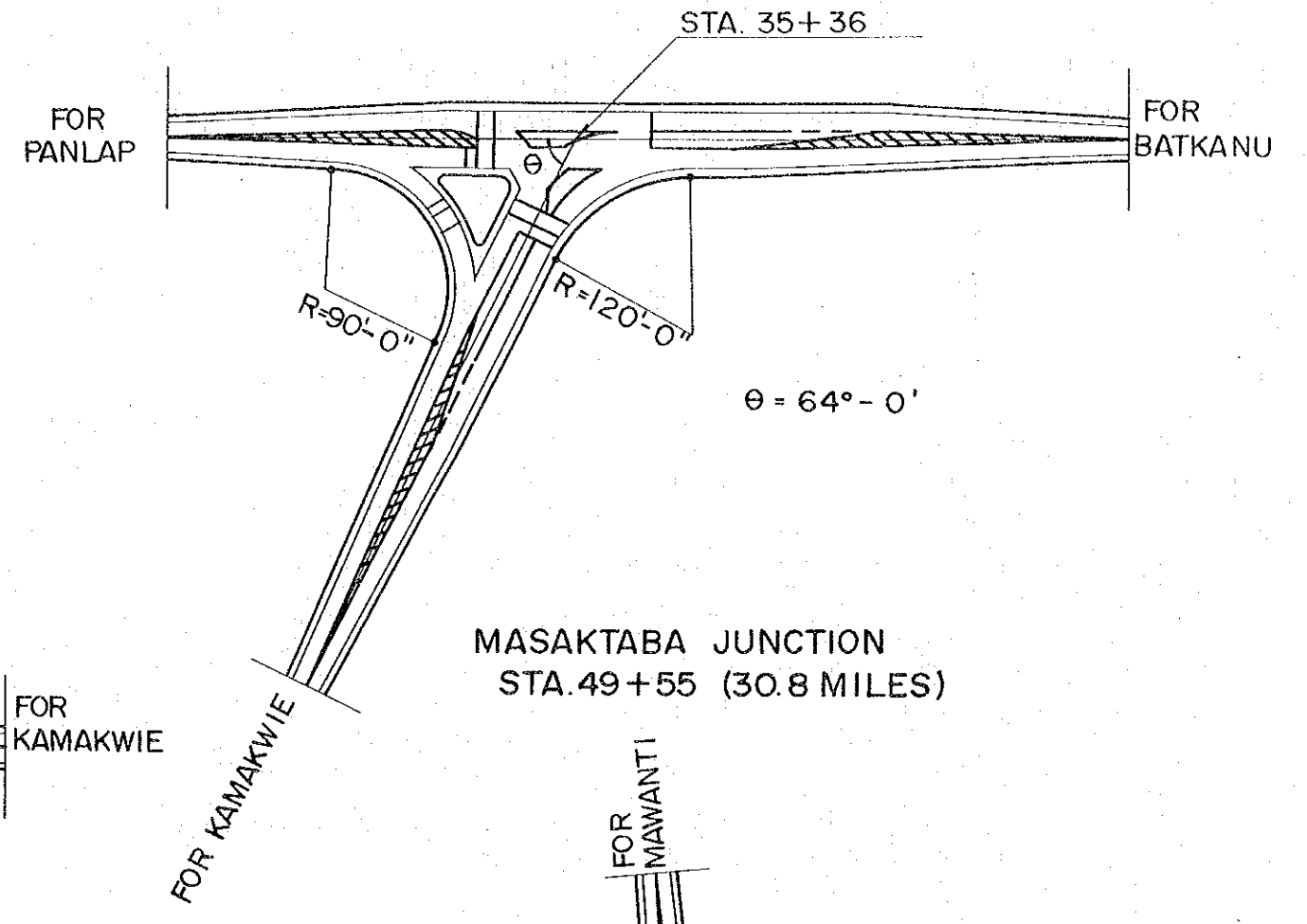


MAKENI-KAMAKWIE ROAD PROJECT FEASIBILITY STUDY	
JUNCTION	
SHEET NO. 2	DWG-53

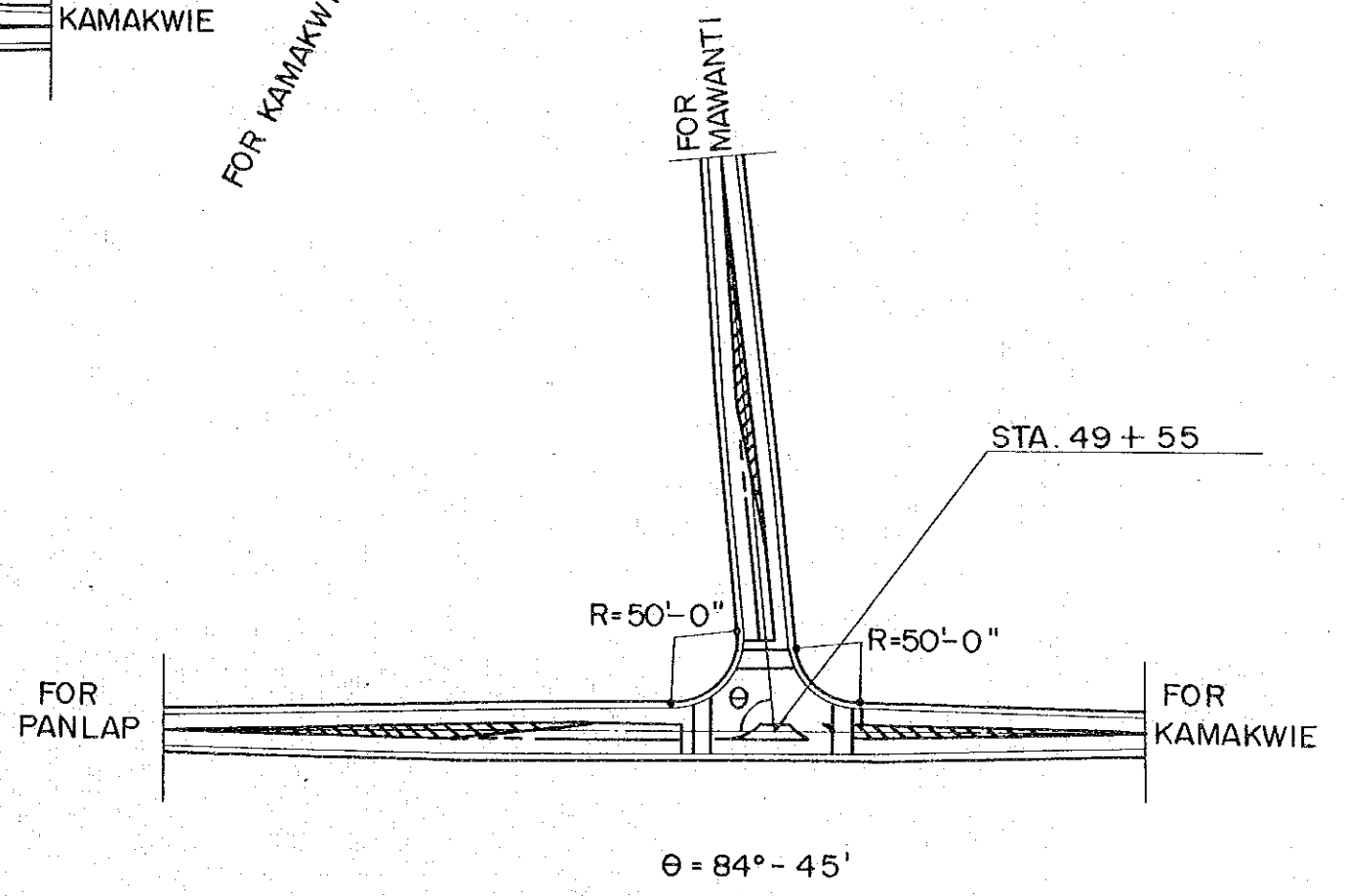
GBENDEMBU JUNCTION
STA. 31+80 (19.8 MILES)



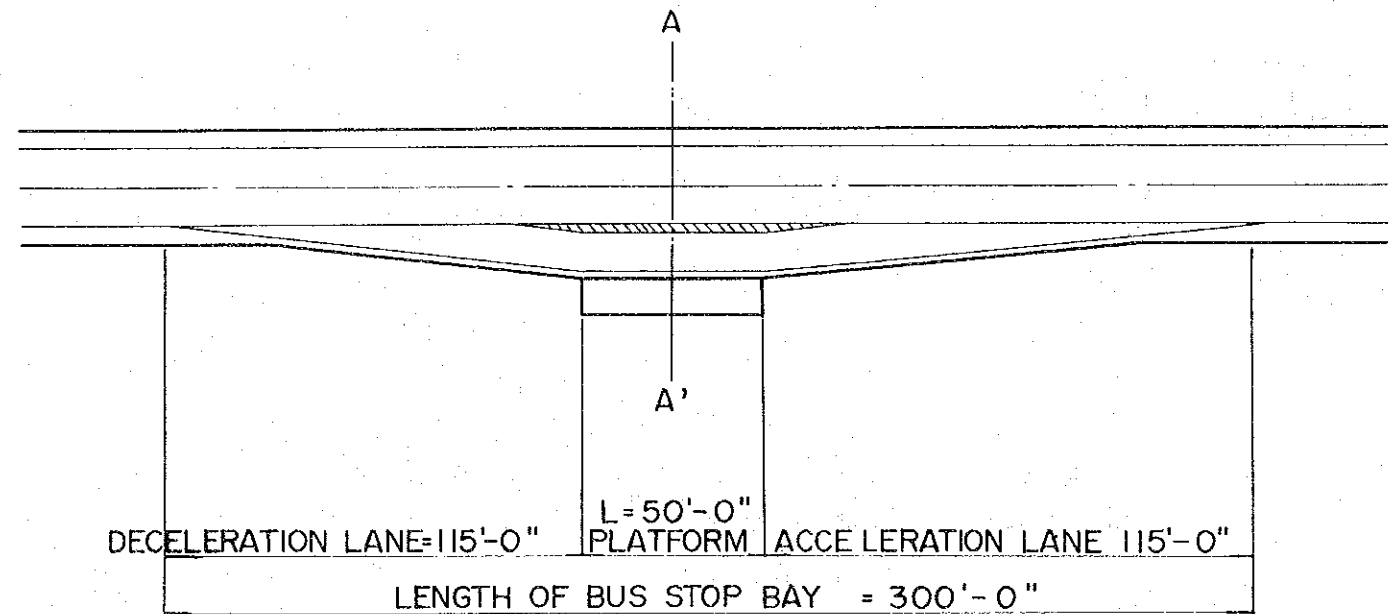
MAGBANDANI JUNCTION
STA. 35+36 (22.0 MILES)



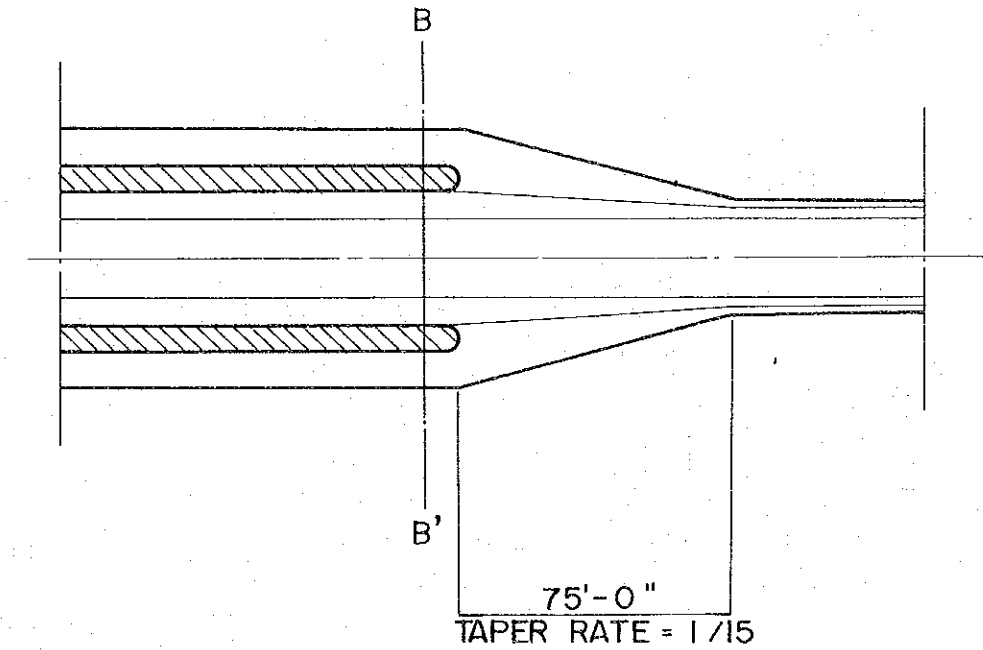
MASAKTABA JUNCTION
STA. 49+55 (30.8 MILES)



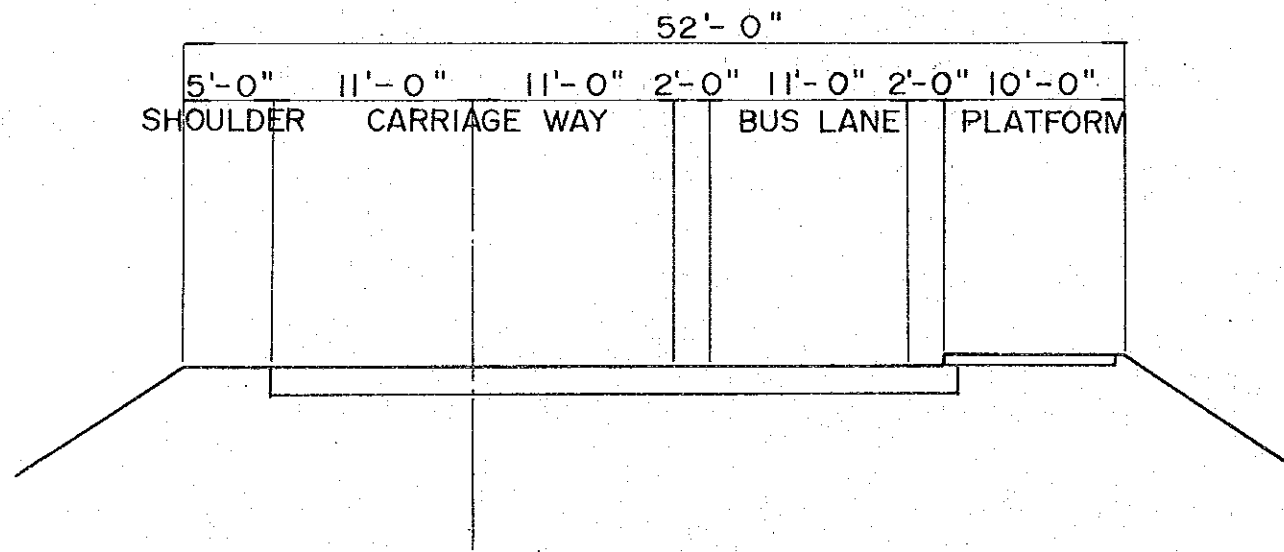
LANE OF BUS STOP



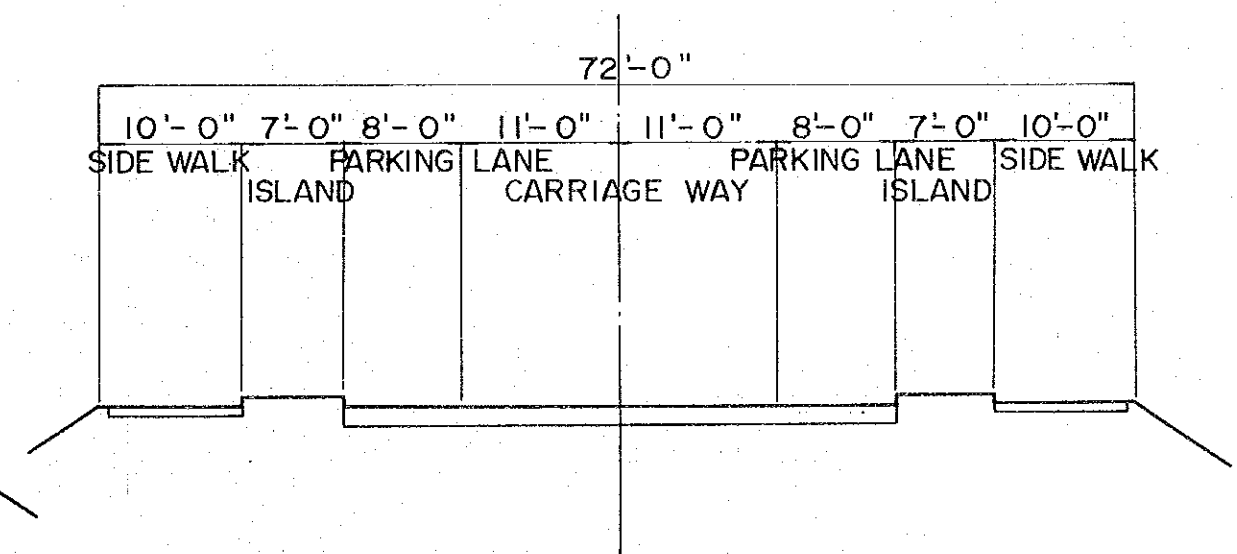
ROAD SECTION FOR DENSE-POPULATED AREA



SECTION A - A



SECTION B - B



APPENDIX T-1 財政的、経済的建設費の概略算定

1. Calculation of Direct Construction Cost for Alternative Plan A in 1978

Unit : Le. 1000

Work Item	Unit of Quantity	Bill of Quantity	Unit Price (Le)	Financial Cost						Economic Cost		Labour Cost			
				Local		Foreign		Total		Rate	Cost	Rate	Cost		
				Rate	Cost	Rate	Cost	Rate	Cost						
Construction work															
Earth work															
Site Clearance & Grubbing	Acre	50	468.0	5.0	1.2	95.0	22.2	1.00	23.4	68.0	15.9	2.8	0.7		
Fell trees 2 ft. dia.	Sq.yd	35,000	1.2	100.0	42.0	0	-	"	42.0	20.0	8.4	80.0	33.6		
Strip top soil	Sq.yd	99,600	0.4	33.5	13.3	66.5	26.5	"	39.8	69.0	15.0	2.5	1.0		
Soil excavation	Cu.yd	1,005,200	1.4	8.0	112.6	92.0	1,294.7	"	1,407.3	65.0	914.7	8.0	112.6		
Excavation of rippable rock	Cu.yd	3,300	2.9	5.0	0.5	95.0	9.1	"	9.6	67.0	6.4	4.2	0.4		
Embankment	Cu.yd	606,000	5.6	10.0	339.4	90.0	3,054.2	"	3,393.6	65.0	2,205.8	8.3	281.7		
Riprap slope protection	Sq.yd	195,700	0.2	100.0	39.1	-	-	"	39.1	20.0	7.8	80.0	31.3		
Side ditch	ft.	78,300	0.6	100.0	47.0	0	-	"	47.0	20.0	9.4	80.0	37.6		
Culvert work															
Pipe culvert 3 ft. dia.	ft.	6,798	56.4	32.0	122.9	68.0	260.5	1.00	383.4	70.0	268.4	9.7	37.2		
Pipe culvert 4 ft. dia.	ft.	105	93.6	31.5	3.0	68.5	6.8	"	9.8	72.4	7.1	9.2	0.9		
Pipe culvert 5 ft. dia.	ft.	63	130.8	28.0	2.3	72.0	5.9	"	8.2	70.7	5.8	8.5	0.7		
Box culvert 5 ft. x 5 ft.	ft.	33	151.2	48.0	2.4	52.0	2.6	"	5.0	68.0	3.4	16.0	0.8		
Box culvert 7 ft. x 7 ft.	ft.	333	212.4	45.8	32.4	54.0	38.3	"	70.7	68.0	48.1	15.9	11.2		
Box culvert 10 ft. x 10 ft.	ft.	675	345.6	45.0	105.0	55.0	128.3	"	233.3	68.0	158.4	15.5	36.2		
Box culvert 13 ft. x 13 ft.	ft.	249	606.0	40.0	60.4	60.0	90.5	"	150.9	68.0	102.6	14.0	21.1		
Box culvert 10 ft. x 10 ft. Double	ft.	33	639.6	42.2	8.9	57.8	12.2	"	21.1	68.0	14.3	14.5	3.1		
Bridge work															
30 ft. Span Bridge	Sq.yd	1,345	281.5	41.3	156.4	58.7	222.2	1.00	378.6	69.2	261.9	13.2	50.1		
50 ft. Span Bridge	Sq.yd	1,380	340.7	41.3	194.2	58.7	276.0	"	470.2	69.2	325.2	13.2	62.1		
Mabole Bridge	Sq.yd	1,152	528.6	41.3	251.5	58.7	357.4	"	608.9	69.2	421.2	13.2	80.4		
Pavement work															
	Sq.yd	673,300	8.1	39.5	2,154.2	60.5	3,299.5	1.00	5,453.7	79.7	4,346.6	2.2	120.0		
Miscellaneous work															
	-			29.0	185.5	71.0	454.2	1.00	639.7	72.0	460.7	7.1	45.4		
Total						28.8	3,874.2	71.2	9,561.1	1.00	13,435.3	71.5	9,607.1	7.2	968.1

Source : JICA Mission.

2. Calculation of Direct Construction Cost for Alternative B at Stage I in 1978

Unit : Le. 1000

Work Item	Unit of Quantity	Bill of Quantity	Unit Price	Financial Cost						Economic Cost		Labour Cost			
				Local		Foreign		Total		Rate	Cost	Rate	Cost		
				Rate	Cost	Rate	Cost	Rate	Cost						
Construction work															
Earth work															
Site Clearance & Grubbing	Acre	45	468.0	5.0	1.1	95.0	20.0	1.00	21.1	68.0	14.3	2.8	0.6		
Fell trees 2 ft. dia.	Sq.yd	34,000	1.2	100.0	40.8	0	0	"	40.8	20.0	8.2	80.0	32.6		
Strip top soil	Sq.yd	80,600	0.4	33.5	10.8	66.5	21.4	"	32.2	69.0	22.2	2.5	0.8		
Soil excavation	Cu.yd	867,800	1.4	8.0	97.2	92.0	1,117.7	"	1,214.9	65.0	789.7	8.0	97.2		
Excavation of rippable rock	Cu.yd	3,300	2.9	5.0	0.5	95.0	9.1	"	9.6	67.0	6.4	4.2	0.4		
Embankment	Cu.yd	556,300	5.6	10.0	311.5	90.0	2,803.8	"	3,115.3	65.0	2,024.9	8.3	258.6		
Riprap slope protection	Sq.yd	176,300	0.07	100.0	12.3	0	0	"	12.3	20.0	2.5	82.0	10.1		
Side ditch	ft.	70,800	0.6	100.0	42.5	0	0	"	42.5	20.0	8.5	80.0	34.0		
Culvert work															
Pipe culvert 3 ft. dia.	ft.	6,798	56.4	32.0	122.7	68.0	260.7	1.00	383.4	70.0	268.4	9.7	37.2		
Pipe culvert 4 ft. dia.	ft.	105	93.6	31.5	3.1	68.5	6.7	"	9.8	72.4	7.1	9.2	0.9		
Pipe culvert 5 ft. dia.	ft.	63	130.8	28.1	2.3	72.0	5.9	"	8.2	70.7	5.8	8.5	0.7		
Box culvert 5 ft. x 5 ft.	ft.	33	151.2	48.0	2.4	52.0	2.6	"	5.0	68.0	3.4	16.0	0.8		
Box culvert 7 ft. x 7 ft.	ft.	333	212.4	46.0	32.5	54.0	38.2	"	70.7	68.0	48.1	15.9	11.2		
Box culvert 10 ft. x 10 ft.	ft.	675	345.6	45.0	105.0	55.0	128.3	"	233.3	68.0	158.6	15.5	36.2		
Box culvert 13 ft. x 13 ft.	ft.	249	606.0	40.0	60.4	60.0	90.5	"	150.9	68.0	102.6	14.0	21.1		
Box culvert 10ft.x10ft. Double	ft.	33	639.6	42.2	8.9	57.8	12.2	"	21.1	68.0	14.3	14.5	3.1		
Bridge work															
30 ft. Span bridge	Sq.yd	1,345	281.5	41.3	156.4	58.7	222.2	1.00	378.6	69.2	262.0	13.2	50.0		
50 ft. Span bridge	Sq.yd	1,380	340.7	41.3	194.2	58.7	276.0	"	470.2	69.2	325.4	13.2	62.1		
Mabole bridge	Sq.yd	-	528.6	-	-	-	-	"	-	-	-	-	-		
Pavement work															
	Sq.yd	664,200	7.8	39.5	2,049.5	60.5	3,139.2	1.00	5,188.7	79.5	4,125.0	2.3	119.3		
Miscellaneous work															
					162.7		407.7		570.4	71.9	409.9	6.8	38.8		
Total						28.5	3,416.7	71.5	8,562.2	1.00	11,978.9	71.9	8,607.3	6.8	815.7

Source : JICA Mission.

3. Calculation of Direct Construction Cost for Alternative Plan B at Stage 2 in 1978

Unit : Le. 1000

Work Item	Unit of Quantity	Bill of Quantity	Unit Price (Le)	Financial Cost						Economic Cost		Labour Cost	
				Local		Foreign		Total		Rate	Cost	Rate	Cost
				Rate	Cost	Rate	Cost	Rate	Cost				
Construction work													
Earth work													
Site Clearance & Grubbing	Acre	6	468.0	5.0	0.1	95.0	2.7	1.00	2.8	68.0	1.9	2.8	0.1
Fell trees 2 ft. dia.	Nos.	4,200	1.2	100.0	5.0	0	0	"	5.0	20.0	1.0	80.0	4.0
Strip top soil	Sq.yd	39,000	0.4	33.5	5.2	66.5	10.4	"	15.6	69.0	10.8	2.5	0.4
Soil excavation	Cu.yd	206,000	1.4	8.0	23.1	92.0	265.3	"	288.4	65.0	187.5	8.0	23.1
Excavation of rippable rock	Cu.yd	-	2.9	0	-	0	-	"	-	-	-	-	-
Embankment	Cu.yd	113,000	5.6	10.0	63.3	90.0	569.5	"	632.8	65.0	411.3	8.3	52.5
Rip rap slope protection	Sq.yd	34,800	0.2	100.0	7.0	0	-	"	7.0	21.4	1.5	82.0	5.7
Side ditch	ft.	15,600	0.6	100.0	9.4	0	-	"	9.4	20.0	1.9	80.0	7.5
Culvert work													
Pipe culvert 3 ft. dia.	ft.	417	56.4	32.0	7.5	68.0	16.0	1.00	23.5	70.0	16.5	9.7	2.3
Pipe culvert 4 ft. dia.	ft.	51	93.6	31.5	1.5	68.5	3.3	"	4.8	72.4	3.5	9.2	0.4
Pipe culvert 5 ft. dia.	ft.	-	130.8	0	-	0	-	"	-	-	-	0	-
Box culvert 5 ft. x 5 ft.	ft.	-	151.2	0	-	0	-	"	-	-	-	0	-
Box culvert 10 ft. x 10 ft.	ft.	-	345.6	0	-	0	-	"	-	-	-	0	-
Box culvert 13 ft. x 13 ft.	ft.	-	606.0	0	-	0	-	"	-	-	-	0	-
Box culvert 10 ft. x 10 ft. Double	ft.	-	639.6	0	-	0	-	"	-	-	-	0	-
Bridge work													
30 ft. Span Bridge	Sq.yd	-	281.5	0	-	0	-	1.00	-	-	-	0	-
50 ft. Span Bridge	"	-	340.7	0	-	0	-	"	-	-	-	0	-
Mabole Bridge	"	1,152	528.6	41.3	251.5	58.7	357.4	"	608.9	69.2	421.2	13.2	80.5
Pavement work	Sq.yd	68,500	9.1	36.2	225.7	63.8	397.7	1.00	623.4	79.7	496.8	1.7	10.6
Miscellaneous work	-	-	-	31.1	30.0	68.9	81.1	1.00	111.1	72.0	80.0	7.3	8.1
Total				27.0	629.3	73.0	1,703.4	1.00	2,332.7	70.0	1,633.9	8.4	196.0

Source : JICA Mission.

4. Summary of Construction Cost in 1978

Unit : Le. 1000

Item	Alternative Plan A				
	Financial Cost			Ec	La
	Lo	Fo	To		
Direct Construction Cost	3,874.2	9,561.1	13,435.3	9,607.1	968.1
Physical Contingency *1	193.7	478.1	671.8	480.4	48.4
Engineering & Administration					
Detailed Design *2	80.7	322.4	403.1	403.1	-
Supervision *3	134.4	537.4	671.8	671.8	-
Accommodation for Engineer *4	77.5	191.2	268.7	192.1	19.4
Price Contingency *5	387.4	956.1	1,343.5	-	-
Total	4,747.9	12,046.3	16,794.2	11,354.5	1,035.9

Note : Abbreviation "Lo" is Local Cost
 "Fo" is Foreign Cost
 "To" is Total Cost
 "Ec" is Economic Cost
 "La" is Labor Cost

- *1 5% of direct Construction Cost
- *2 3% of direct Construction Cost
- *3 5% of direct Construction Cost
- *4 2% of direct Construction Cost
- *5 10% of direct Construction Cost

Unit : Le. 1000

Item	Alternative Plan B														
	Stage 1					Stage 2					Total				
	Financial Cost			Ec	La	Financial Cost			Ec	La	Financial Cost			Ec	La
	Lo	Fo	To			Lo	Fo	To			Lo	Fo	To		
Direct Construction Cost	3,416.7	8,562.2	11,978.9	8,607.3	815.7	629.3	1,703.4	2,332.7	1,633.9	196.0	4,046.0	10,265.6	14,311.6	10,241.2	1,011.7
Physical Contingency *1	170.8	428.1	598.9	430.4	40.8	31.5	85.2	116.7	81.7	9.8	202.3	513.3	715.6	512.1	50.6
Engineering & Administration															
Detailed Design *2	71.9	287.5	359.4	359.4	-	13.4	53.6	67.0	67.0	-	85.3	341.1	426.4	426.4	-
Supervision *3	119.8	479.1	598.9	598.9	-	23.3	93.4	116.7	116.7	-	143.1	572.5	715.6	715.6	-
Accommodation for Engineer *4	68.3	171.2	239.5	172.1	16.3	12.6	34.1	46.7	32.7	3.9	80.9	205.3	286.2	204.8	20.2
Price Contingency *5	341.7	856.2	1,197.9	-	-	62.9	170.4	233.3	-	-	404.6	1,026.6	1,431.2	-	-
Total	4,189.2	10,784.3	14,973.5	10,168.1	872.8	77.3	2,140.1	2,913.1	1,932.0	209.7	4,962.2	12,924.4	17,886.6	12,100.1	1,082.5

Source : JICA Mission.

APPENDIX T-2 維持、補修費の概略算定

Preliminary Estimate for Maintenance Cost

1. Unit Cost for Routine Maintenance Work

Unit : Le. Per mile per year

Work items	ADT		
	Over 400	150 ~ 400	50 ~ 150
Surface	1233	237	80
Drainage	99	75	28
Road Side	89	54	51
Bridges	7	5	11
Other	28	21	14
Total	1456	392	184

Note : Unit cost in 1978.

Rate of cost increase is 5% each year.

Source : Roy Jorgenson, UNDP Technical Assistance for Highway Organization and Maintenance, proposed 4 year Highway Programme, Ministry of Works, Sierra Leone 1976.

2. Unit Cost for Remedial Maintenance Work

Unit : Le. Per mile

Work items	Cost
Resurfacing Add only	2191
Rehabilitation	2308
Reballast laterite shoulders	182
Re-excavate Side Drains	230
Total	4911

Note : Unit Cost in 1978.

Source : Maintenance Division, Ministry of Works Sierra Leone.

3. Average ADT for whole Project Road Section

Unit : Vehicle number

Year	1985	1990	1995	2000	2005	2010
ADT	157	201	257	325	408	506

Source : JICA Mission.

4. Maintenance Cost for Alternative Plan A and B in 1978

Unit : Le. 1000

Year	Alternative Plan A			Alternative Plan B		
	Routine	Remedial	Total	Routine	Remedial	Total
1987	20.8	-	20.8	20.8	-	20.8
1988	20.8	-	20.8	20.8	-	20.8
1989	20.8	-	20.8	20.8	-	20.8
1990	20.8	260.8	281.6	20.8	222.5	243.3
1991	20.8	-	20.8	20.8	-	20.8
1992	20.8	-	20.8	20.8	-	20.8
1993	20.8	-	20.8	20.8	-	20.8
1994	20.8	-	20.8	20.8	-	20.8
1995	20.8	260.8	281.6	20.8	222.5	243.3
1996	20.8	-	20.8	20.8	-	20.8
1997	20.8	-	20.8	20.8	-	20.8
1998	20.8	-	20.8	20.8	-	20.8
1999	20.8	-	20.8	20.8	-	20.8
2000	20.8	260.8	281.6	20.8	260.8	281.6
2001	20.8	-	20.8	20.8	-	20.8
2002	20.8	-	20.8	20.8	-	20.8
2003	20.8	-	20.8	20.8	-	20.8
2004	20.8	-	20.8	20.8	-	20.8
2005	77.3	260.8	338.1	77.3	260.8	338.1
2006	77.3	-	77.3	77.3	-	77.3
2007	77.3	-	77.3	77.3	-	77.3
2008	77.3	-	77.3	77.3	-	77.3
2009	77.3	-	77.3	77.3	-	77.3
2010	77.3	260.8	338.1	77.3	260.8	338.1

Source : JICA Mission.

APPENDIX T-3 経済的費用の算定

Unit : Le 1000

	Alternative A		Alternative B				
	Total Cost		Construction Cost		Maintenance Cost	Total Cost	
	With Labour Cost	Without Labour Cost	With Labour Cost	Without Labour Cost		With Labour Cost	Without Labour Cost
1983	4,398.9	4,053.6			-	3,919.9	3,629.0
1984	3,995.8	3,650.5			-	3,560.5	3,269.6
1985	3,995.8	3,650.5			-	3,560.5	3,269.6
1986					-		
1987	20.8	20.8			20.8		
1988	20.8	20.8			20.8		
1989	20.8	20.8			20.8		
1990	281.6	281.6			243.3		
1991	20.8	20.8			20.8		
1992	20.8	20.8			20.8		
1993	20.8	20.8			20.8		
1994	20.8	20.8			20.8		
1995	281.6	281.6	1,104.4	999.5	243.3	1,347.7	1,242.8
1996	20.8	20.8	1,037.4	932.5	20.8	1,058.2	953.3
1997	20.8	20.8			20.8		
1998	20.8	20.8			20.8		
1999	20.8	20.8			20.8		
2000	281.6	281.6			281.6		
2001	20.8	20.8			20.8		
2002	20.8	20.8			20.8		
2003	20.8	20.8			20.8		
2004	20.8	20.8			20.8		
2005	338.1	338.1			338.1		
2006	77.3	77.3			77.3		
2007	77.3	77.3			77.3		
2008	77.3	77.3			77.3		
2009	77.3	77.3			77.3		
2010	338.1	338.1			338.1		

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