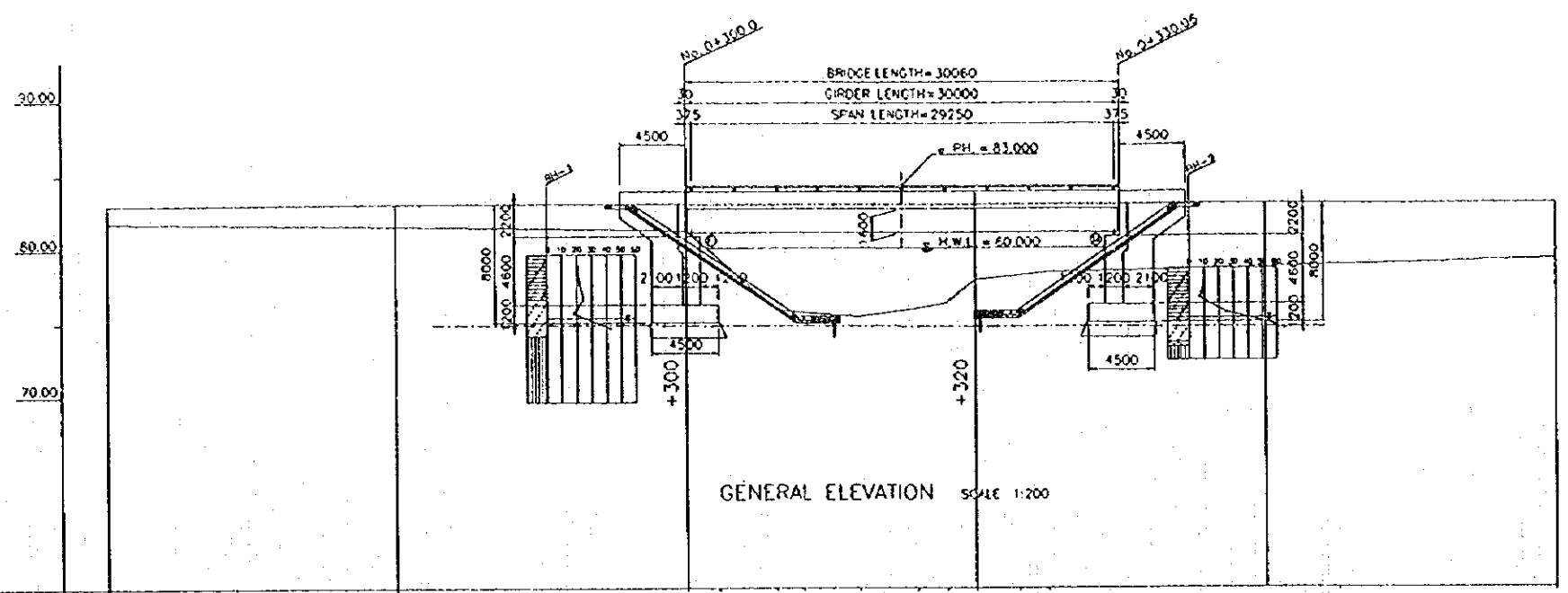
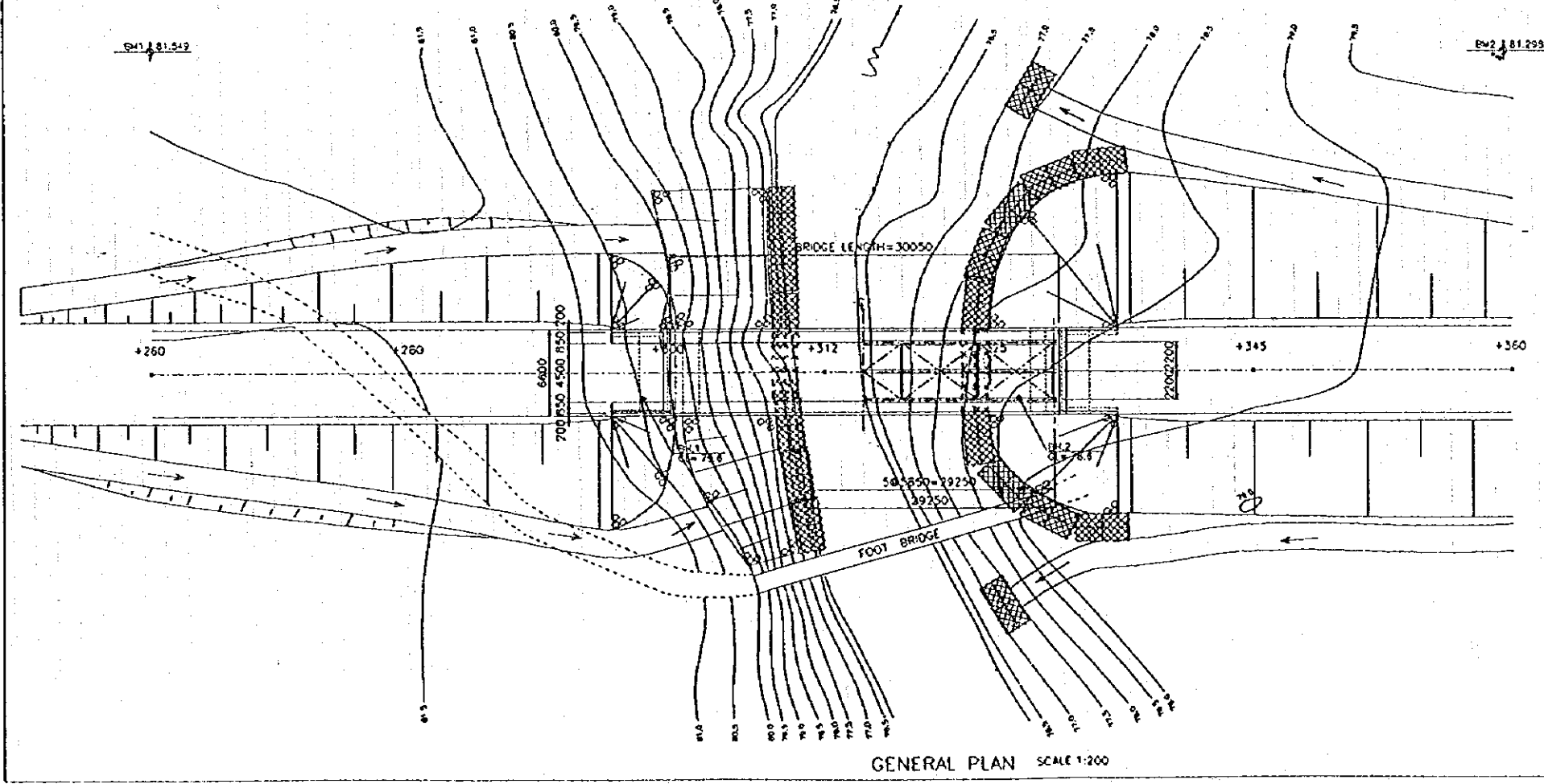
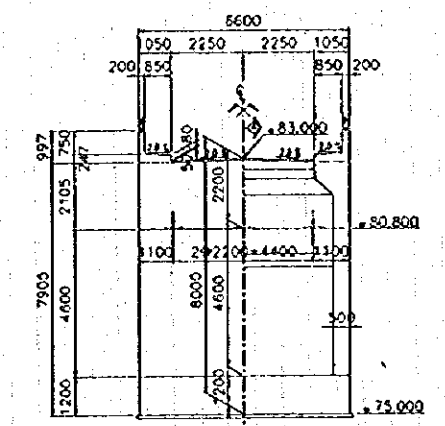
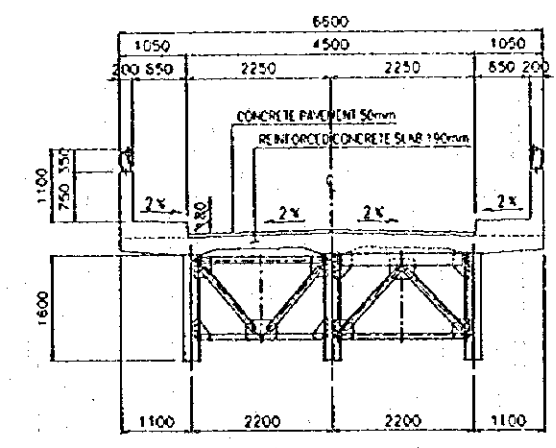


**APPENDIX 5**

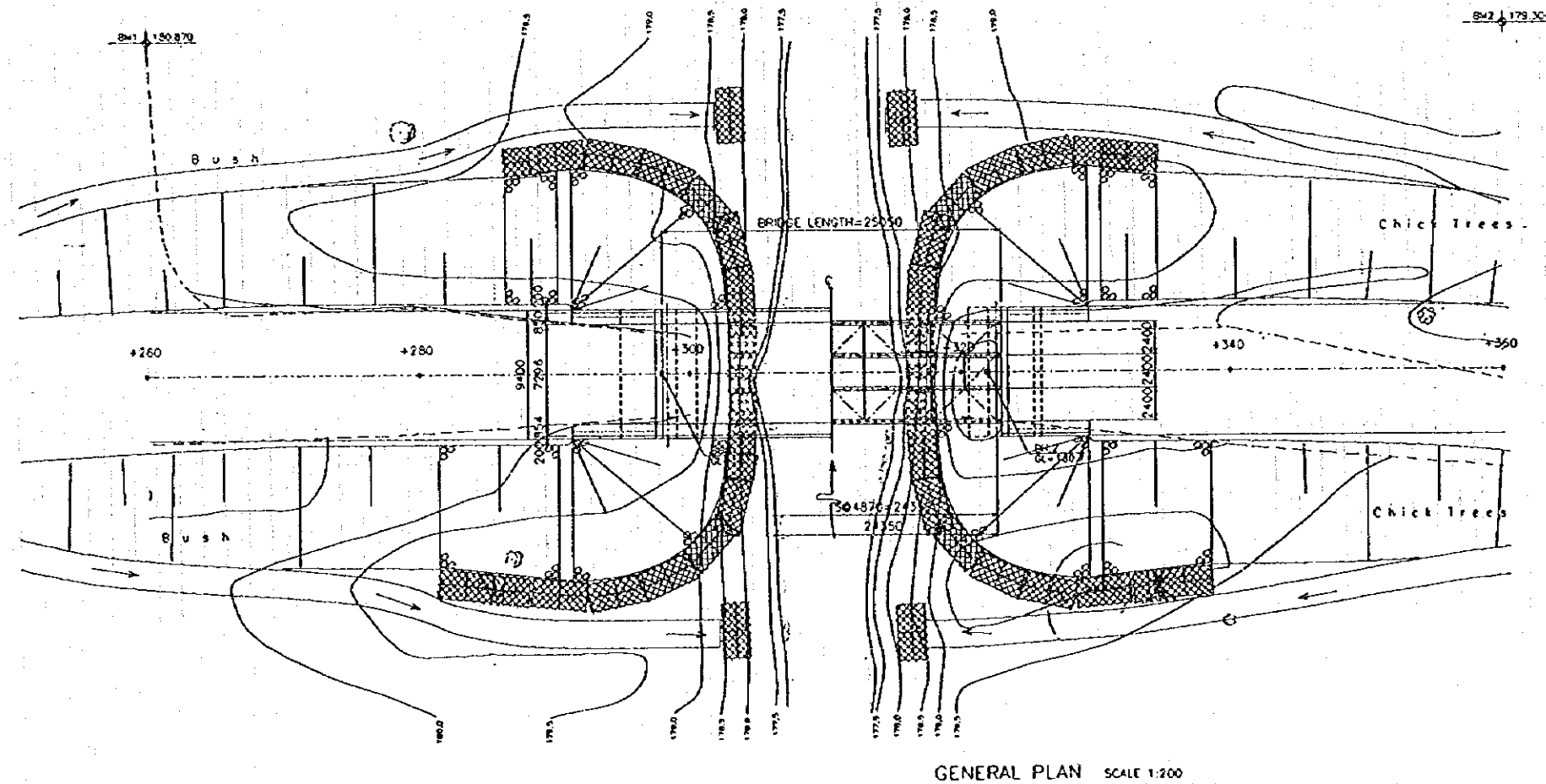
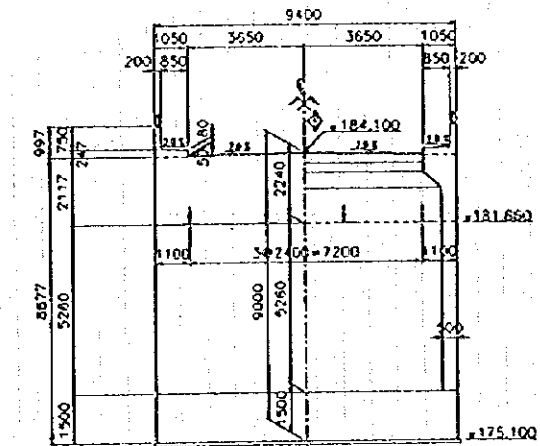
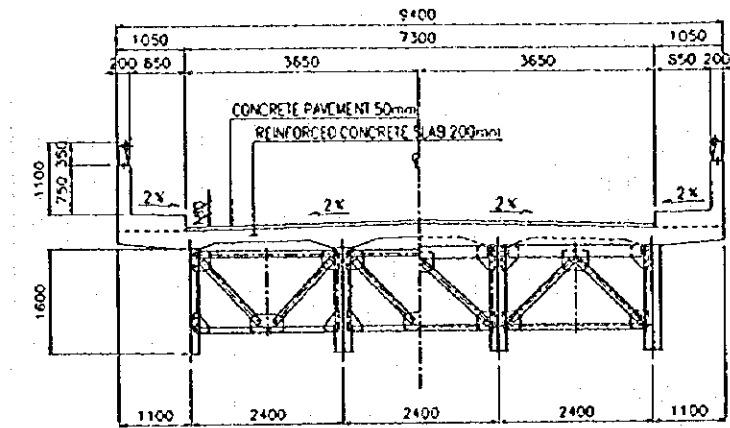
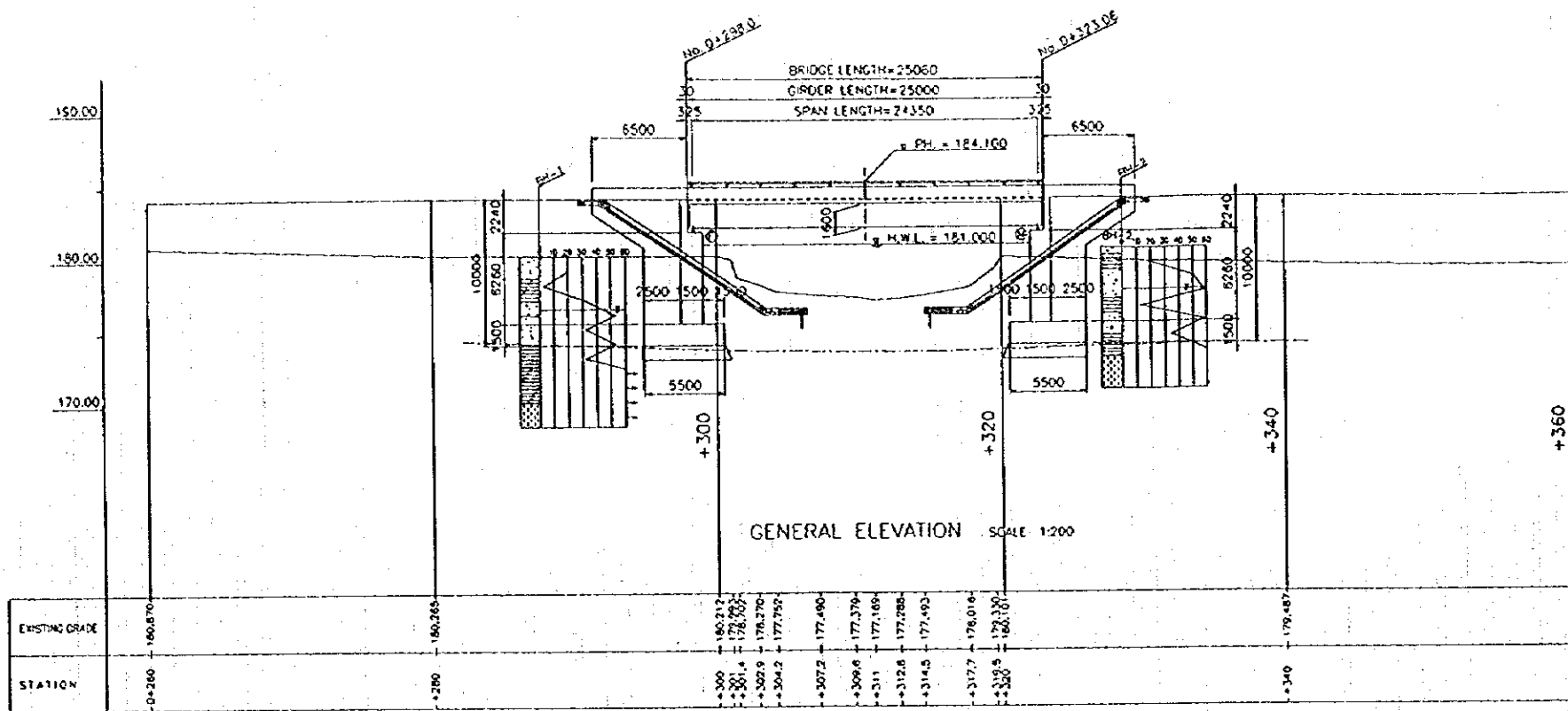
**GENERAL VIEW OF BRIDGES**



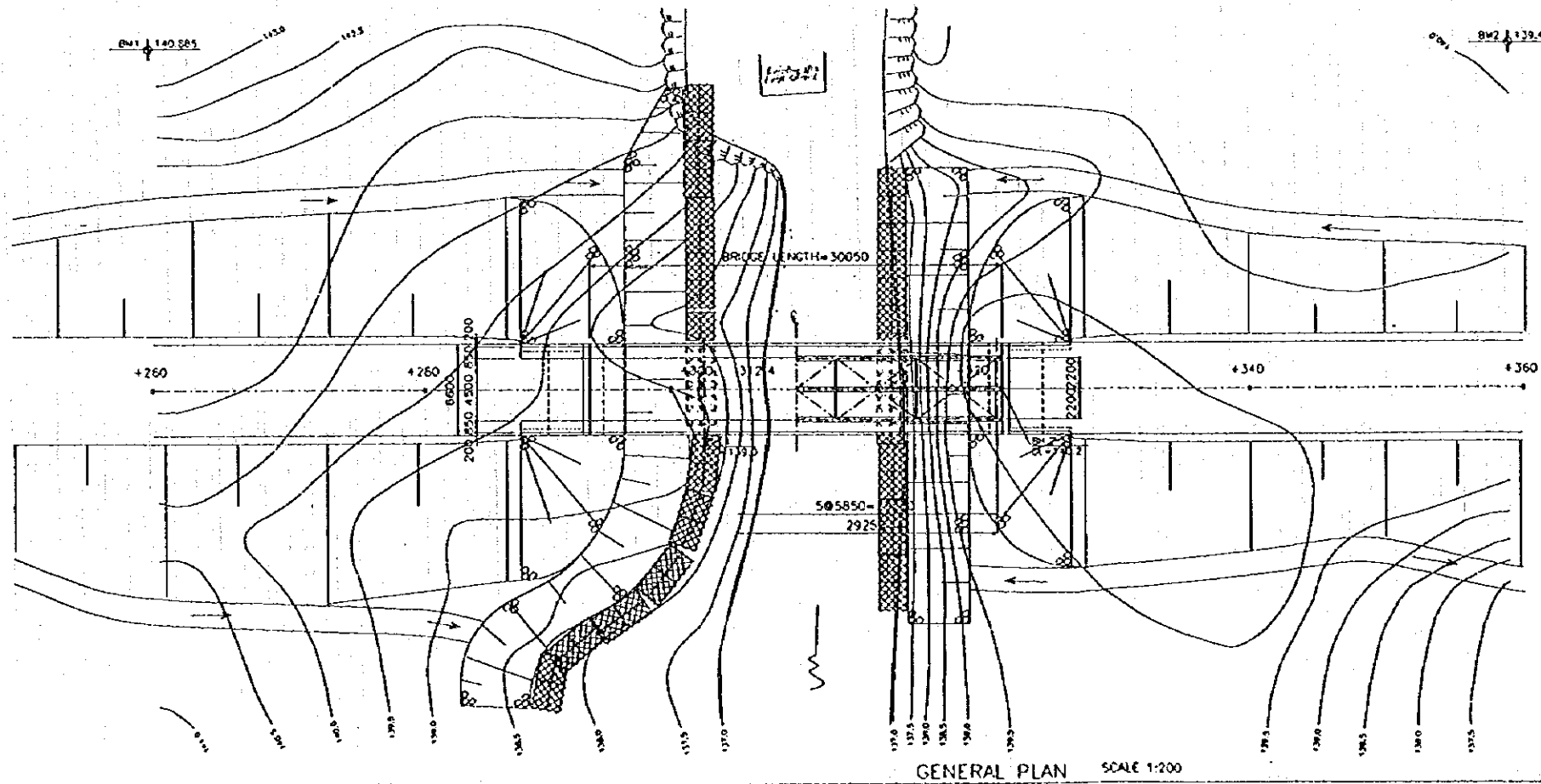
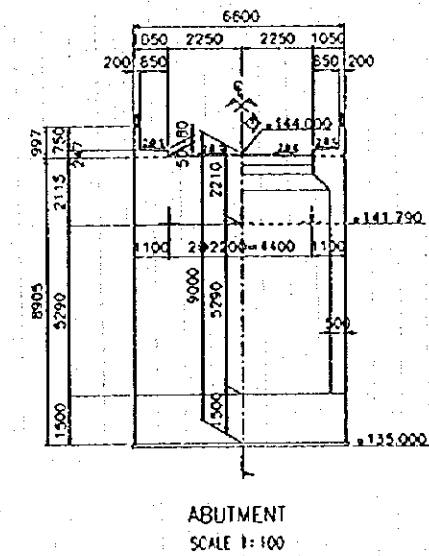
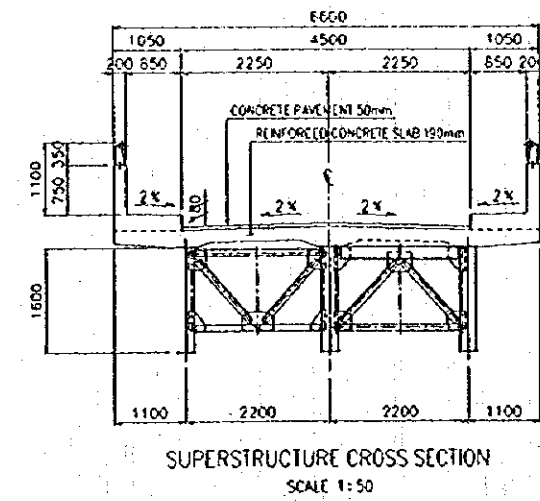
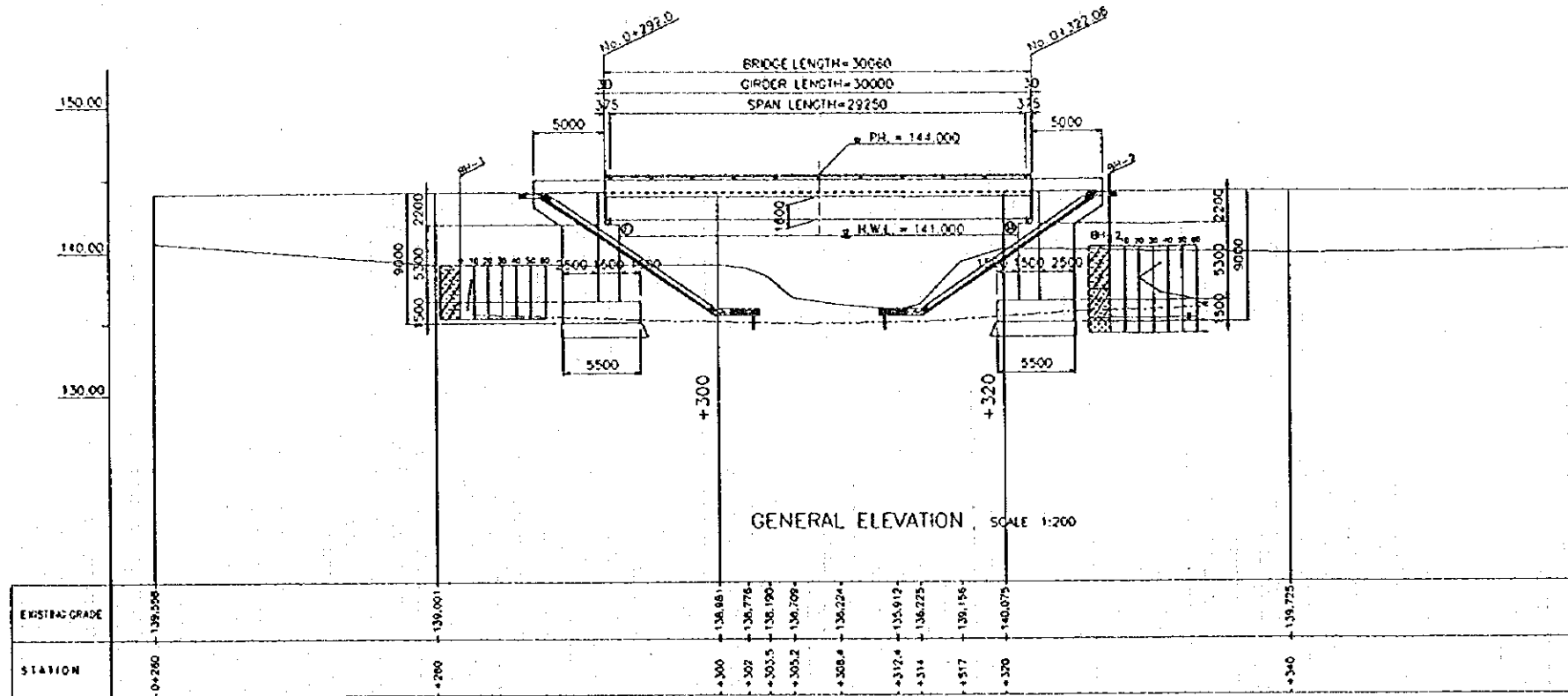
EXISTING GRADE	81.233	81.495	81.187	78.316	75.893	75.860	75.420	75.338	76.086	77.814	78.183	78.334	78.805	79.174
STATION	0+260	+260	+300	+302.2	+306.1	+308	+312	+316	+318	+320	+323	+325	+345	0+360



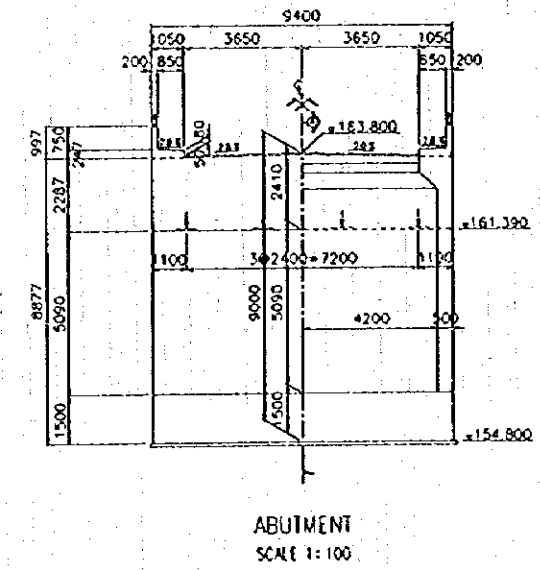
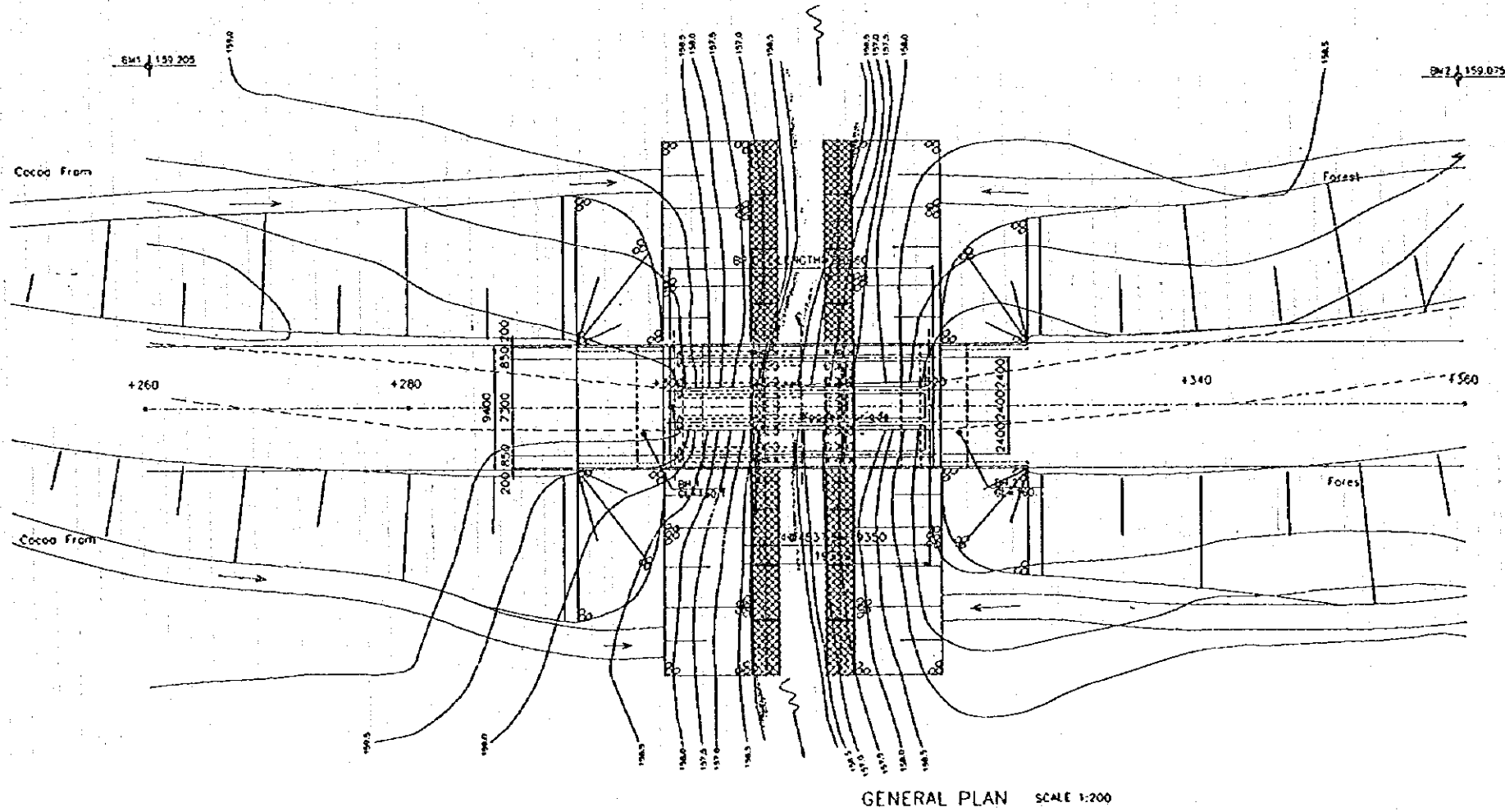
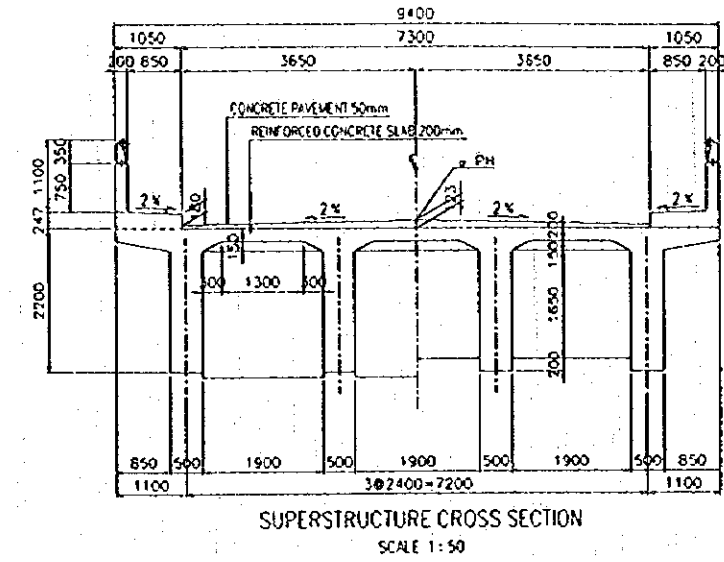
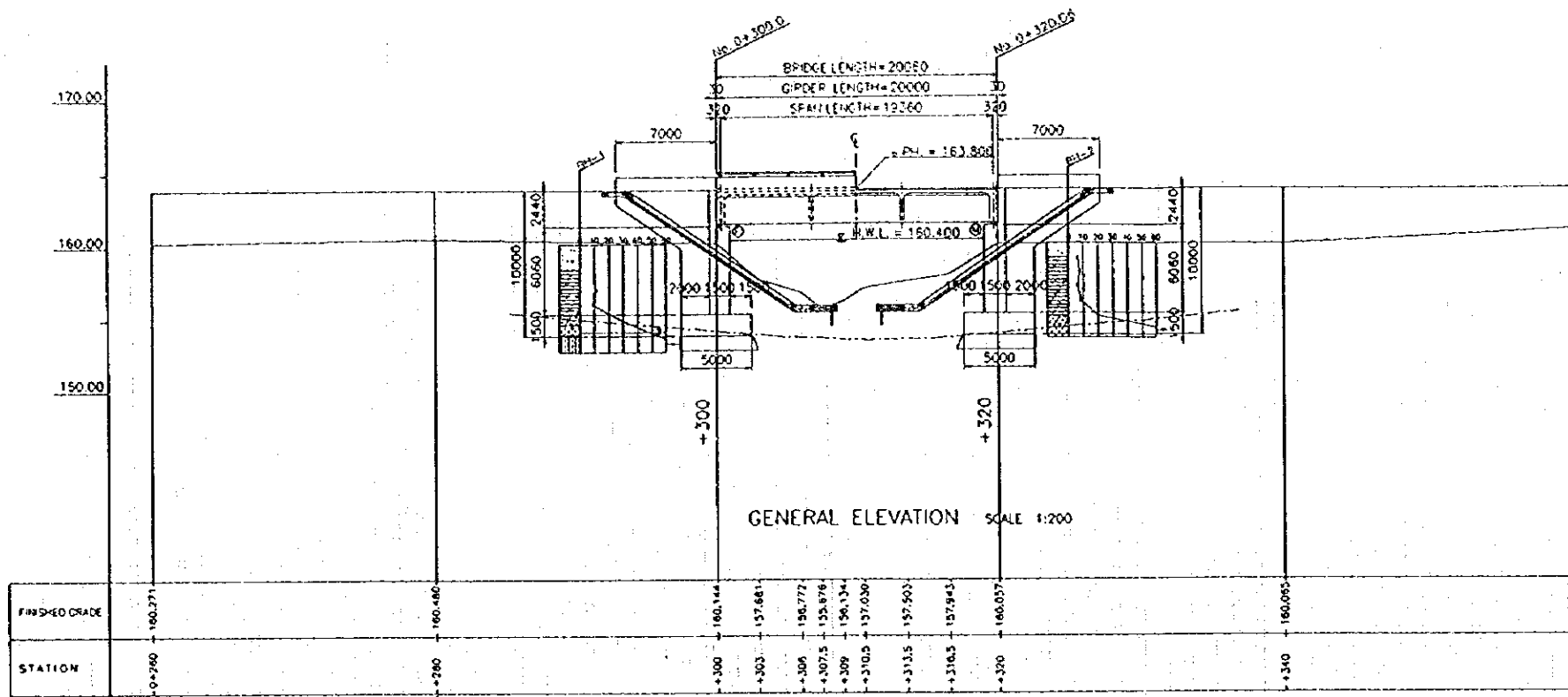
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 2-2 AYENSU BRIDGE



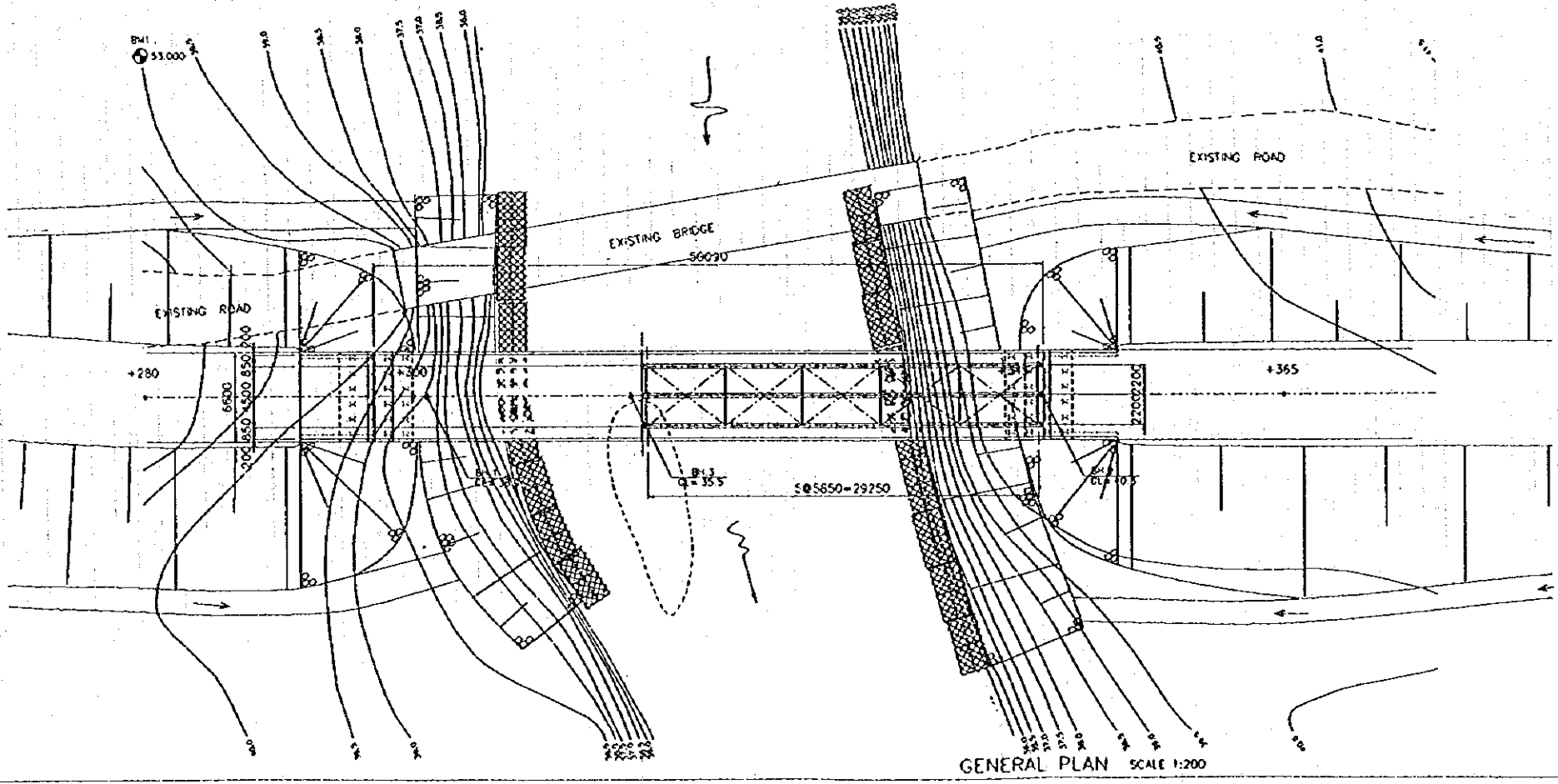
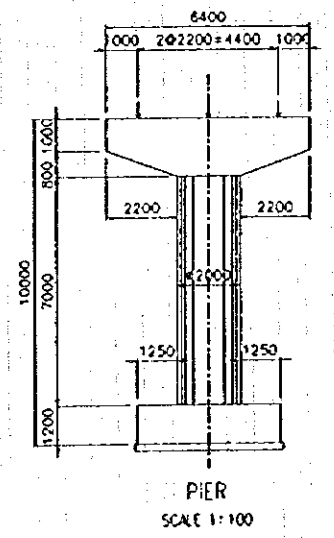
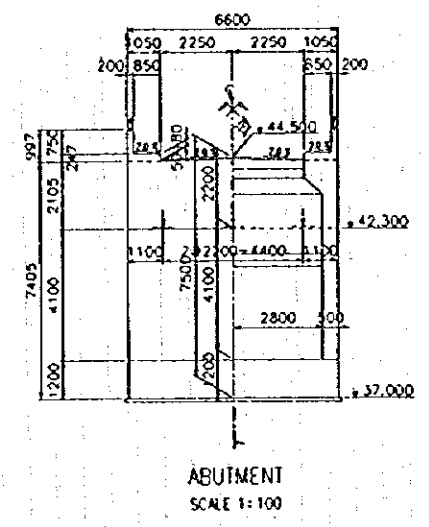
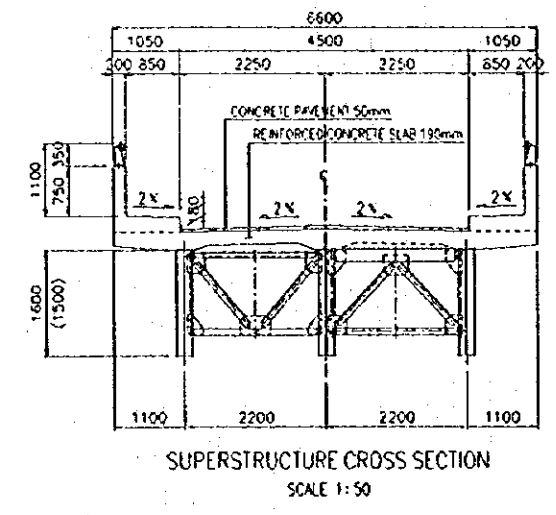
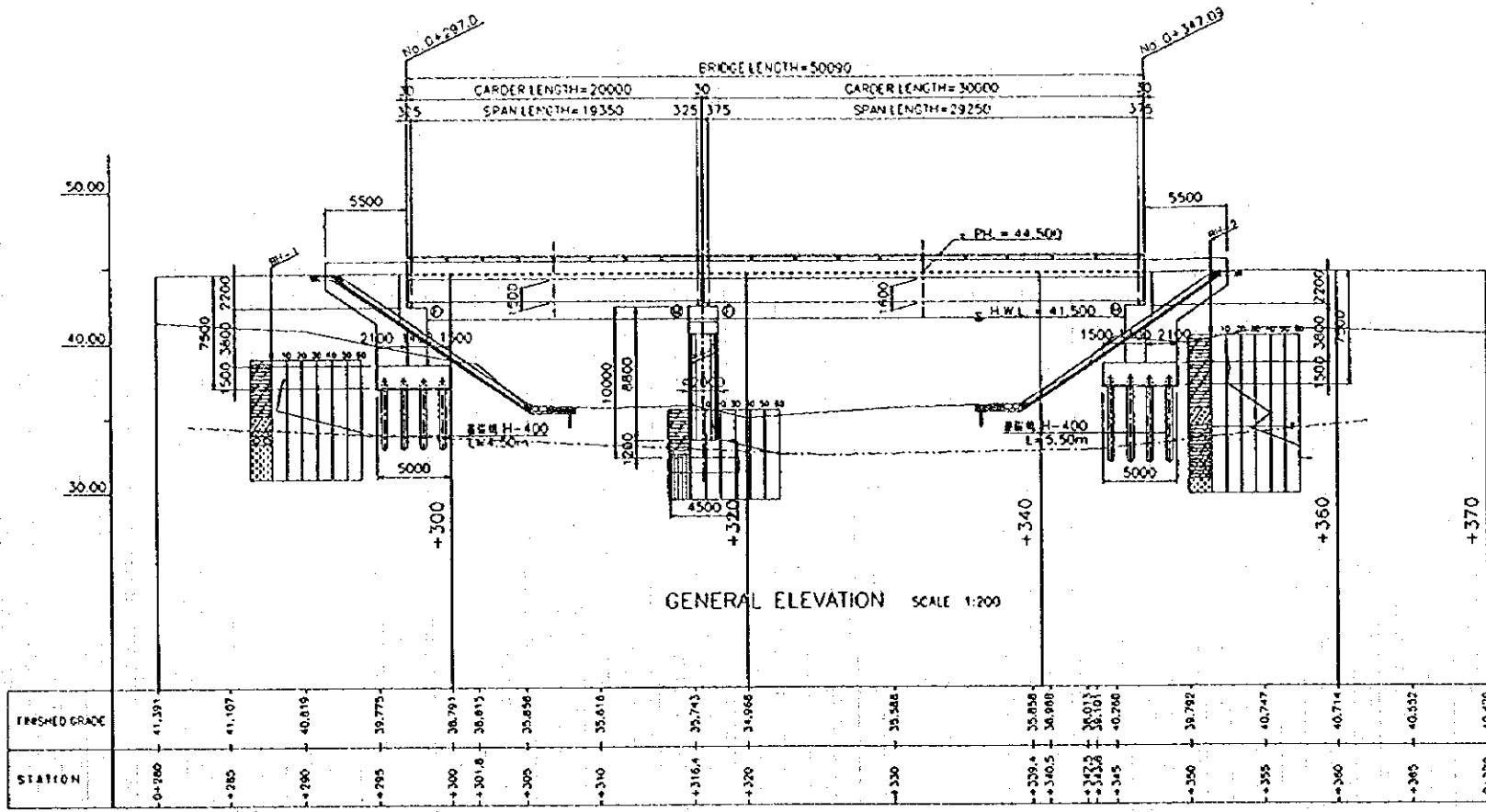
2-4 EMUO BRIDGE



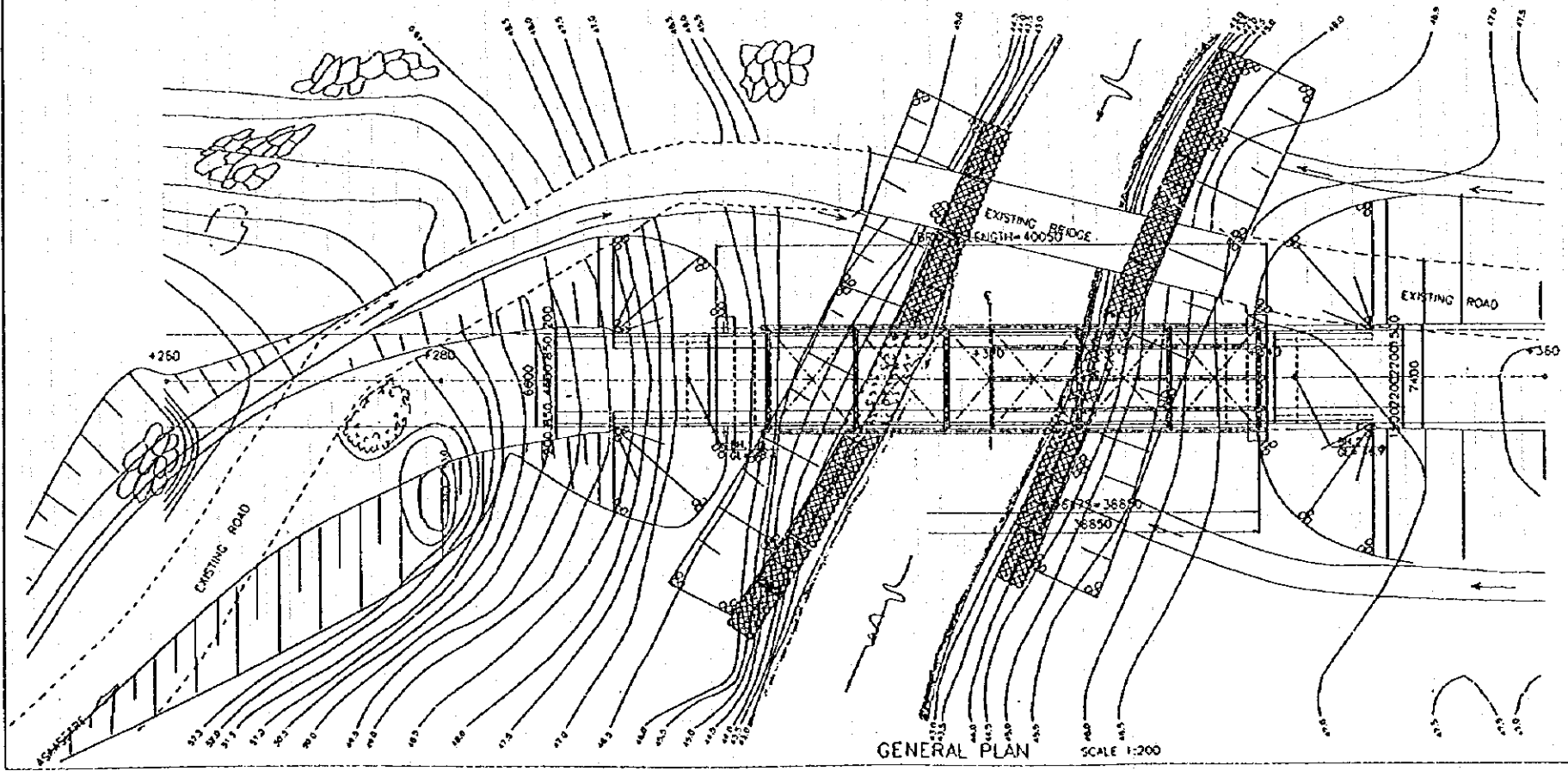
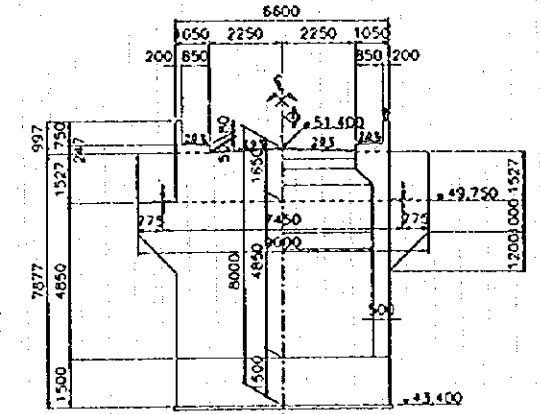
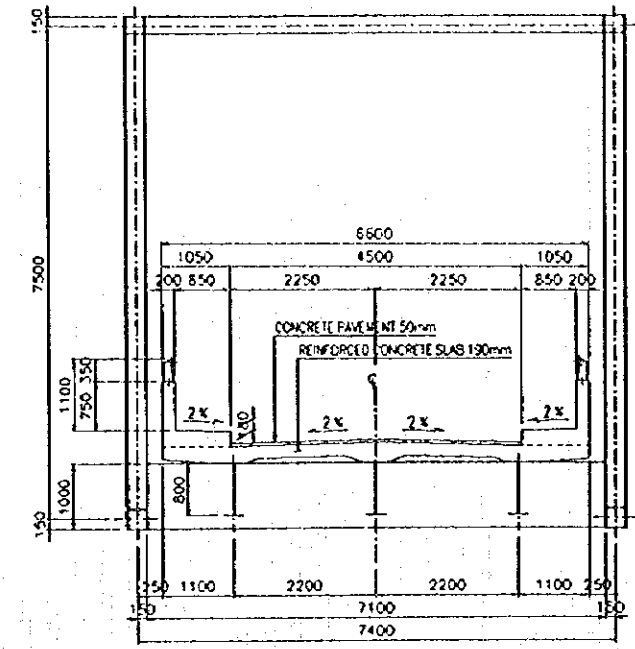
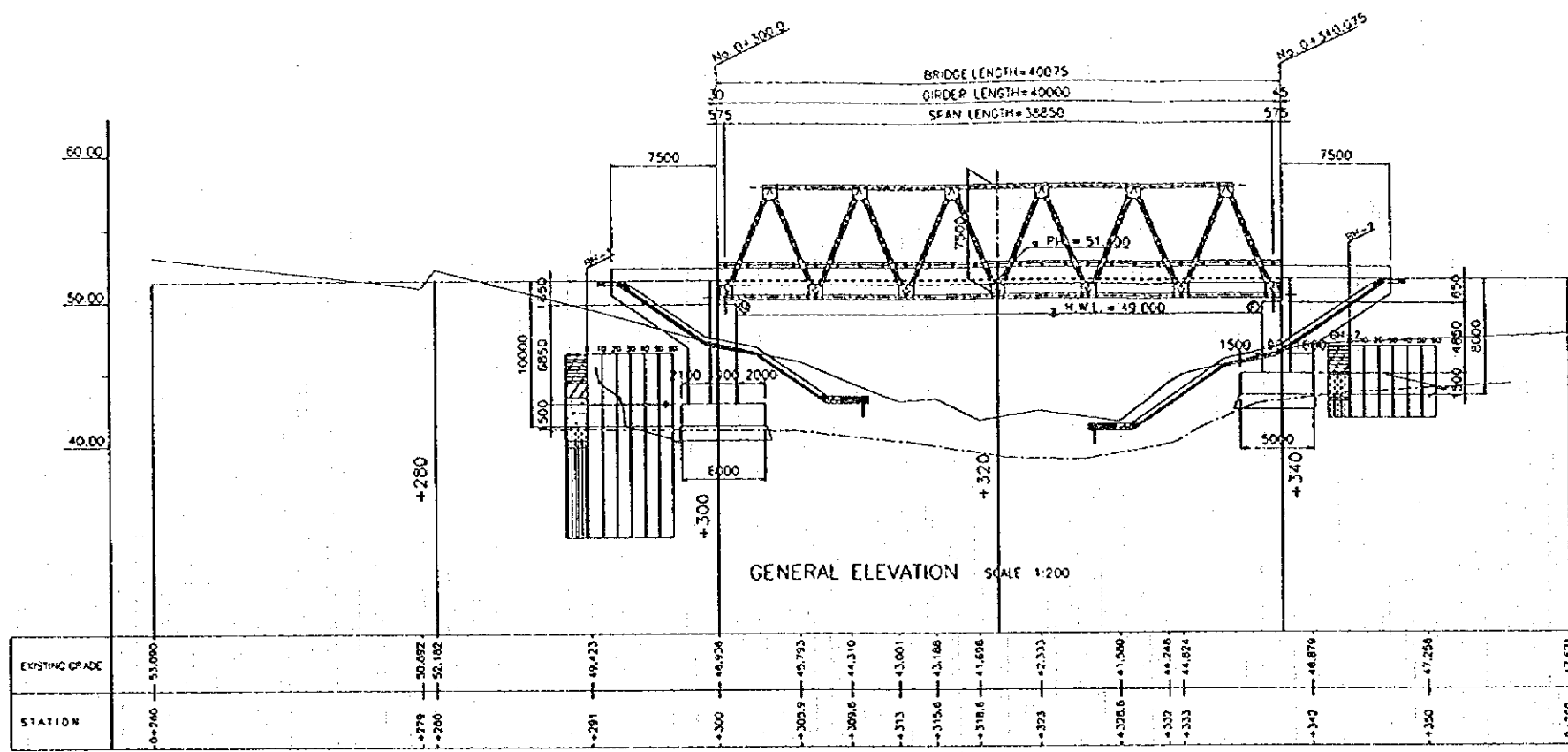
3-5 FUM BRIDGE



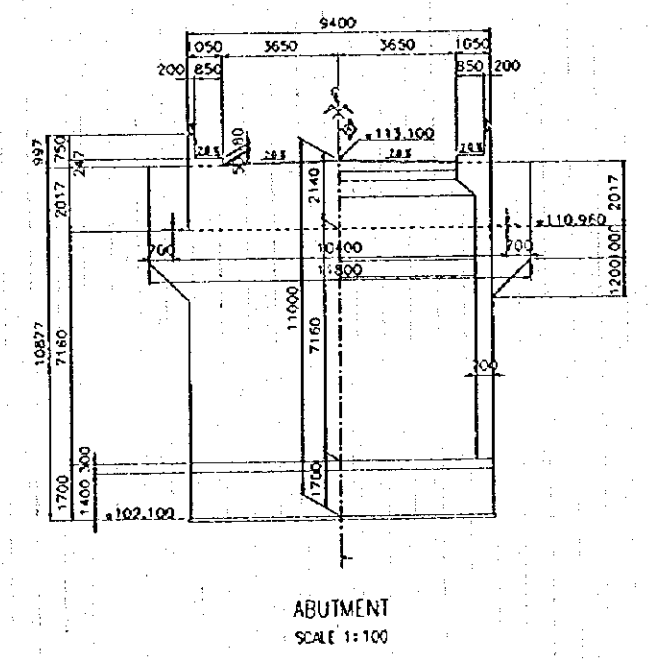
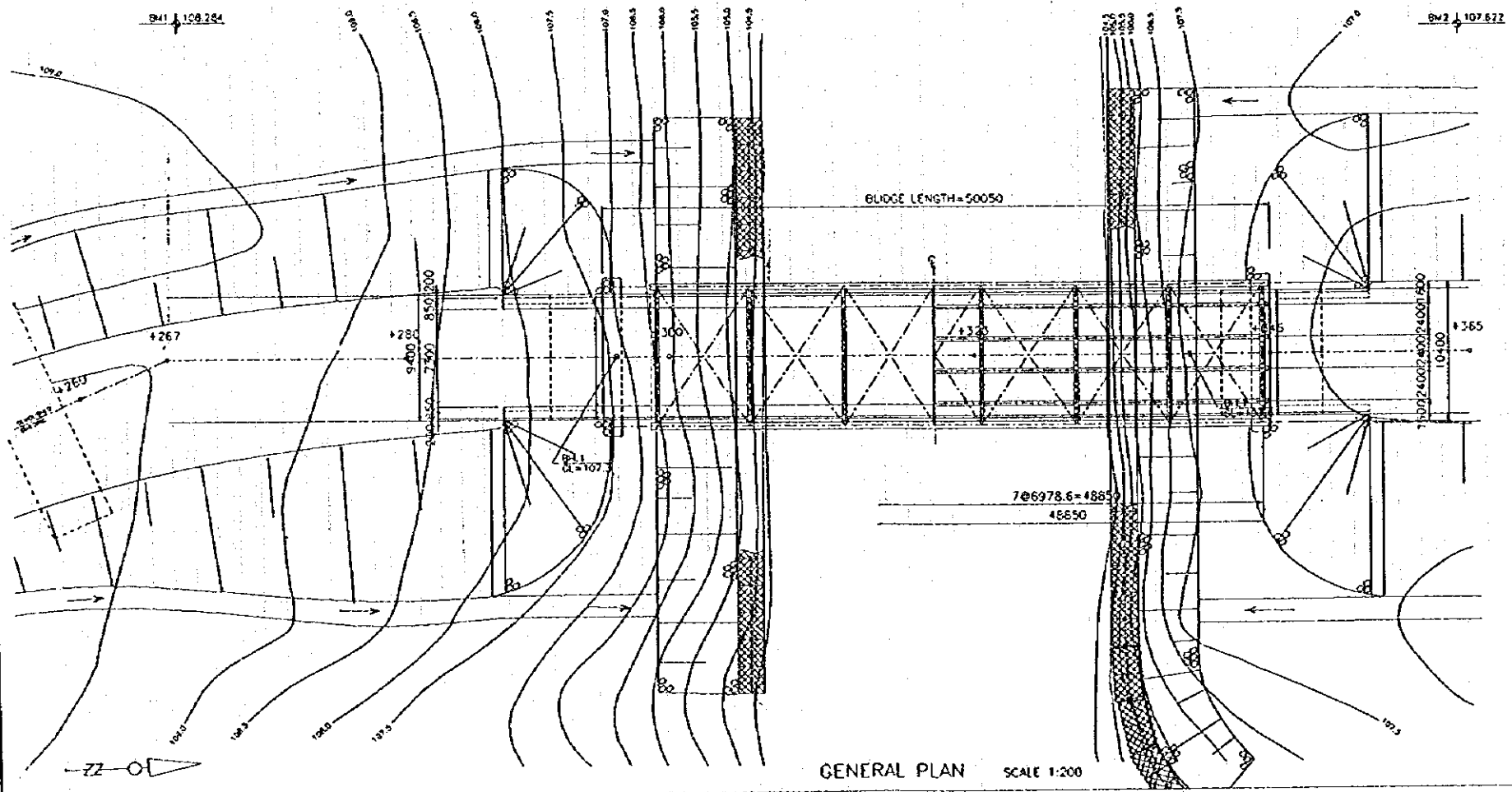
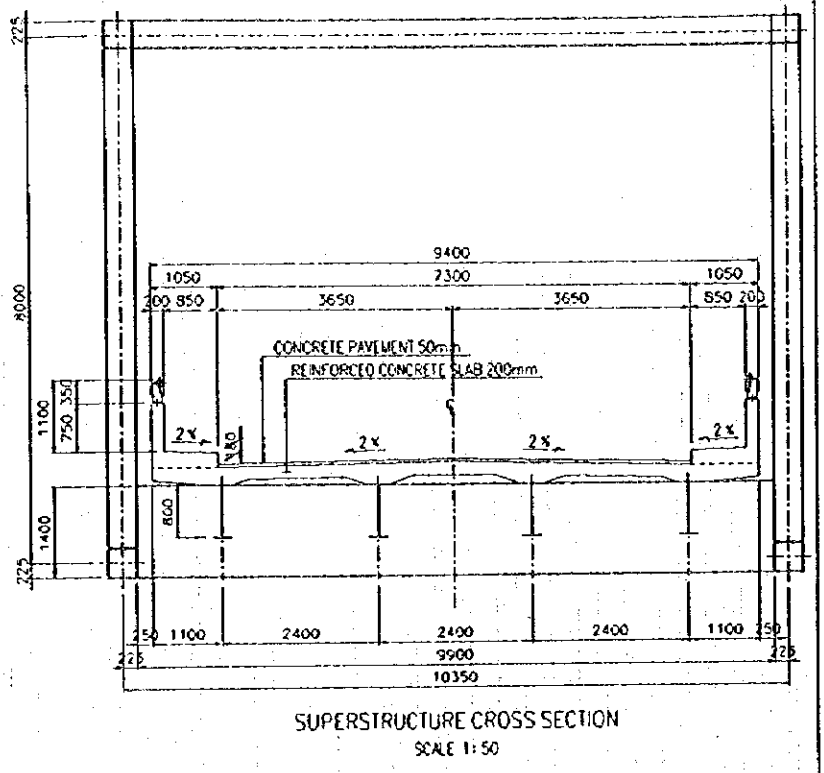
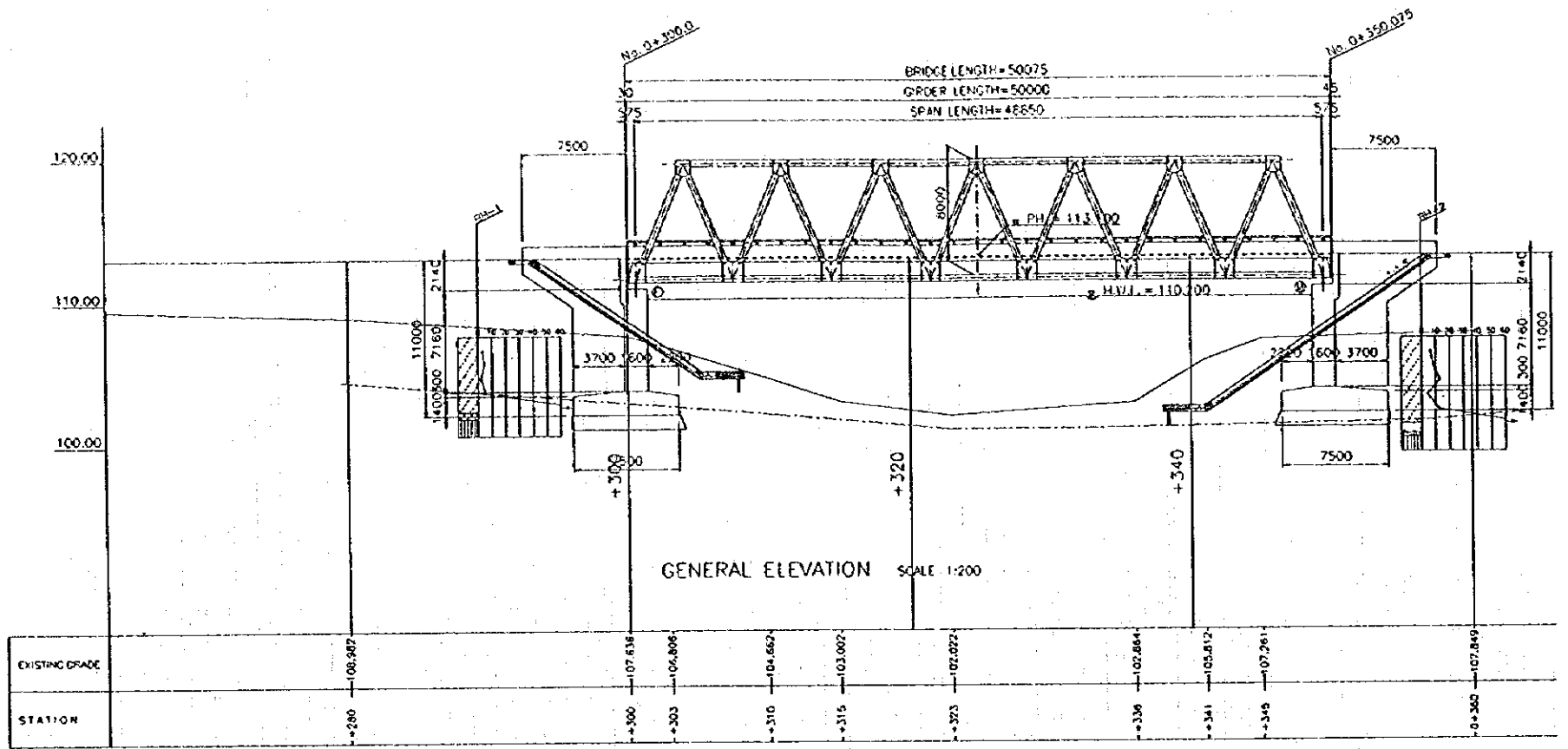
4-7 SAYARE BRIDGE



4--11 NHWINE BRIDGE

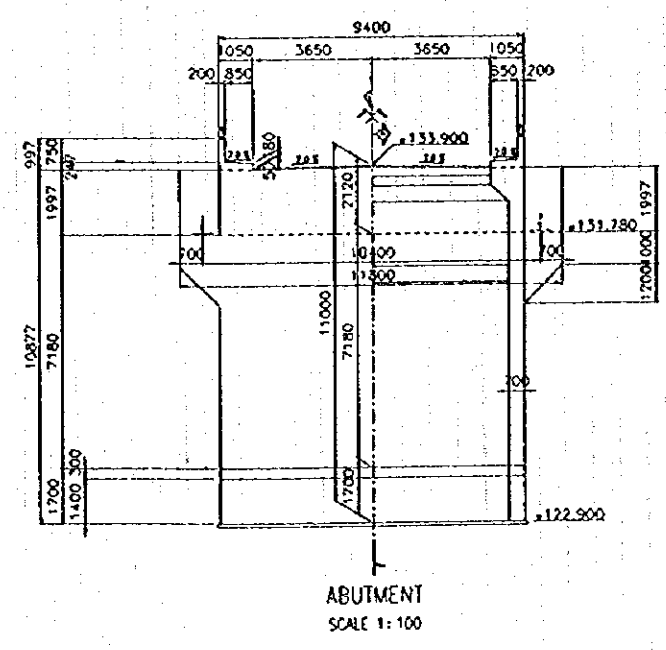
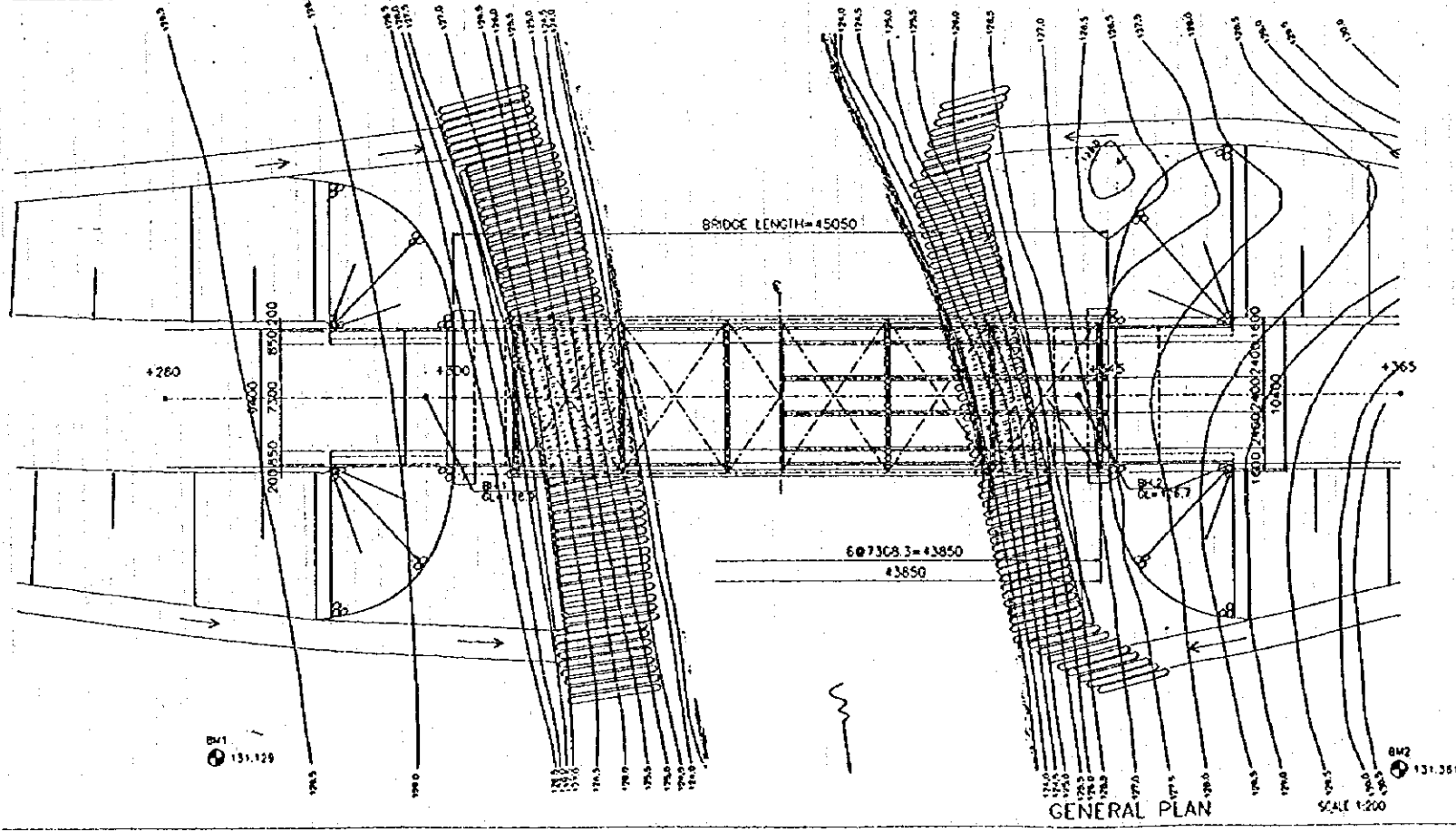
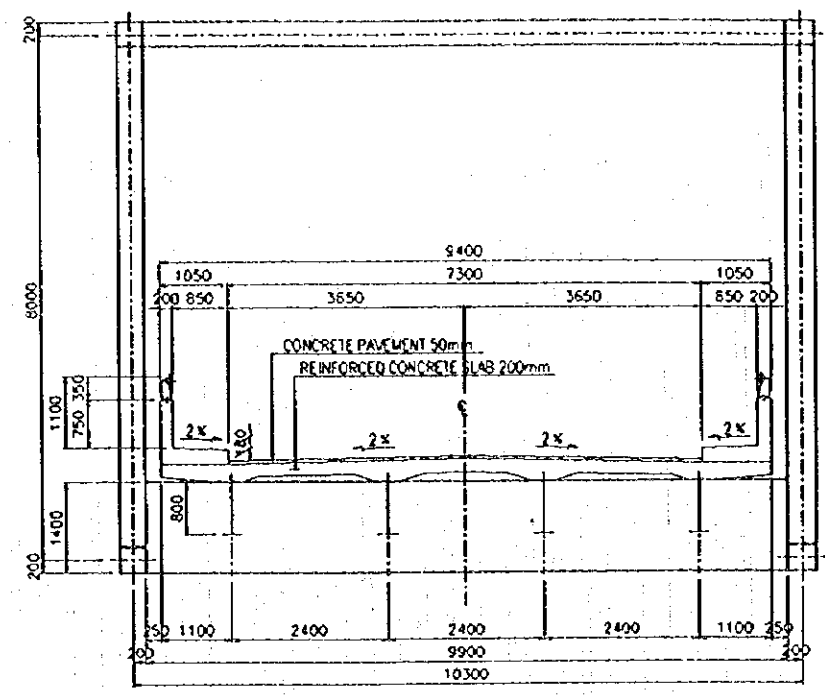
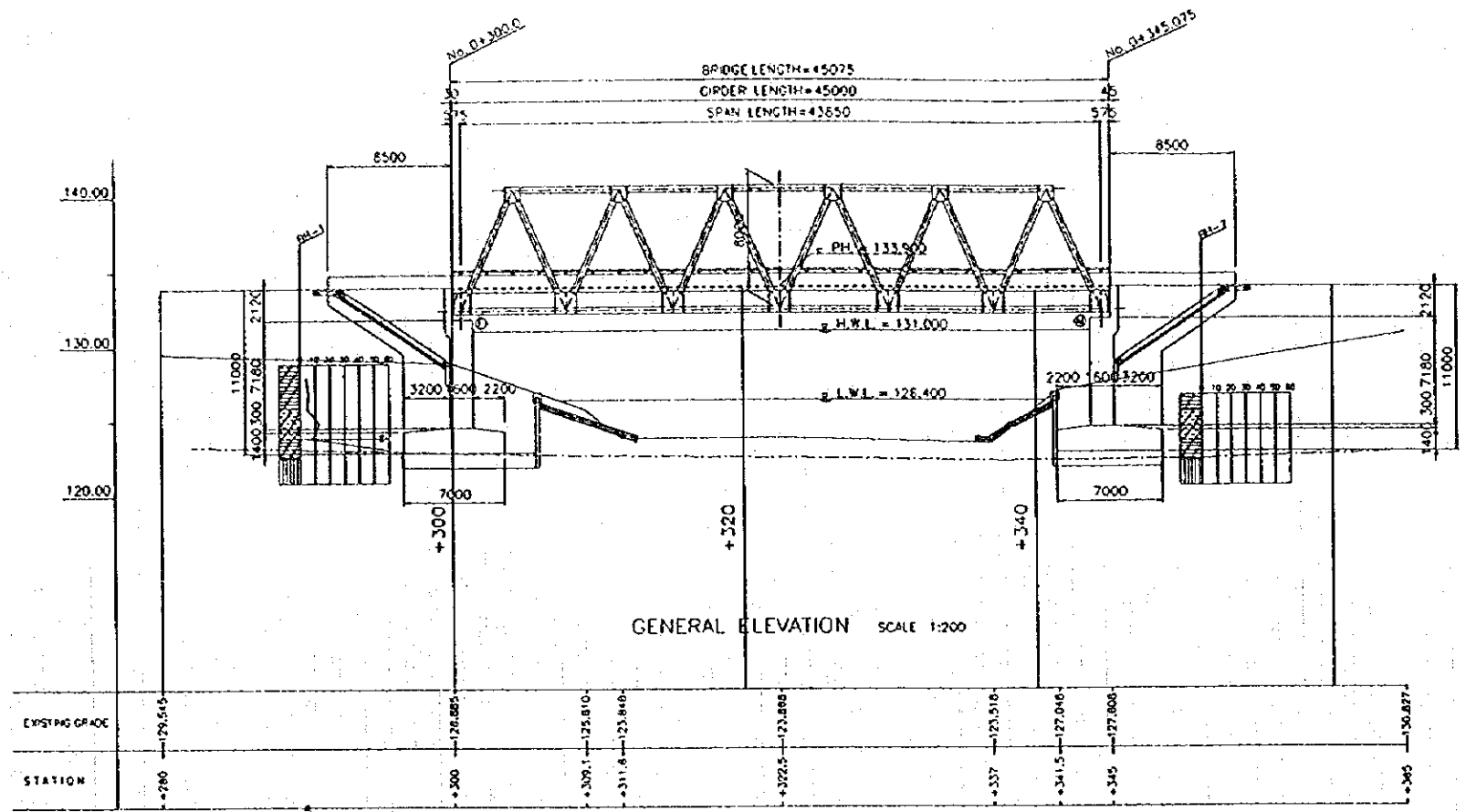


4-12 DRAW BRIDGE

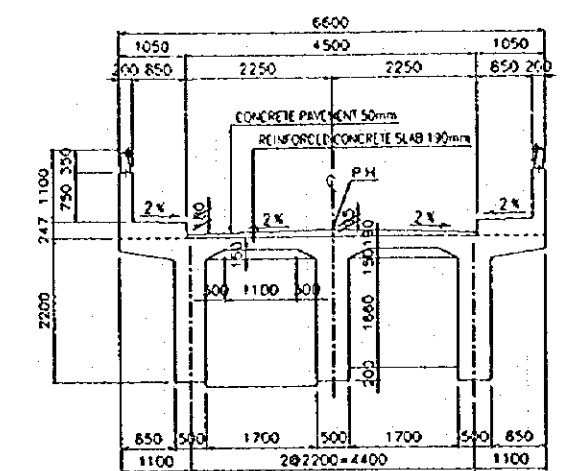
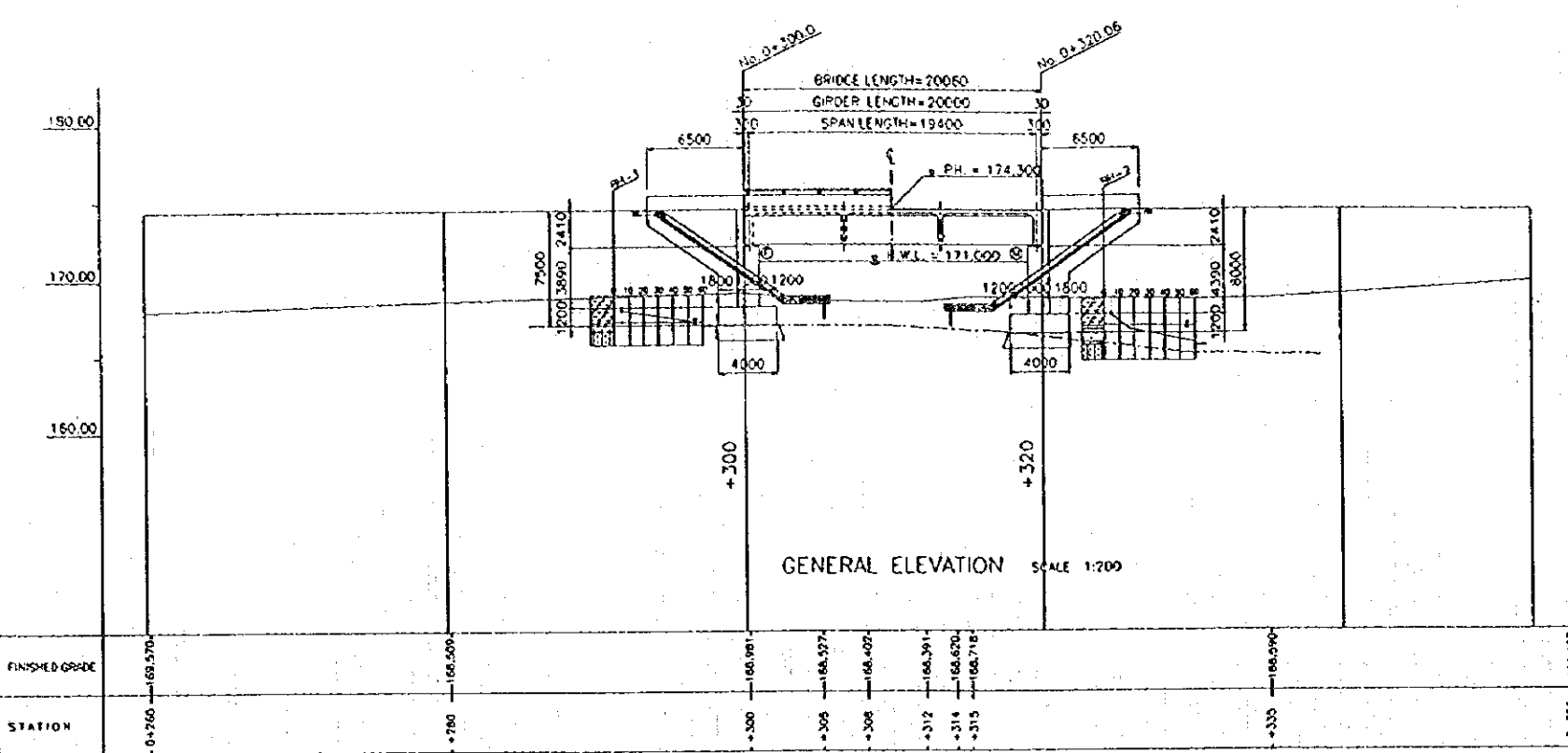


5-9 TANODUMASE

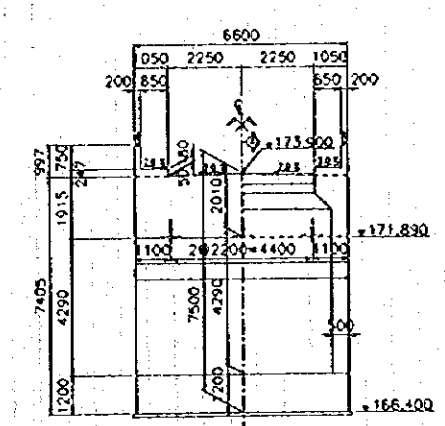




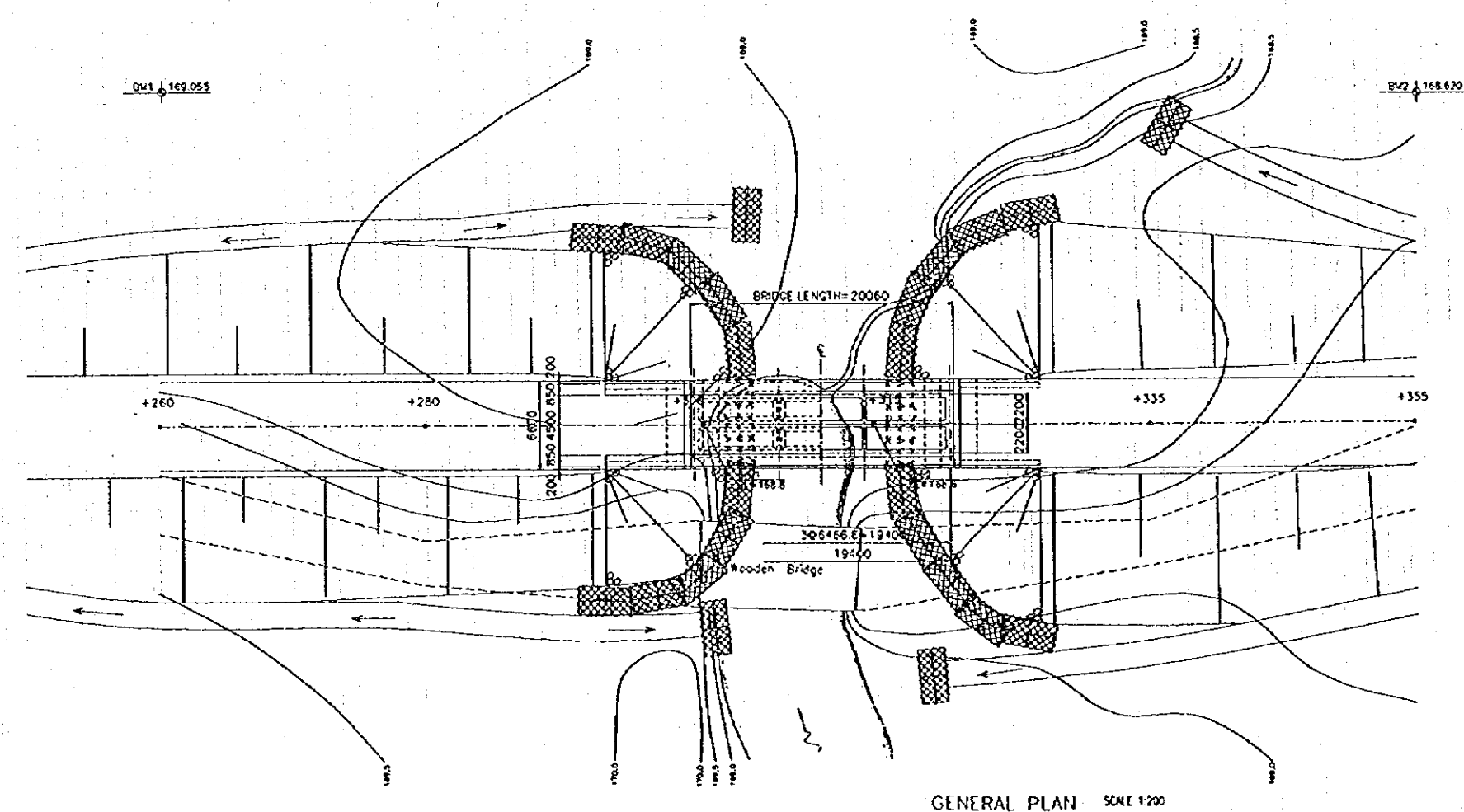
6-3 JOHOL BRIDGE



SUPERSTRUCTURE CROSS SECTION  
 SCALE 1:50



ABUTMENT  
 SCALE 1:100



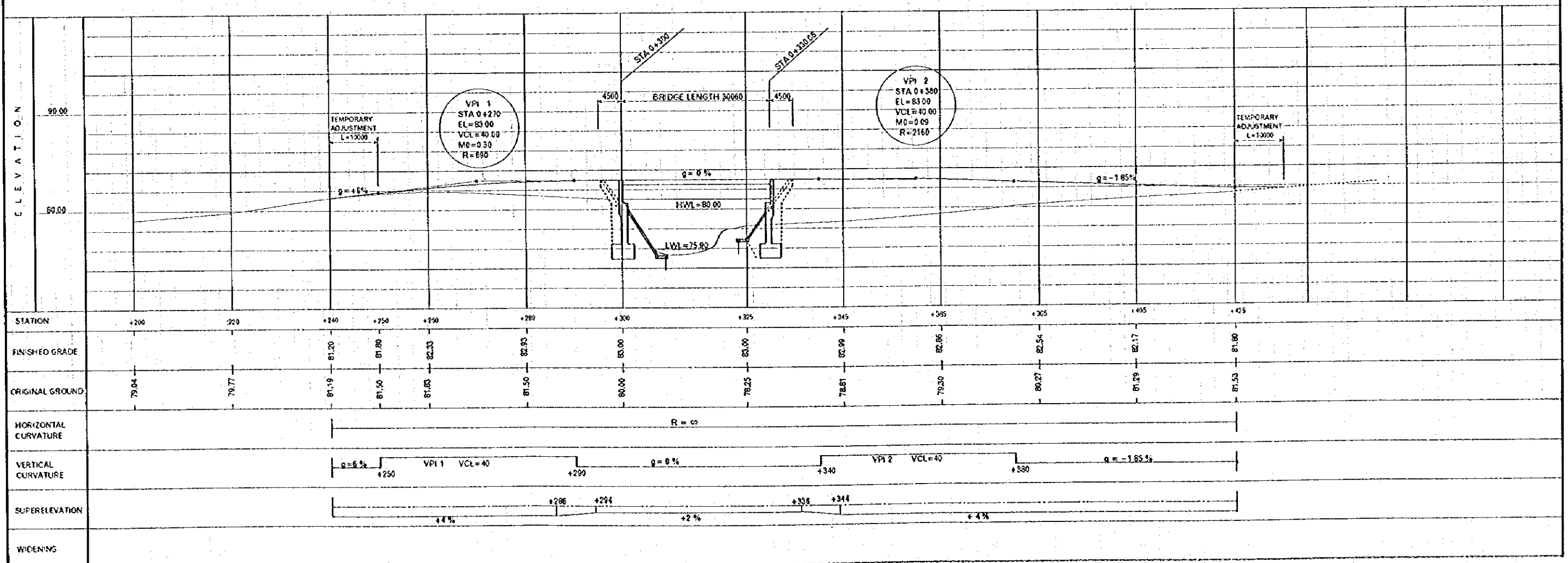
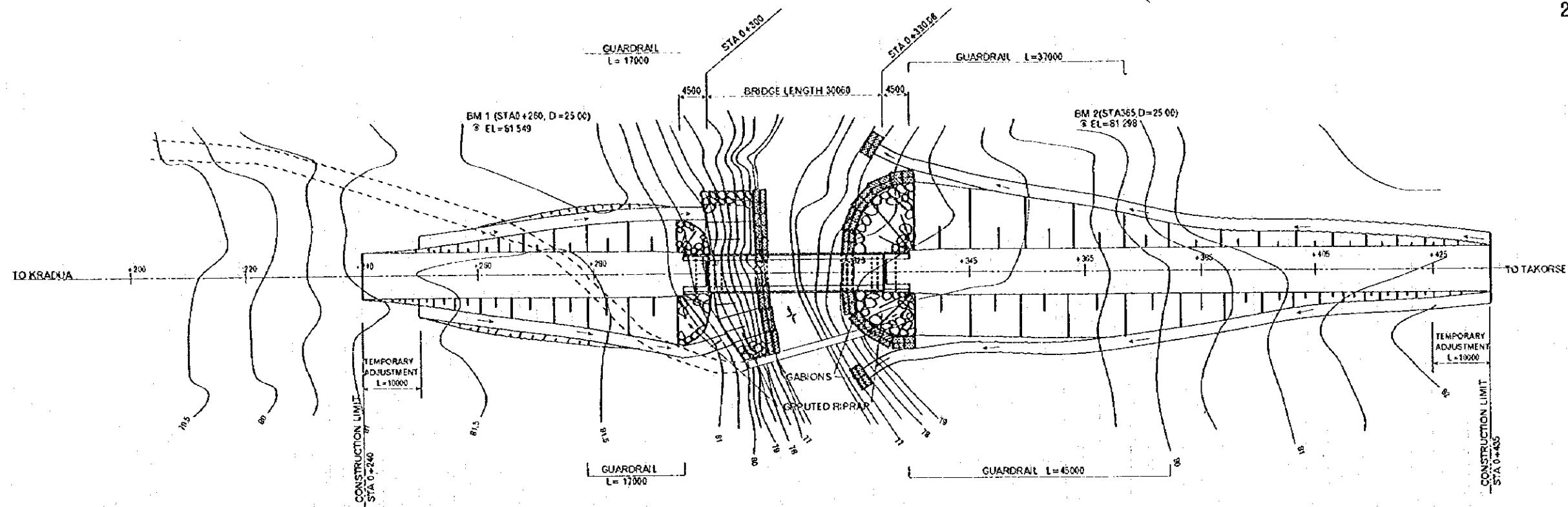
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 6-6 FAWOHOYEDEN

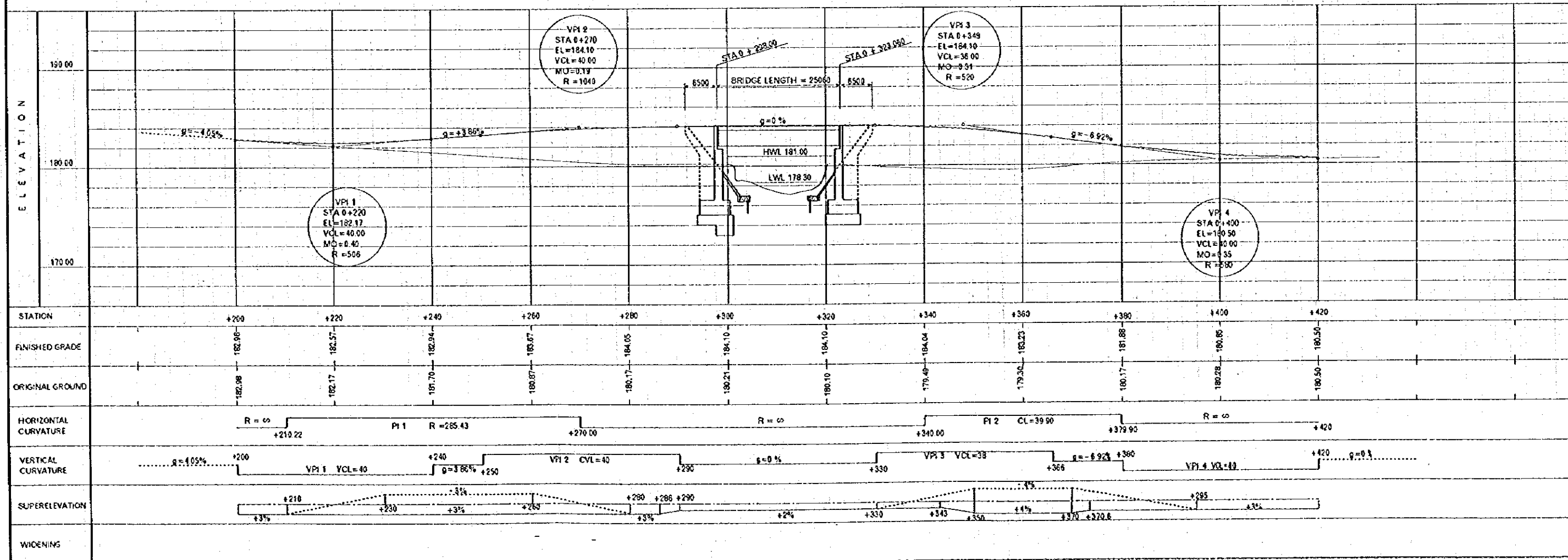
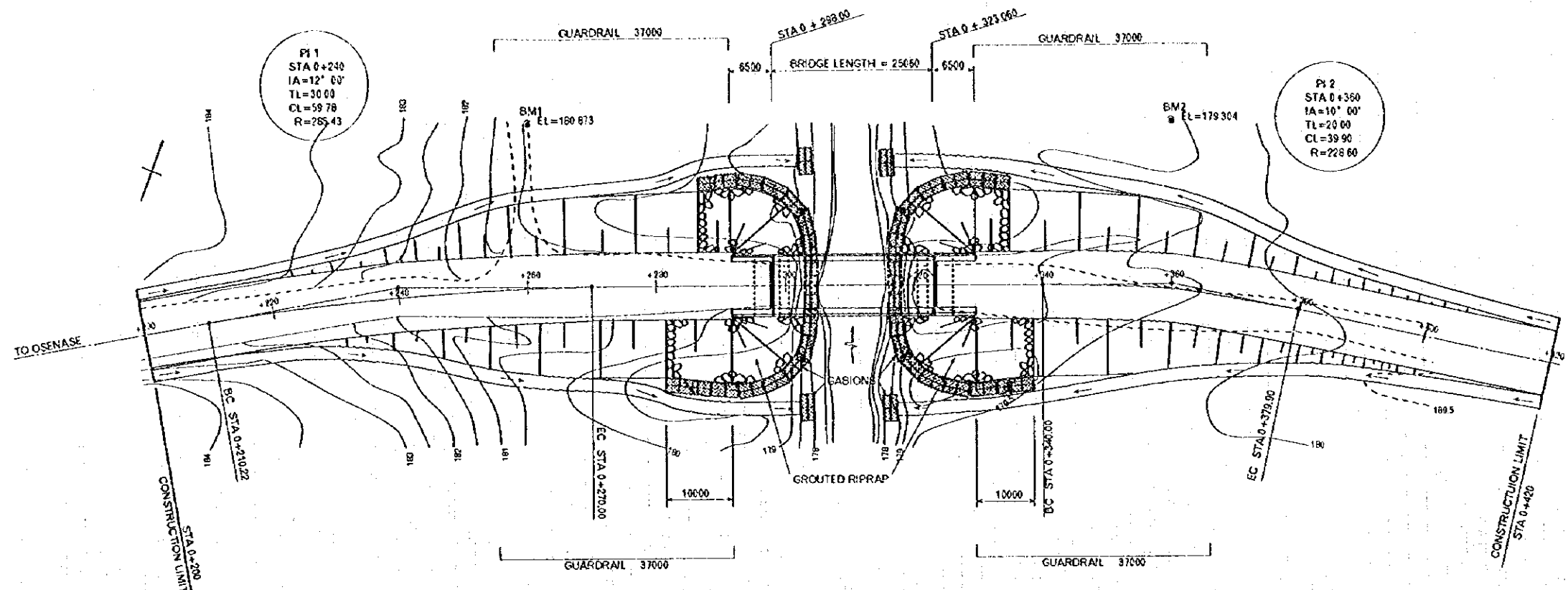
## **APPENDIX 6**

### **PLAN & PROFILE OF APPROACH ROADS**

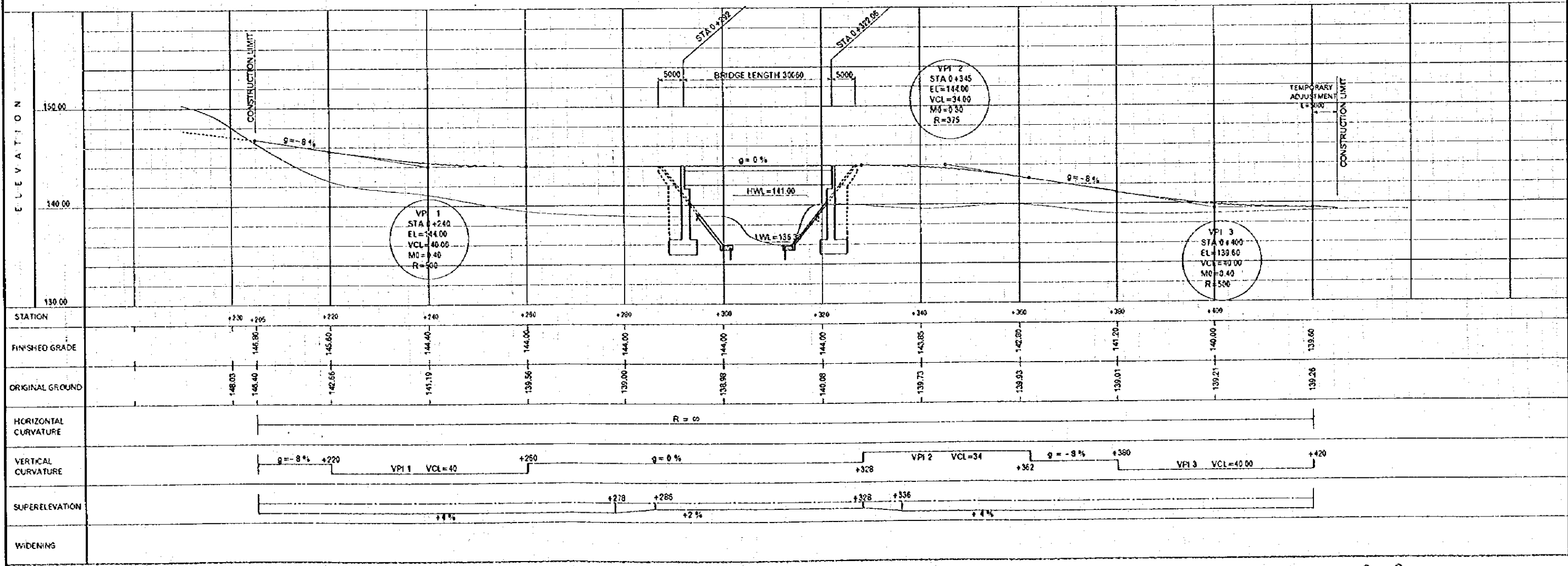
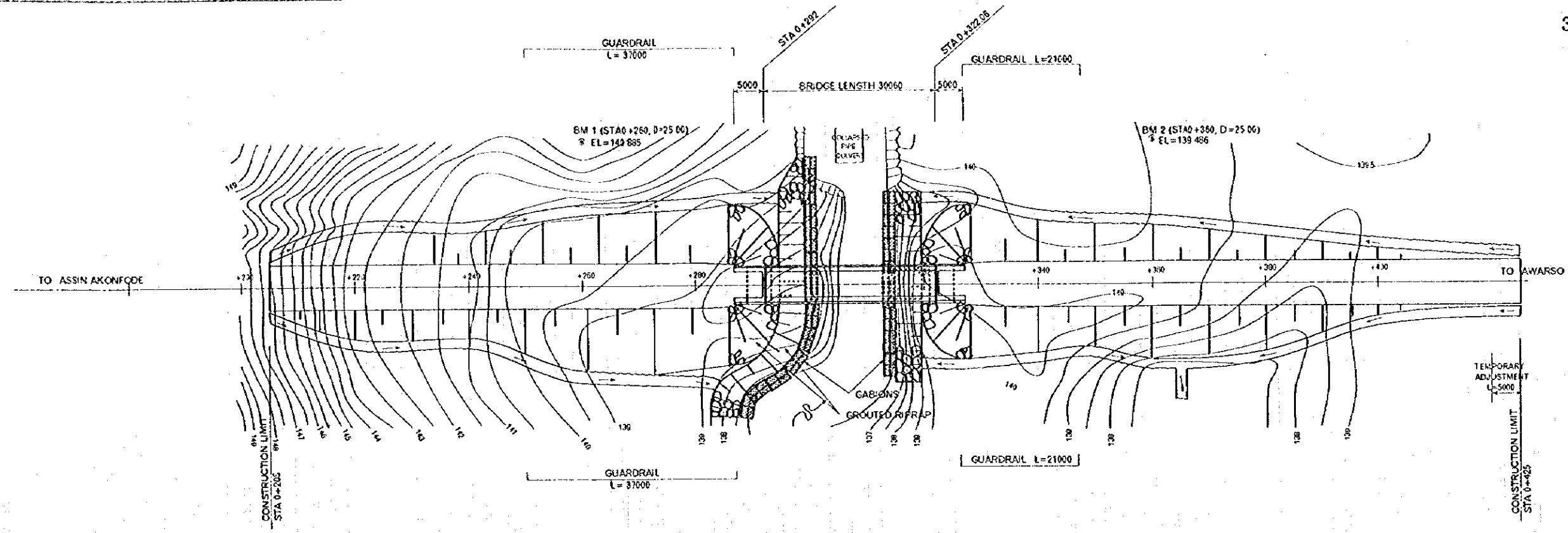


2-2 AYENSU BRIDGE  
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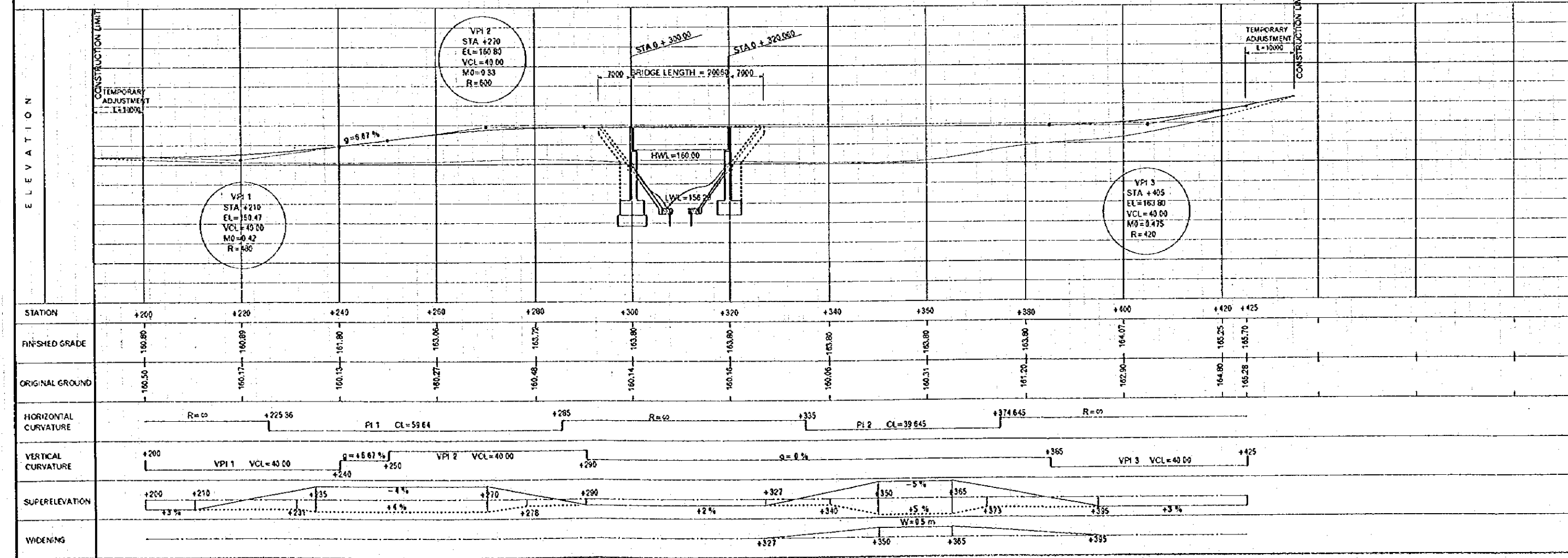
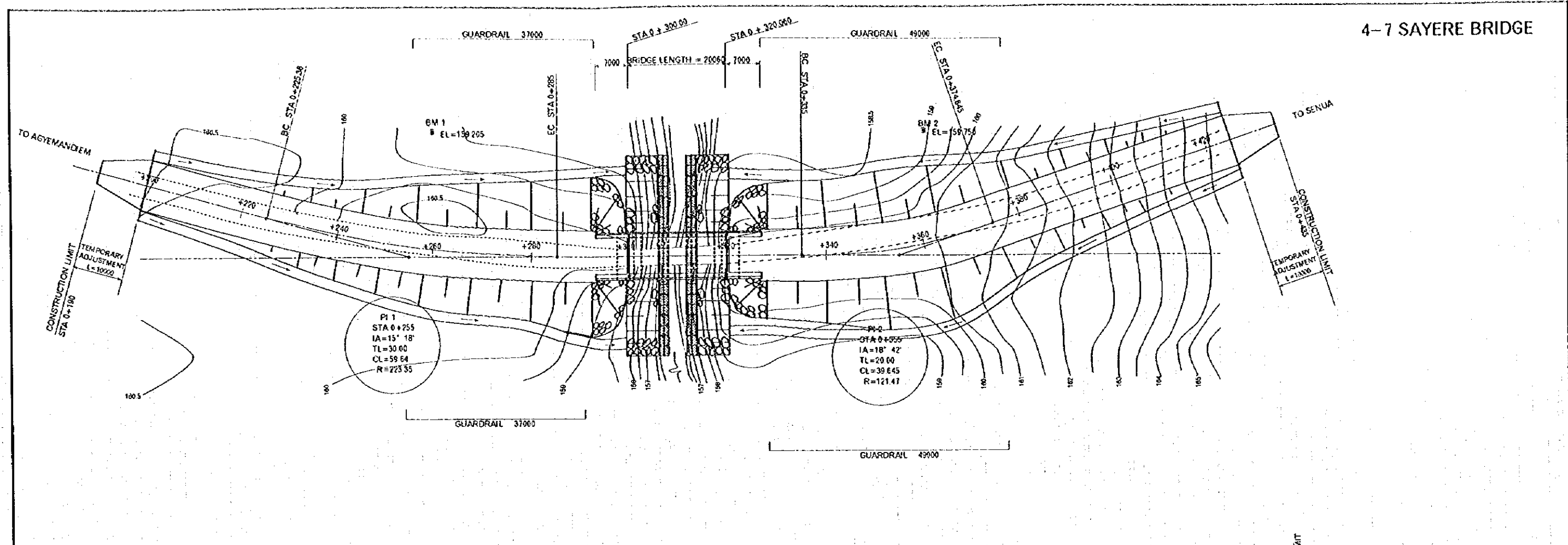




3-5 FUM BRIDGE

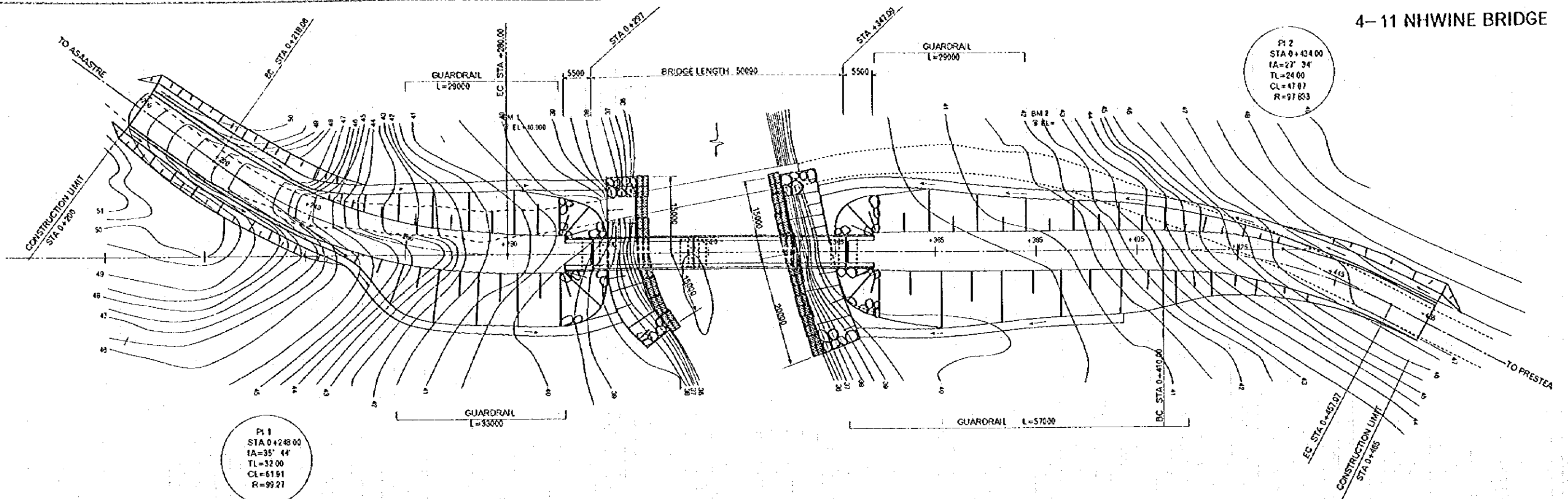


4-7 SAYERE BRIDGE



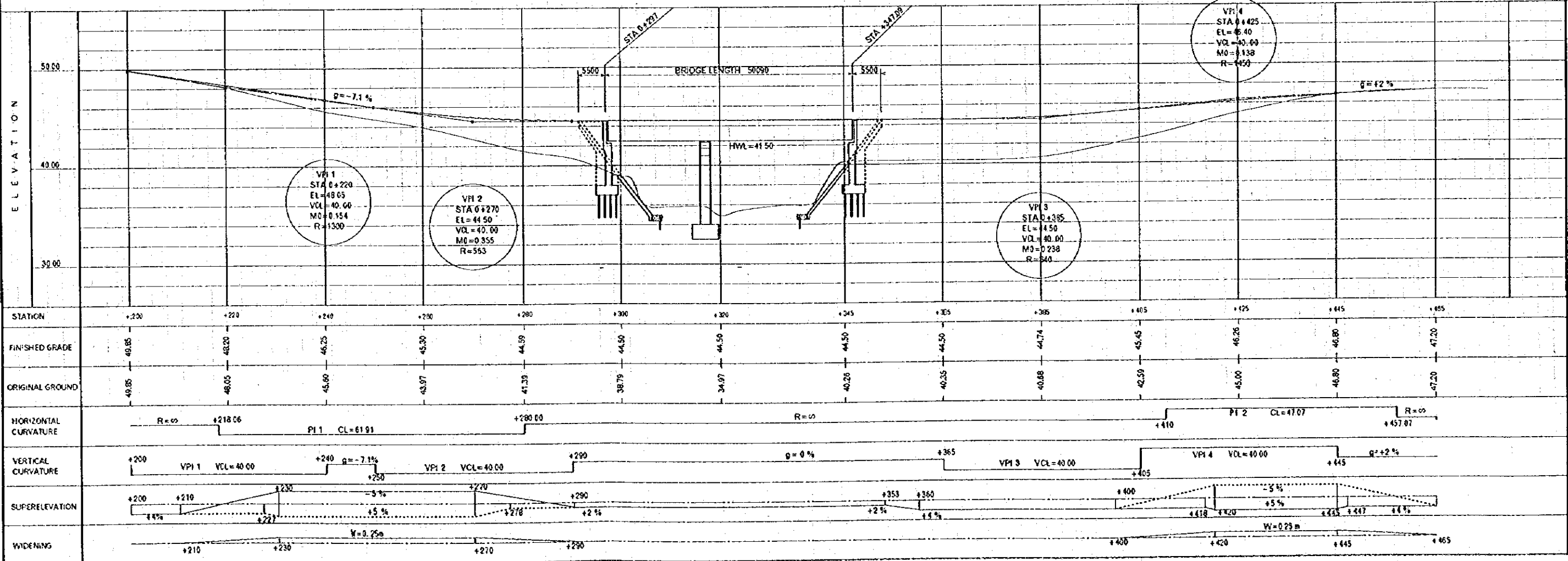


4-11 NHWINE BRIDGE

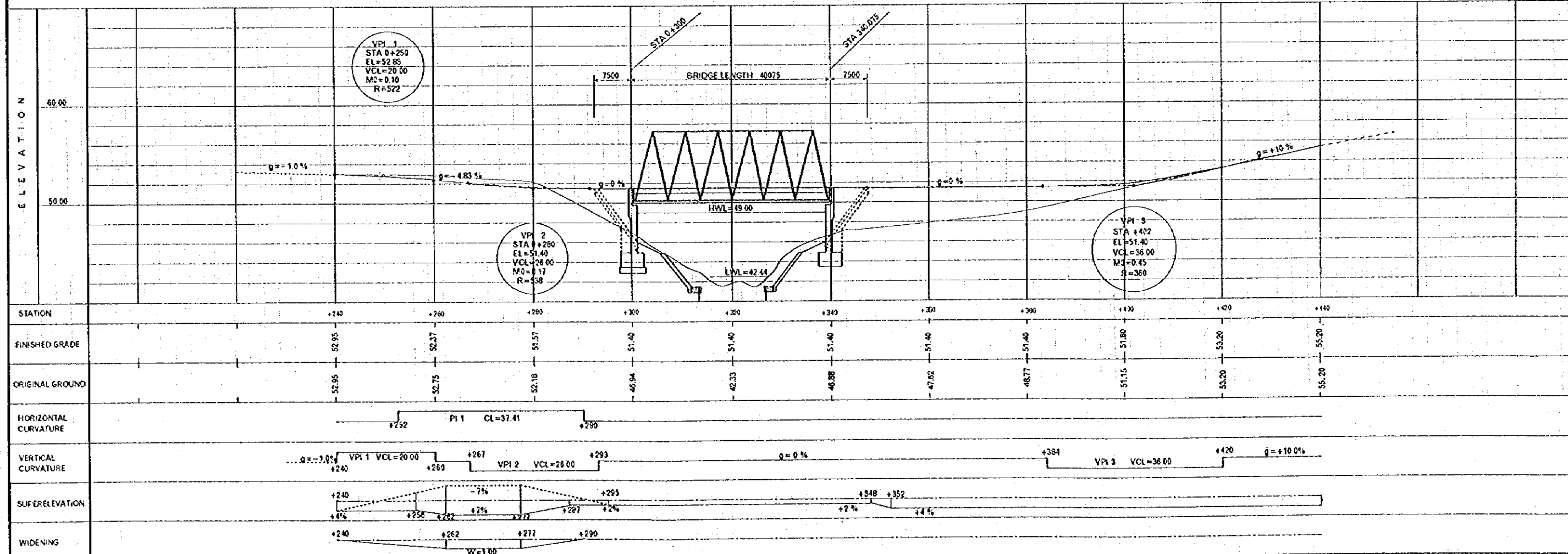
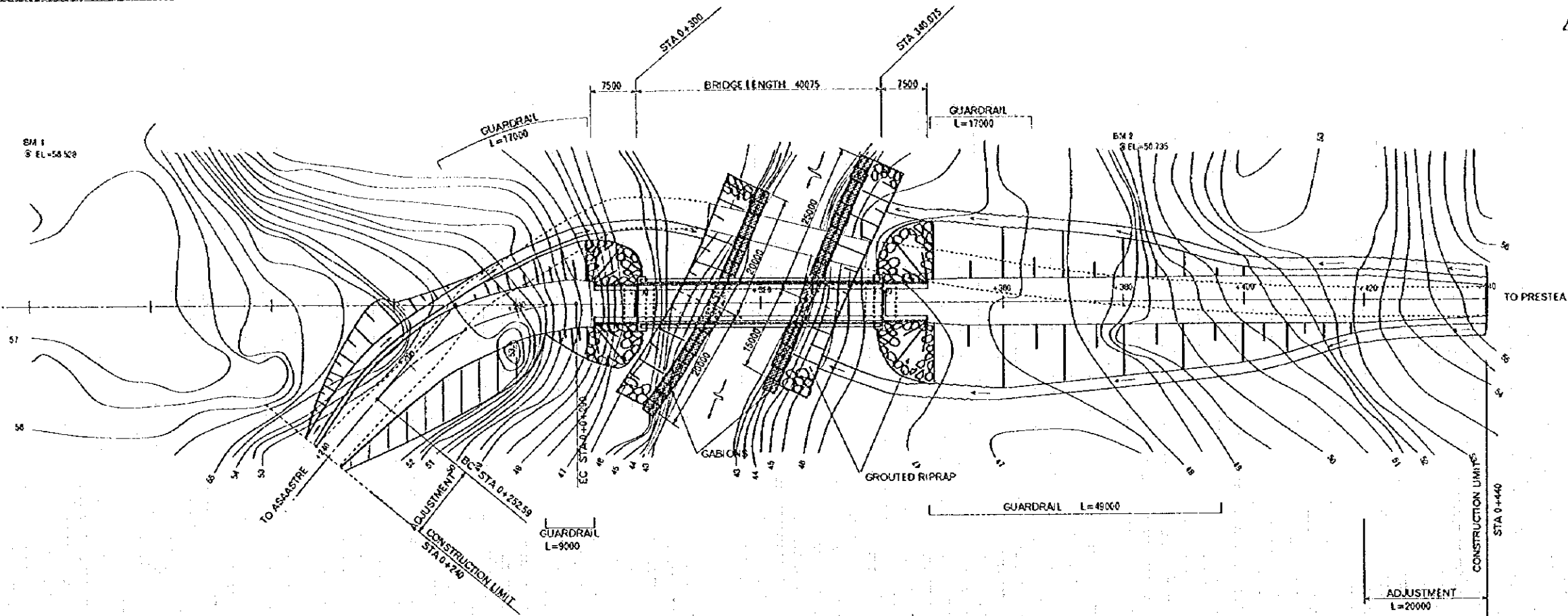


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 TL=32.00  
 CL=61.91  
 R=99.27

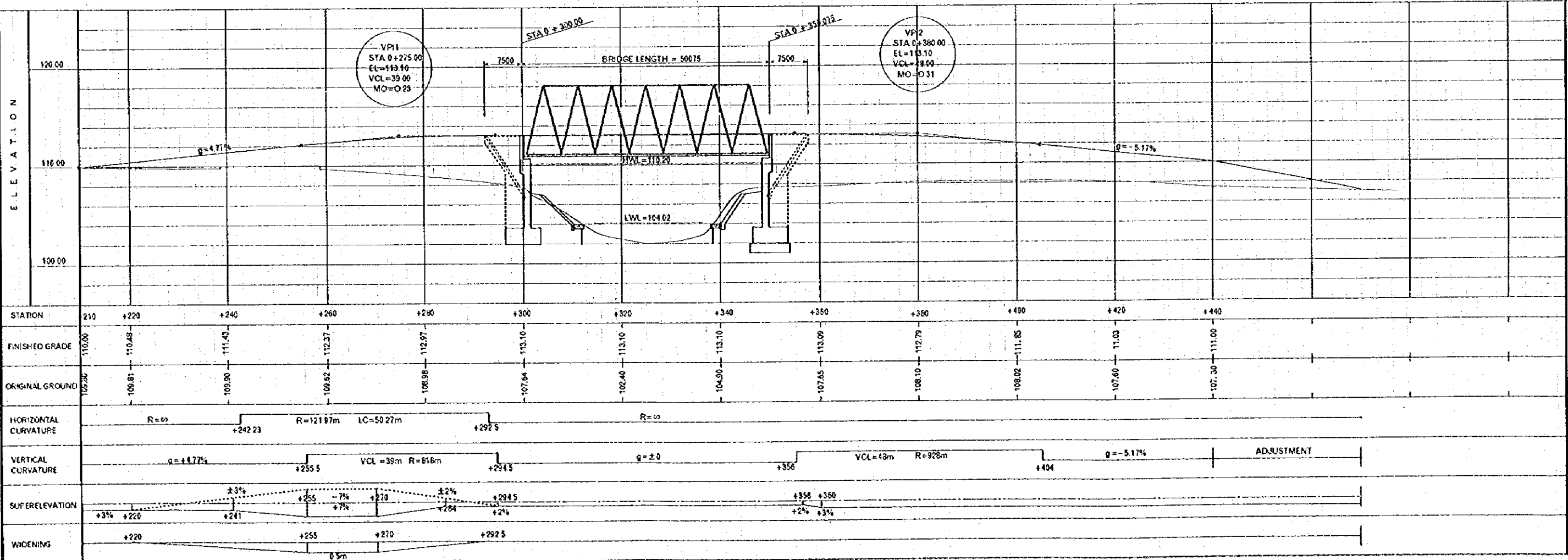
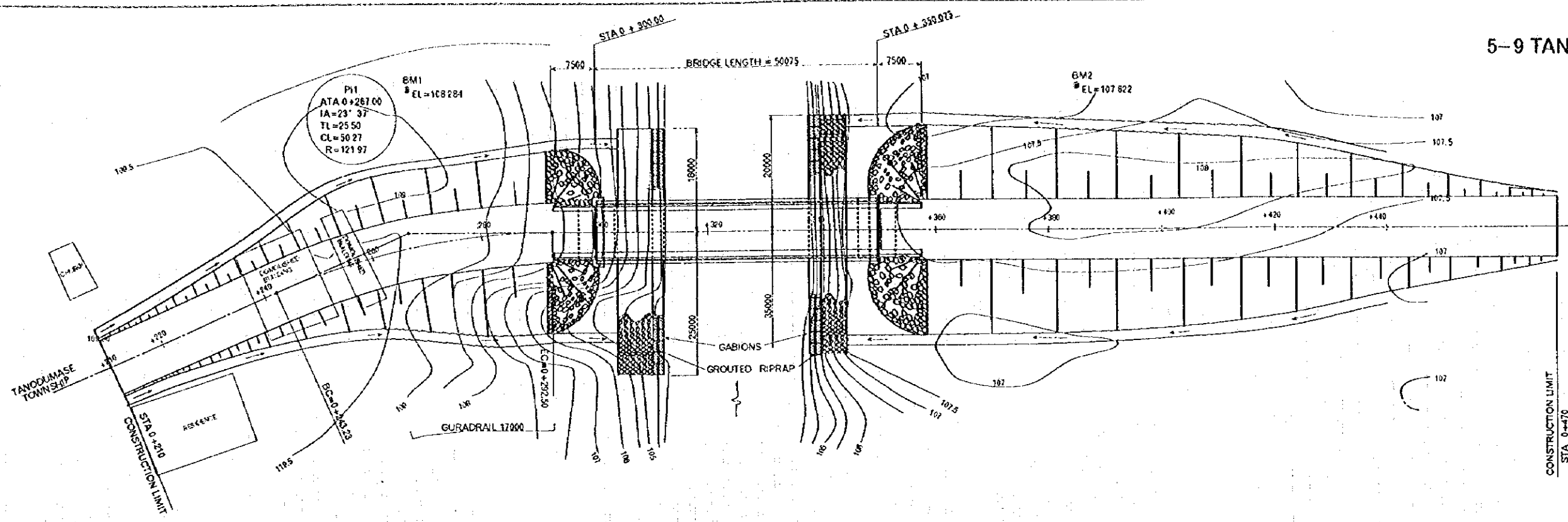
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 IA=27° 34'  
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 CL=47.07  
 R=97.63

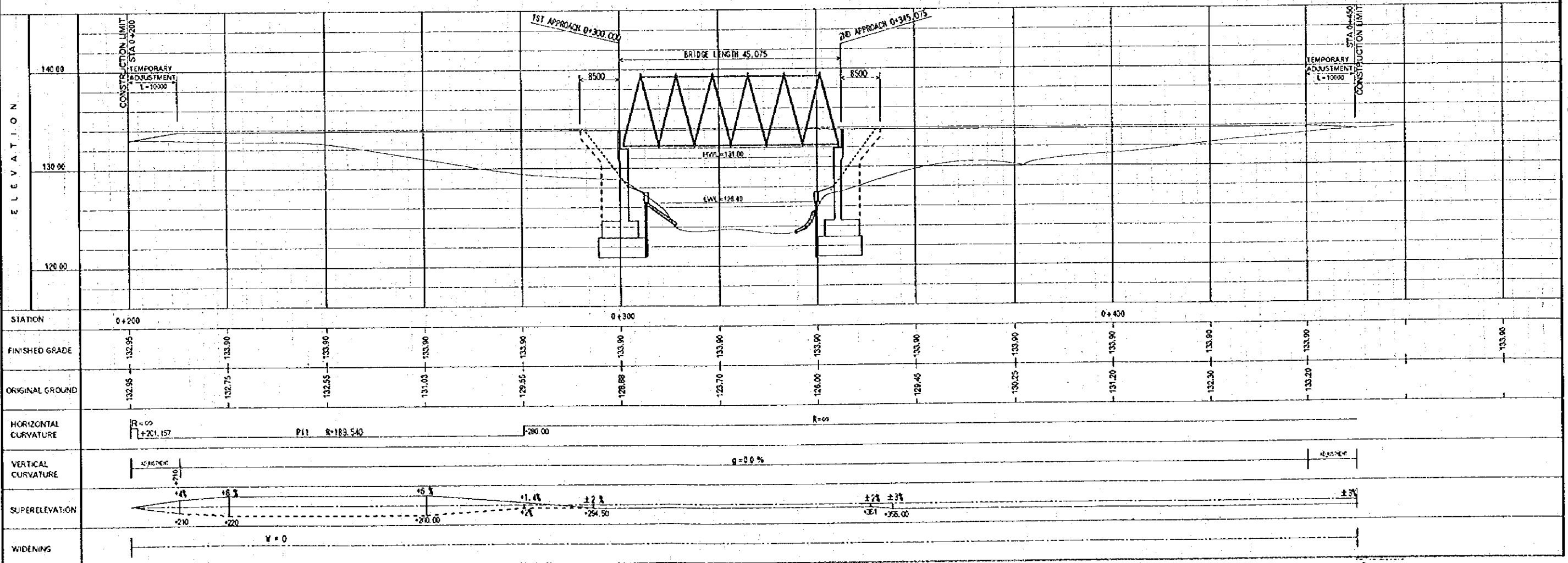
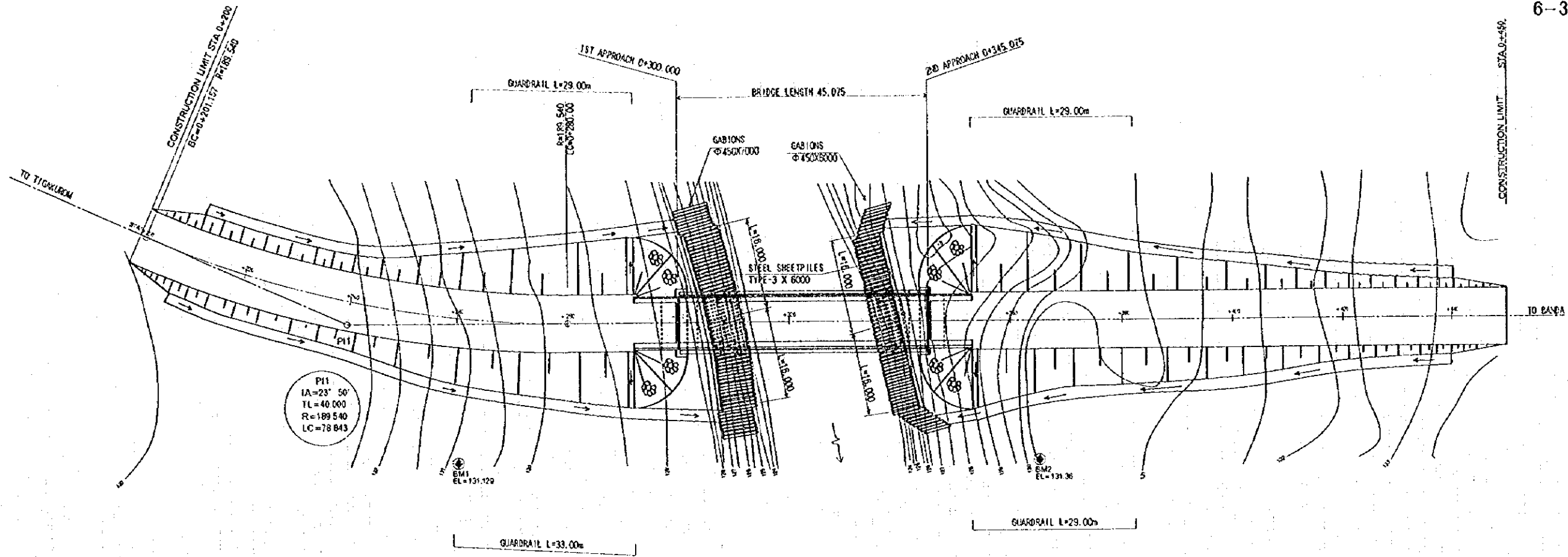


4-12 DRAW BRIDGE



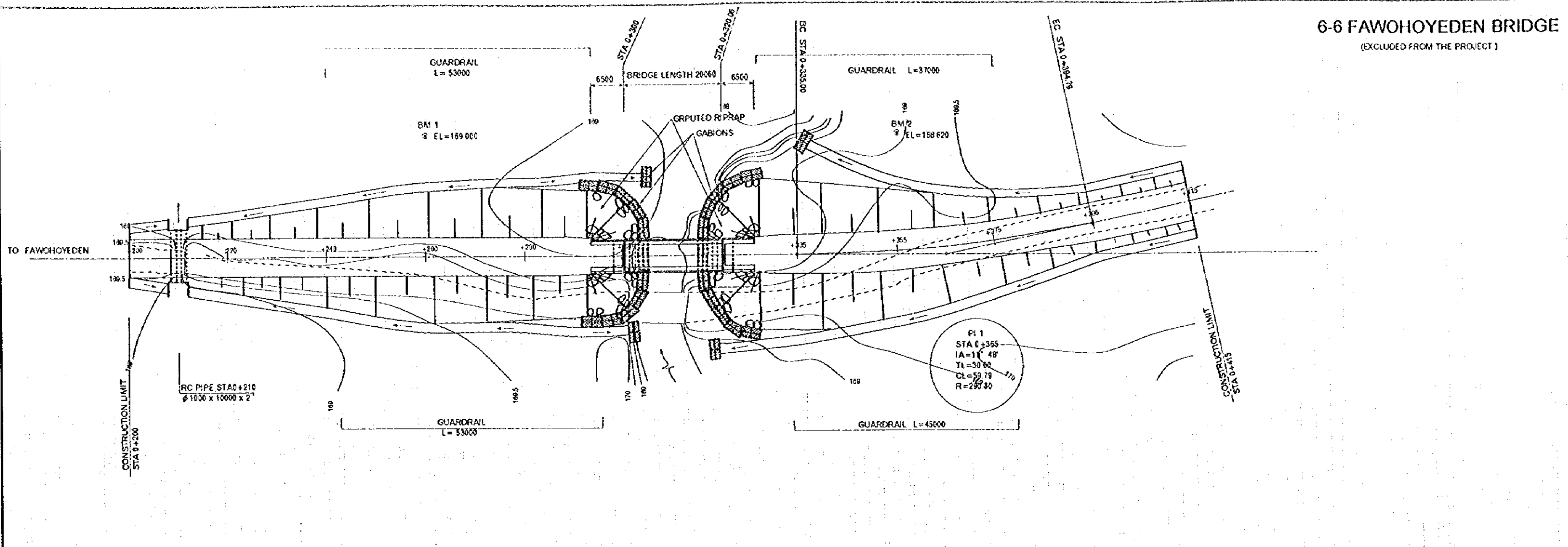
5-9 TANADUMASE BRIDGE





# 6-6 FAWOHOYEDEN BRIDGE

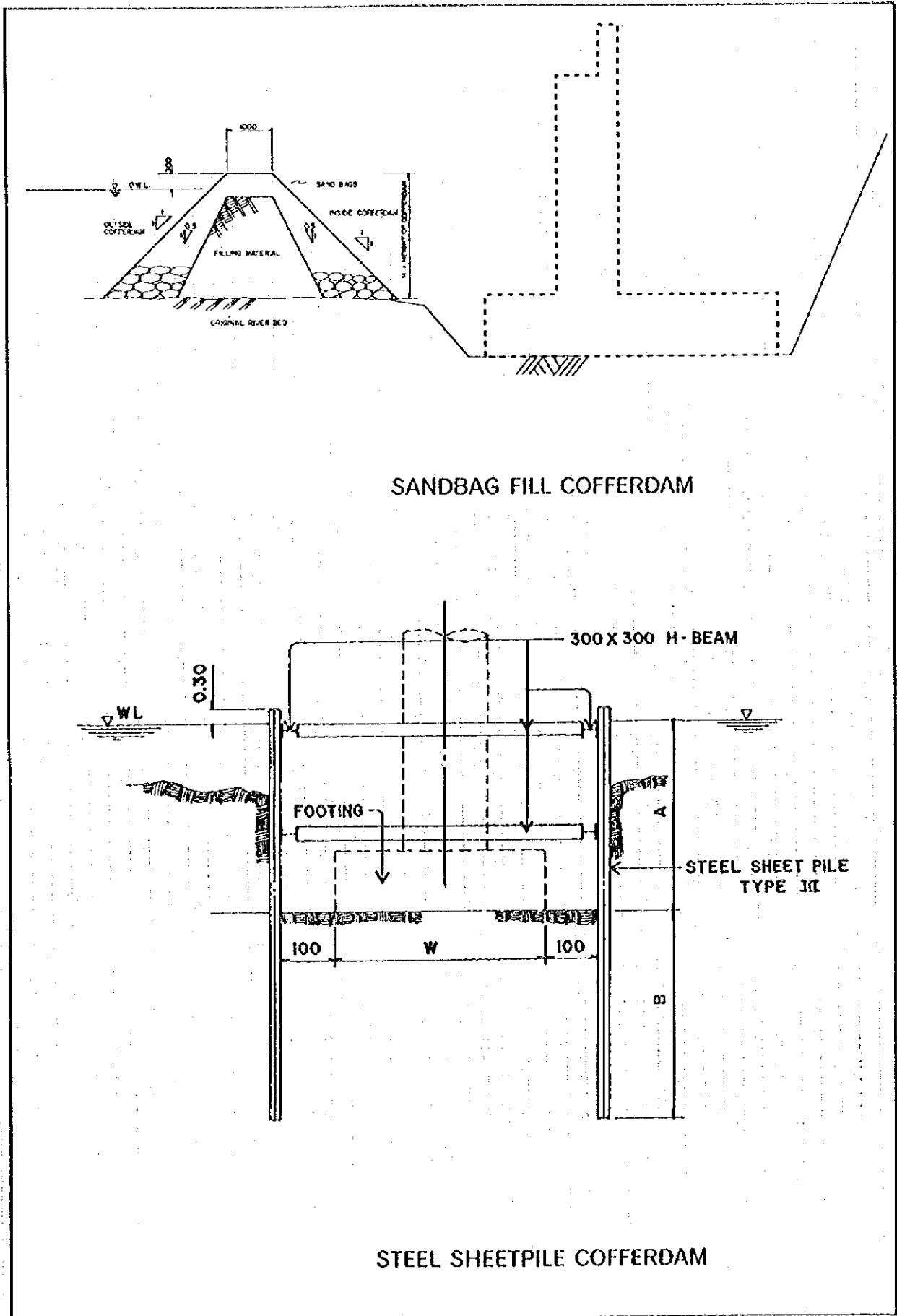
(EXCLUDED FROM THE PROJECT)



ELEVATION	ELEVATION											
	130.00											
120.00												
STATION	+200	210	+240	+260	+280	+300	+315	+335	+355	+365	+415	
FINISHED GRADE	169.74	170.26	171.88	173.23	174.27	174.40	174.40	174.57	173.55	172.08	170.67	170.15
ORIGINAL GROUND	169.59	169.29	169.04	169.57	168.51	169.08	168.72	168.50	169.90	169.41	169.70	169.99
HORIZONTAL CURVATURE	R = ∞											
VERTICAL CURVATURE	VPI 1 VCL=30.00	g = +1.77%	VPI 2 VCL=30.00	g = 0%	VPI 3 VCL=30.00	g = -2.73%	VPI 4 VCL=30.00					
SUPERELEVATION	+4%											
WIDENING												

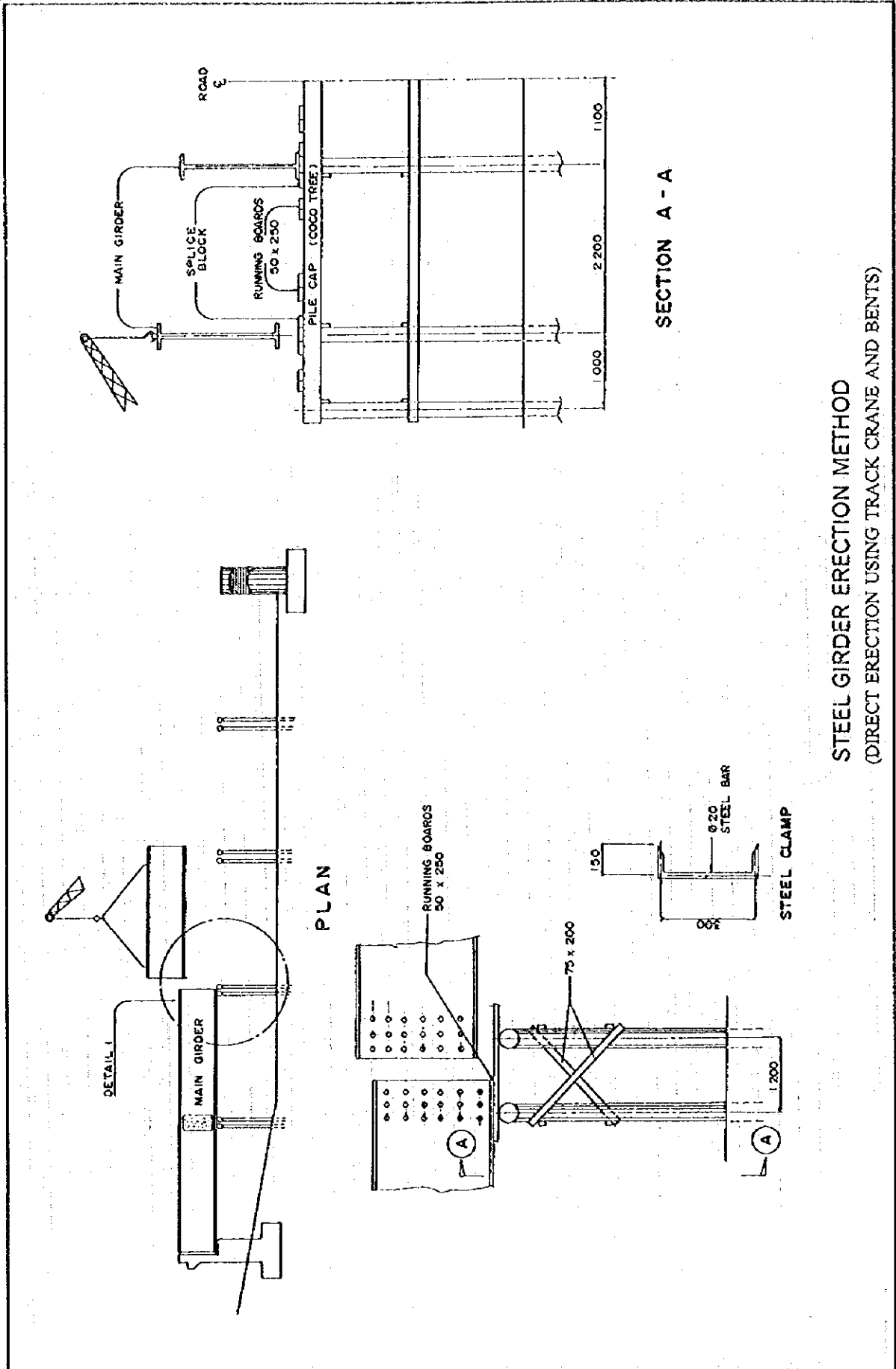


APPENDIX 7. SCHEME OF CONSTRUCTION METHODS



SANDBAG FILL COFFERDAM

STEEL SHEETPILE COFFERDAM



STEEL GIRDER ERECTION METHOD  
(DIRECT ERECTION USING TRACK CRANE AND BENTS)



APPENDIX 8. SUMMARY OF DESIGN CALCULATION

Calculation Results of Plate Girder Bridges  
Stress and Reflection at the span center

Bridge Name	AVENSU		EMUO		FUM		NHWINE		NHWINE	
	2-2		2-4		3-5		4-11 (30m)		4-11 (20m)	
Bridge Number	G1.G3	G2	G1.G3	G2	G1.G3	G2	G1.G3	G2	G1.G3	G2
Main Girder										
Mb (tf·m)	493.60	474.20	390.30	356.30	493.60	474.20	493.60	474.20	233.40	224.2
Sb (tf)	12.70	11.90	13.50	11.70	12.70	11.90	12.70	11.90	8.20	7.80
Area (cm <sup>2</sup> )	409.00	399.00	342.00	320.00	409.00	399.00	409.00	399.00	333.00	324.2
Inertia (cm <sup>4</sup> )	2056752	1990732	1909568	1464860	2056752	1990732	2056752	1990732	1399865	1348899
Material Grade	SM490Y	SM490Y	SM490Y	SM490Y	SM490Y	SM490Y	SM490Y	SM490Y	SS400	SS400
$\sigma$ (kg/cm <sup>2</sup> )	1980	1965	1993	1990	1980	1965	1980	1965	1287	1283
$\sigma_a$ (kg/cm <sup>2</sup> )	2100	2100	2100	2100	2100	2100	2100	2100	1400	1400
$\tau$ (kg/cm <sup>2</sup> )	88	83	94	81	88	83	88	83	61	58
$\tau_a$ (kg/cm <sup>2</sup> )	1200	1200	1200	1200	1200	1200	1200	1200	800	800
Deflection $\delta$ (mm)	34.9	32.0	27.5	23.5	34.9	32.0	34.9	32.0	12.4	12.4

- Mb : Bending Moment
- Sb : Shearing Force
- $\sigma$  : Stress due to Bending Moment
- $\sigma_a$  : Allowable Stress for  $\sigma$
- $\tau$  : Stress due to Shearing Force
- $\tau_a$  : Allowable Stress for  $\tau$
- $\delta$  : Vertical Deflection by Live Load

Truss Bridges

Bridge Name		JOHOL				
Bridge Number		6-3				
Main	Truss	U3	L4	DI	D7	
Section	Ns (tf)	-291.88	274.07	-203.85	60.84	
Force	Mo (tf·m)	4.86	6.57	-	-	
	Lx (cm)	730.80	730.80	791.60	791.60	
	Ly (cm)	730.80	730.80	791.60	791.60	
Section	Area (cm <sup>2</sup> )	306.50	248.50	199.00	137.48	
Property	Ix (cm <sup>4</sup> )	79305	75716	50574	13869	
	Iy (cm <sup>4</sup> )	82552	66339	51725	42413	
	Material Grade	SS400	SS400	SS400	SS400	
Stress	$\sigma$ (kg/cm <sup>2</sup> )	952	-1103	1024	-443	
	$\sigma_{ca}$ (kg/cm <sup>2</sup> )	1186	1400	1511	1400	
	$\sigma_{cf}$ (kg/cm <sup>2</sup> )	1099	-1284	-	-	
	$\sigma_{cfa}$ (kg/cm <sup>2</sup> )	1400	1400	-	-	
	$\sigma_{cw}$ (kg/cm <sup>2</sup> )	1084	-	-	-	
	$\sigma_{cwa}$ (kg/cm <sup>2</sup> )	1400	-	-	-	
Deflection	$\delta$ (mm)				16.9	

RC Bridges

Bridge Name		SAYERE		FAWOHO	
Bridge Number		4-7		YEDEH	
Section	Force	Force	Force	Force	Force
	Mo (tf·m)	356.20	323.90	72.40	72.40
Section	Property	b (cm)	230	220	220
		b <sub>0</sub> (cm)	50	50	50
		h (cm)	250	250	250
		t (cm)	19	19	19
		As (cm <sup>2</sup> )	103.25	103.25	103.25
			13-D32	13-D32	13-D32
Stress	$\sigma_c$ (kg/cm <sup>2</sup> )	32.9	31.4	80.0	80.0
	$\sigma_{ca}$ (kg/cm <sup>2</sup> )	80.0	80.0	1418	1418
	$\sigma_s$ (kg/cm <sup>2</sup> )	1558	1558	1600.0	1600.0
	$\sigma_{sa}$ (kg/cm <sup>2</sup> )	1600.0	1600.0		

Truss Bridges		DRAW					TANODUMASE				
Bridge Name		4-12					5-9				
Bridge Number		U3	L4	D1	D7	U3	L4	D1	D7		
Section	Ns (tf)	-171.05	160.72	-125.39	38.01	-363.56	362.01	-236.31	-33.19		
Force	Mb (tf·m)	2.69	3.48	-	-	5.34	6.99	-	-		
	Lx (cm)	647.50	647.50	735.20	735.20	697.90	697.90	785.50	785.50		
	Ly (cm)	647.50	647.50	735.20	735.20	697.90	697.90	785.50	785.50		
Section	Area (cm <sup>2</sup> )	195.00	150.50	138.00	70.20	352.50	315.50	223.00	158.40		
Property	Ix (cm <sup>4</sup> )	27348	25210	18234	2346	115176	120700	72733	46043		
	Iy (cm <sup>4</sup> )	29596	23535	21408	11045	121278	107221	72832	50958		
	Material Grade	SS400	SS400	SS400	SS400	SS400	SS400	SS400	SS400		
Stress	$\sigma$ (kg/cm <sup>2</sup> )	877	-1068	909	-541	1031	-1147	1060	210		
	$\sigma_{ca}$ (kg/cm <sup>2</sup> )	1109	1400	1030	1400	1244	1400	1182	813		
	$\sigma_{cf}$ (kg/cm <sup>2</sup> )	1061	-1283	-	-	1151	-1284	-	-		
	$\sigma_{cfa}$ (kg/cm <sup>2</sup> )	1400	1400	-	-	1400	1400	-	-		
	$\sigma_{cw}$ (kg/cm <sup>2</sup> )	1040	-	-	-	1140	-	-	-		
	$\sigma_{cwa}$ (kg/cm <sup>2</sup> )	1400	-	-	-	1400	-	-	-		
Deflection	$\delta$ (mm)	14.6					20.7				

Ns : Axial Force  $\sigma_{cfa}$  : Allowable Stress for  $\sigma_{cf}$   
 Mb : Bending Moment  $\sigma_{cw}$  : Compression Stress at Web due to Axial Force and Bending Moment  
 Lx, Ly : Effective Buckling Length  $\sigma_{cwa}$  : Allowable Stress for  $\sigma_{cw}$   
 $\sigma_c$  : Compression Stress due to Axial Force  $\delta$  : Vertical Deflection under Live Load (Center of Span)  
 $\sigma_{ca}$  : Allowable Stress for  $\sigma_c$   
 $\sigma_{cf}$  : Compression Stress at Flange due to Axial Force and Bending Moment

Calculation results of Abutment and Pier Stability

Bridge Name	AYENSU	EMUO	FUM	SAYERE	NHWINE	DRAW	TANODU MASE	IOHOL	FAWOHO YEDEN
Bridge No.	2-2	2-4	3-5	4-7	4-11	4-12	5-9	6-3	6-6
Superstructure									
Bridge Type Mark	PI Girder	PI Girder	PI Girder	RC Bridge	PI Girder	Truss	Truss	Truss	RC Bridge
Bridge Length	Lo	25.060	30.060	20.600	20.060+30.060	40.075	50.075	45.075	20.060
Substructure					Abutment				
Abutment Width	L	6.600	6.600	9.400	6.600	6.600	9.400	9.400	6.600
Abutment Hig.	H	8.000	9.000	9.000	7.000	10.000	11.000	11.000	7.500
Footing Width	B	4.500	5.500	5.000	5.000	4.500	7.500	7.000	4.000
Bearing (F=0)	Normal	33.8	30.4	33.9	34.9	37.3H	37.6	36.7	28.9
	Allowa.	40.0	40.0	40.0	40.0	46.0H	40.0	40.0	40.0
	Earth Q.	38.9	36.4	39.7	41.8	40.3H	44.7	44.0	33.6
	Allowa.	60.0	60.0	60.0	60.0	70.0H	60.0	60.0	60.0
Sliding (F=1)	Normal	2.51	2.46	2.42	2.29	0.3cm	2.26	2.45	2.15
	Allowa.	1.50	1.50	1.50	1.50	1.0cm	1.50	1.50	1.50
	Earth Q.	1.93	1.80	1.78	1.69	0.4cm	1.75	1.76	1.69
	Allowa.	1.20	1.20	1.20	1.20	1.5cm	1.20	1.20	1.20

H-Pile

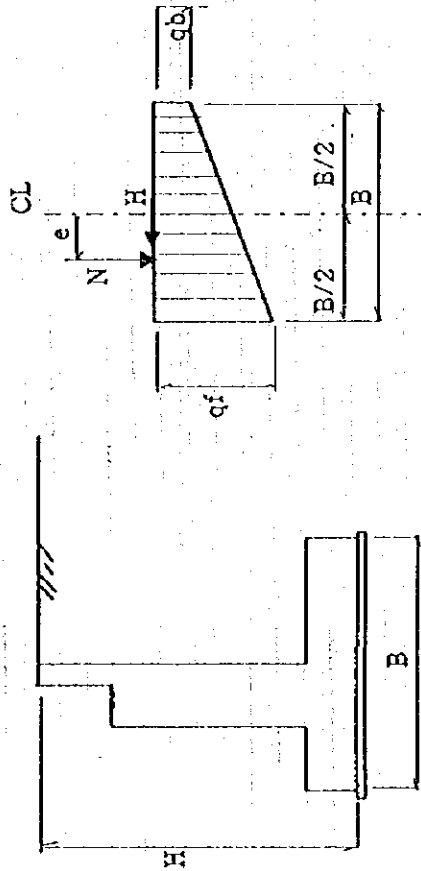
Not 4-11 is used H-Pile for Abutment

qf: Reaction

qa: Bearing Capacity

f: Deflection of Pile Top

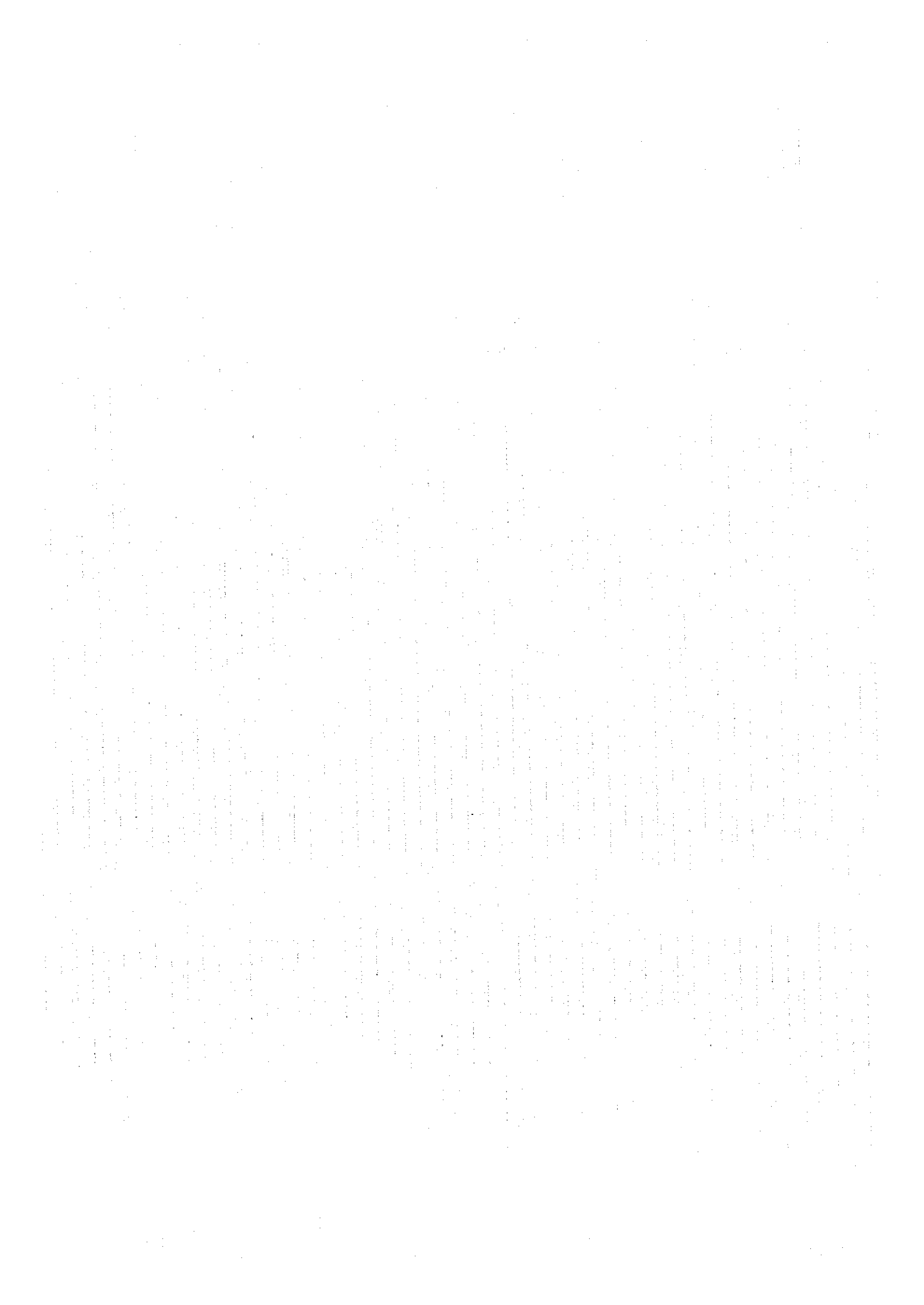
af: Allowabl Deflection



## APPENDIX 9. REFERENCES

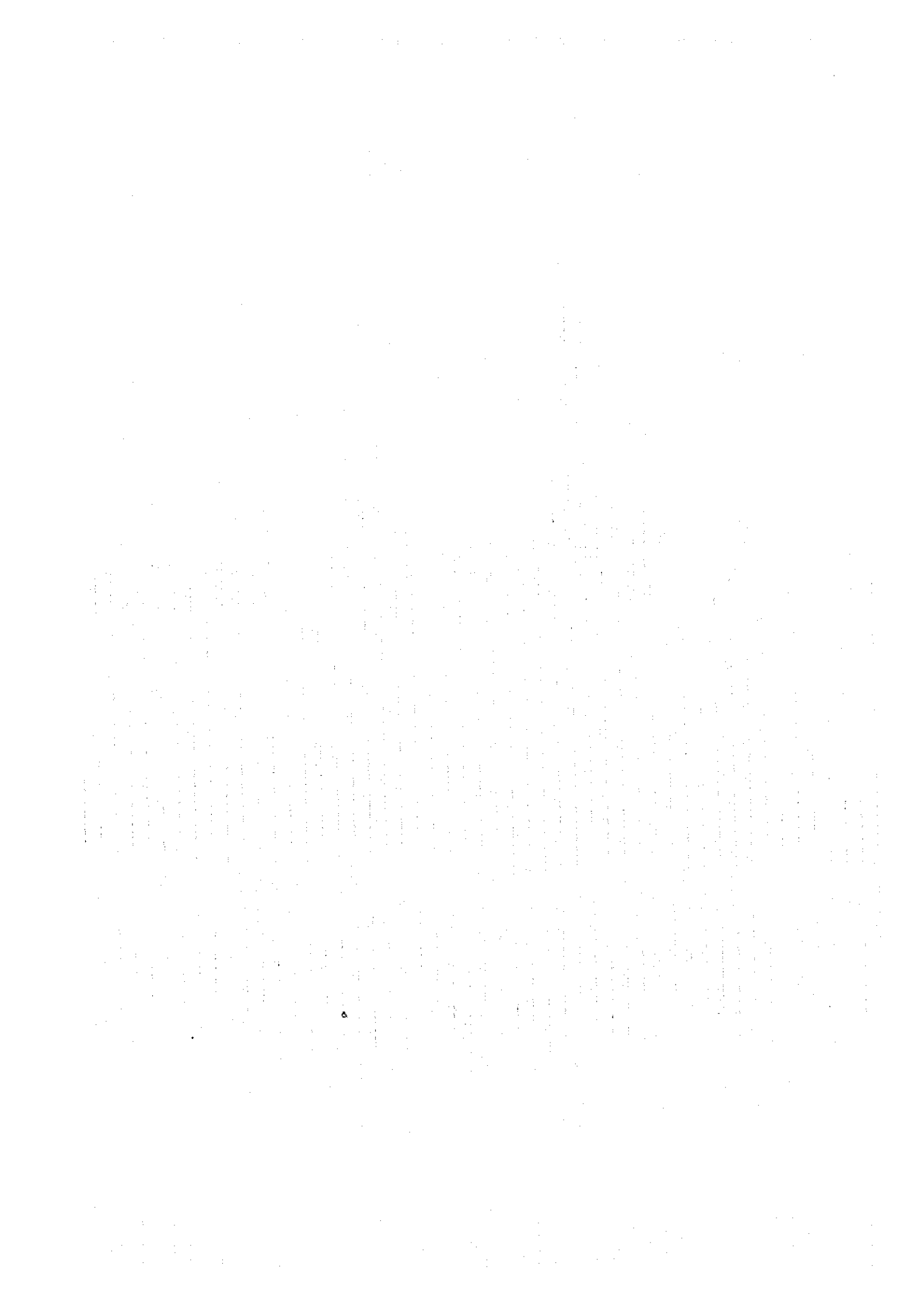
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