

MINUTES OF DISCUSSION

ON

THE BASIC DESIGN STUDY ON THE PROJECT

FOR

REHABILITATION OF RURAL ROADS

IN

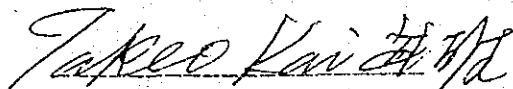
THE REPUBLIC OF ZIMBABWE

Based on the results of the Preliminary Study, the Government of Japan decided to conduct a Basic Design Study on the Project for Rehabilitation of Rural Roads in the Republic of Zimbabwe (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (JICA).

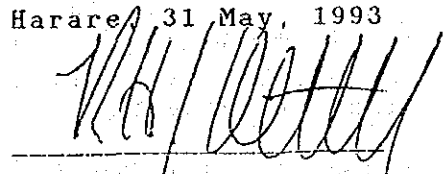
JICA sent to Zimbabwe a study team which is headed by Mr. Takeo Kai, Transport and Land Development Specialist, JICA, and is scheduled to stay in the country from May 23 to June 15, 1993.

In the course of the discussions and field survey, both parties have confirmed the main items described on the attached sheets. Based on these Minutes of Discussions the team will proceed to further works and prepare the Basic Design Study report.

Harare, 31 May, 1993



Takeo Kai
Leader
Basic Design Study Team
JICA



Mr R.H.J Mitchell
Director
Department of State Roads
Ministry of Transport and
Energy

ATTACHMENT

1. Objectives

The objectives of the Project is to rehabilitate the secondary roads including construction of bridges.

2. Project Sites

The sites of the Project to be studied are shown with priority in Annex I.

3. Executing Agency

The Department of State Roads of the Ministry of Transport is responsible for the implementation and administration of the Project.

4. Items Requested by the Government of Zimbabwe

After the discussion on the Project, the following items were requested by Zimbabwe side:

- (1) To construct bridges and rehabilitate the secondary roads as shown in Annex I.
- (2) To supply materials and equipment for the road construction by Zimbabwe side as shown in Annex II.

However, the final components of the Project will be decided after further studies.

5. Items Agreed by both sides

- (1) Road Rehabilitation will be carried out by Japanese side and Zimbabwe side.
- (2) Zimbabwe side confirmed to secure the necessary budget for the road rehabilitation which shall be constructed.
- (3) Bridges are designed as First Class Bridge of Japanese Road Bridge Design Standard (for National Trunk A Class Road Bridge). Then, the design result will be examined with Zimbabwe Standard.
- (4) Technical transfer will be done including on-the-Job Training.

F.K. 

6. Japan's Grant Aid system

The Government of Zimbabwe has understood the system of Japanese Grant Aid explained by the team.

The Government of Zimbabwe will take necessary measures, described in Annex III for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

7. Schedule of the Study

The consultant will proceed to further studies in Zimbabwe until June 15, 1993.

JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around September 1993.

J.K.M

Annex I

Items requested by Zimbabwe side.

1. Rehabilitation/construction of bridges

- (1) Odzi Bridge (Route 357)
- (2) Ungwe Bridge (Route 956)
- (3) Devure Bridge (Route 344)
- (4) Sote Bridge (Route 344)
- (5) Pembezi Bridge (Route 344)
- (6) Devure Bridge (Route 359)
- (7) Nata Bridge (Route 759)

Note: The items are listed on the priority order.

2. Rehabilitation of secondary roads

- (1) Route 357 between Chinyauhwera and Marange.
- (2) Route 956 between Kuwirirana and Nemangwe.
- (3) Route 344 between Gutu and Kurai.
- (4) Route 359 between Kurai and Moodies' Pass.

Note: The items are listed on the priority order.

JK M

Annex II

The requested materials and equipment are as follows:

MACHINE	POWER/CAPACITY	REMARKS
A. Earth equipment		
Road grader	100-150 kW	With engine
Bull-dozer (tracked tractor)	200-250 kW	
Bull-dozer (tracked tractor)	130-150 kW	
Bull-dozer (tracked tractor)	50- 60 kW	
Excavator	25- 50 tonne	With engine
Tipper (dumper)	3- 5 m3	With engine
Front-end-loader: (tractor shovel)	80-120 kw	With engine
B. Compaction equipment		
Pneumatic tyred roller	8- 15 tonne	With engine
Pneumatic tyred roller	5- 10 tonne	Without engine
Steel wheeled flat roller	8- 12 tonne	With engine
Grid roller	5- 19 tonne	Without engine
C. Ancillary equipment for (A) & (B)		
Water tanker (bowser)	5- 15 m3	With engine
Water tanker (bowser)	3- 5 m3	Without engine
Pneumatic tyred tractor	60-115 kW	
Disc harrow	5-furrow	Towed
Water pump (150mm)		
D. Surfacing equipment		
Bitumen distributor	5000-10 000 litres	With engine
Stone chip spreader	3.0 m wide	With engine
Drag Broom	3.0 m wide	With engine
E. Sundries		
Telescopic loader	7- 10 tonne	With engine
Concrete mixer	175-300 litres	Towed
F. Materials		
Steel corrugated pipes for culverts		
Bitumen		

J.K. M

Annex III

Necessary measures to be taken by the Government of Zimbabwe in case Japan's Grant Aid is extended.

1. To secure the site for the project.
2. To clear the site, prior to the commencement of the project.
3. To bear commissions to the Japanese foreign exchange bank for banking services based upon the Banking Arrangement.
4. To exempt taxes and take necessary measures for customs clearance of the materials and equipment brought for the project at the port of disembarkation.
5. To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the verified contract such facilities as may be necessary for their entry into Zimbabwe and stay therein for the performance of their work.
6. To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant.
7. To bear all the expenses other than those to be borne by the Grant, necessary for construction of the facilities as well as for the transportation and installation of the equipment.

FK D

**MINUTES OF DISCUSSIONS ON
THE BASIC DESIGN STUDY ON THE PROJECT
FOR REHABILITATION OF RURAL ROADS
IN THE REPUBLIC OF ZIMBABWE**

In May 1993, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team on the Project for Rehabilitation of Rural Roads (hereinafter referred to as the "Project") to the Republic of Zimbabwe.

The team has prepared the draft report of the study, through discussions between both sides, field survey and examination of the results in Japan.

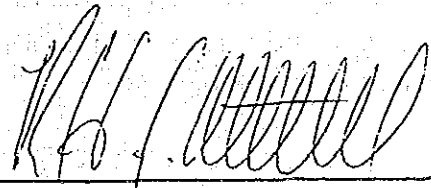
In order to explain and to consult the Zimbabwe side on the components of the draft report, JICA sent to Zimbabwe a study team, which is headed by Mr. Takeo Kai, Transport and Land Development Specialist, JICA, and is scheduled to stay in the country from September 19 to September 27, 1993.

In the course of the discussions, both parties have confirmed the main items described on the attached sheets. Based on those Minutes of Discussions, the team will proceed to further works and prepare the Basic Design Study Report.

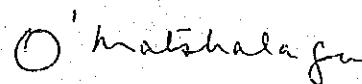
Harare, September 22, 1993



Mr. Takeo Kai
Leader,
Basic Design Study Team,
JICA



Mr. R. H. J. Mitchell
Director
Department of State Roads,
Ministry of Transport and Energy



Mr. O. Matshalaga
Under Secretary,
Ministry of Finance

ATTACHMENT

1. Components of the draft report

- (1) The Government of the Republic of Zimbabwe has agreed and accepted the components of the draft report proposed by the JICA Basic Design Study Team after the perusal of the draft report and discussion between the team and GOZ officials.
- (2) Zimbabwe side will rehabilitate the following roads: Route 357, 956, 344 and 359, totaling to 168 km, using 2 construction units within 5 years after receiving the construction equipment and materials.

2. Grant Aid Programme extended by Japan

- (1) The Government of the Republic of Zimbabwe has understood the system of Japanese Grant Aid explained by the team.
- (2) The Government of the Republic of Zimbabwe will take necessary measures as agreed by both sides in the minutes of discussions held on October 6th, 1992 and May 31st, 1993.

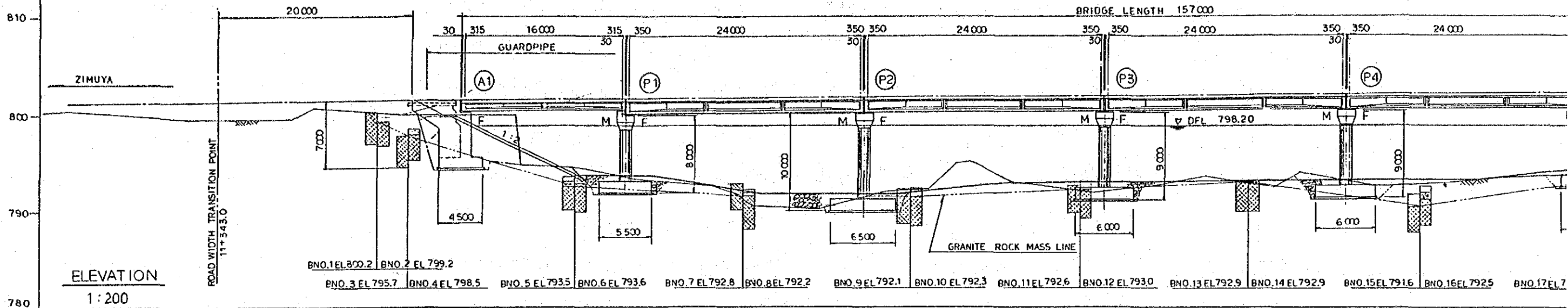
3. Further Schedule

The team will make the final report in accordance with the confirmed items, and send it to the Government of the Republic of Zimbabwe by the end of December 1993.

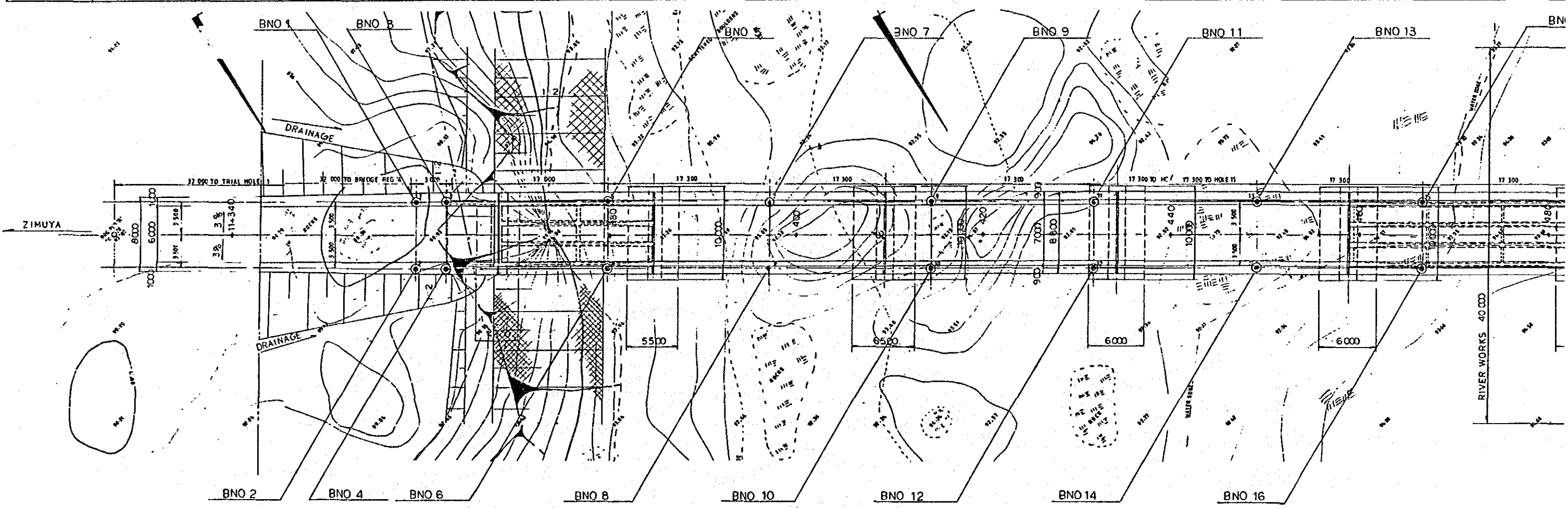
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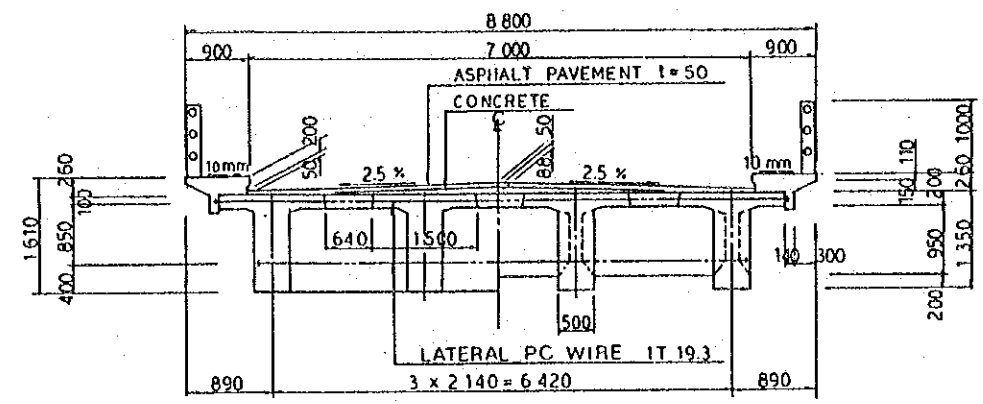
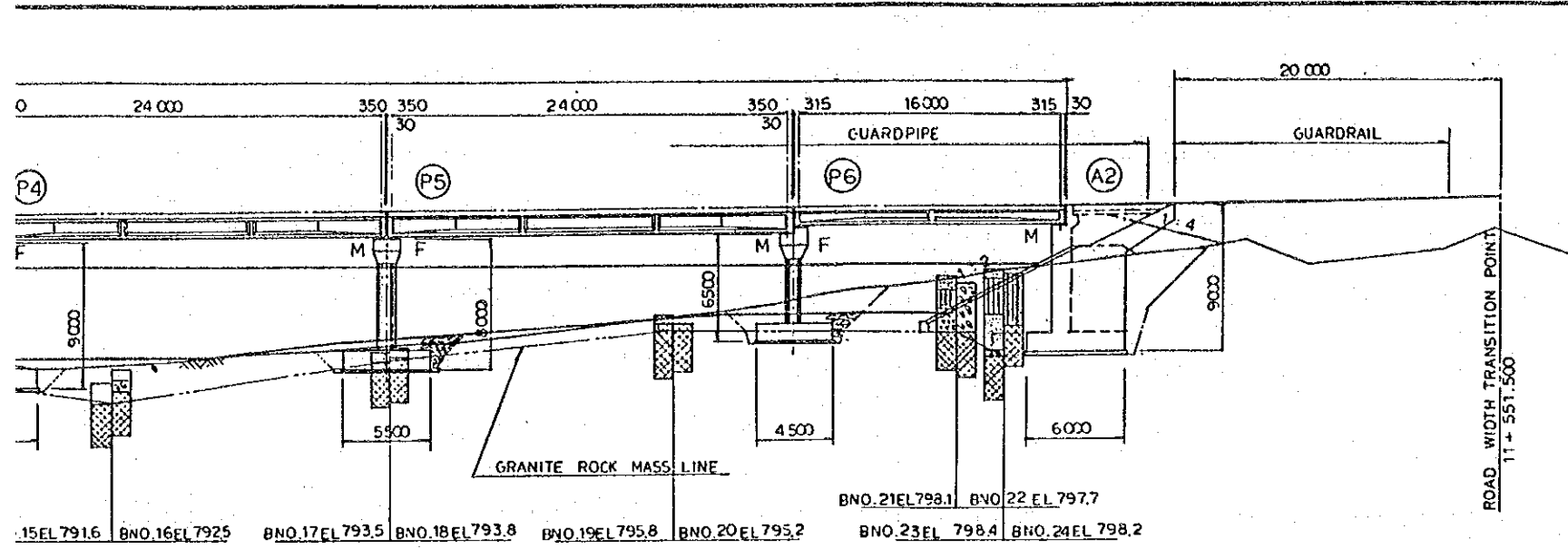
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Basic Design Drawings

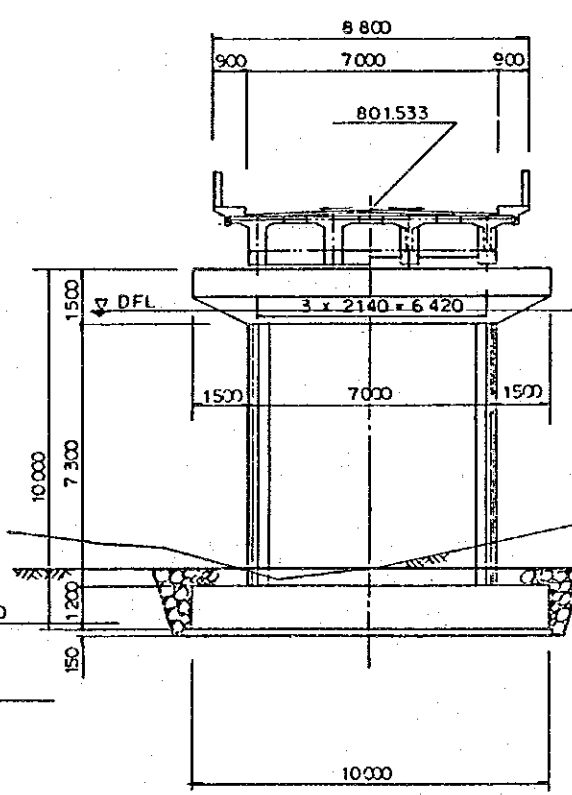
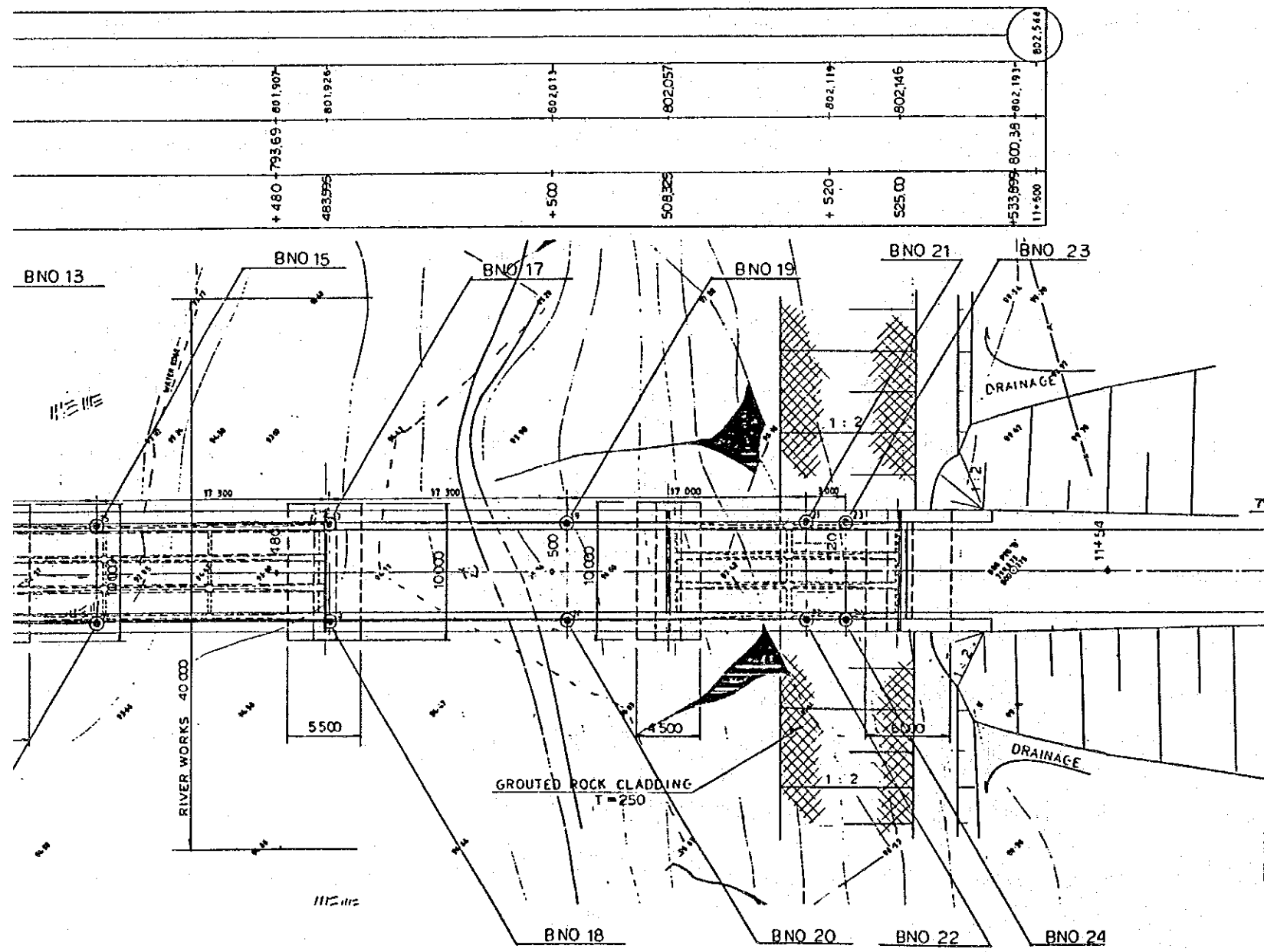


VERTICAL ALIGNMENT	PROPOSED LEVEL	GROUND LEVEL	CHAINAGE
800.560			11+245
	801.097	800.28	32745
	801.164	799.39	11+340
	801.270	799.93	+360
	801.313		+368
	801.376	794.40	+380
	801.401		394675
	801.483	790.50	+400
	801.533		409405
	801.589	794.87	+420
	801.664		434135
	801.695	792.82	+440
	801.795	792.57	458965
	801.801		+460
	801.907	793.69	+480

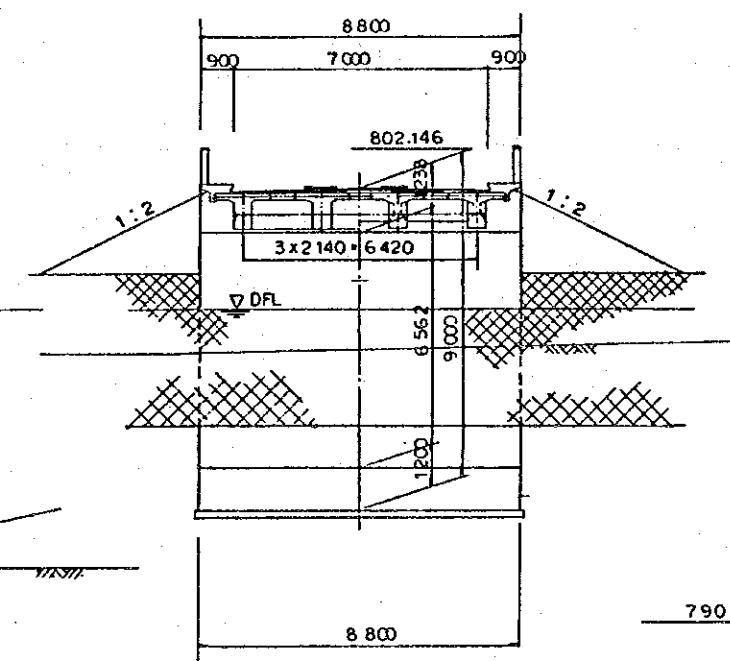




TYPICAL CROSS SECTION (24 m)
S = 1 : 50



PIER 2
1 : 100



ABUTMENT 2
1 : 100

DESIGN SPECIFICATION		
BRIDGE CLASS	FIRST CLASS (JAPAN)	
BRIDGE LENGTH	157.0 m	
BRIDGE SPAN	5@24 m, 2@16 m	
BRIDGE WIDTH	0.9x2 + 7.0 = 8.80m (TYPE 5)	
BRIDGE ANGLE	90°00'00"	
BRIDGE TYPE	TEE GIRDER PRESTRESSED	
GIRDER CONCRETE	C 50 = CYLINDER TEST 400KG/CM ²	
REINFORCEMENT	410 N/MM ²	
PRESTRESSING STEEL	SWPR1 12#7	SWPR19 1T19.3
(1) TENSILE	155 KG/MM ²	150 KG/MM ²
(2) YIELD	135 KG/MM ²	160 KG/MM ²

Fig. A-1 General View of Odzi Bridge (Route 357)

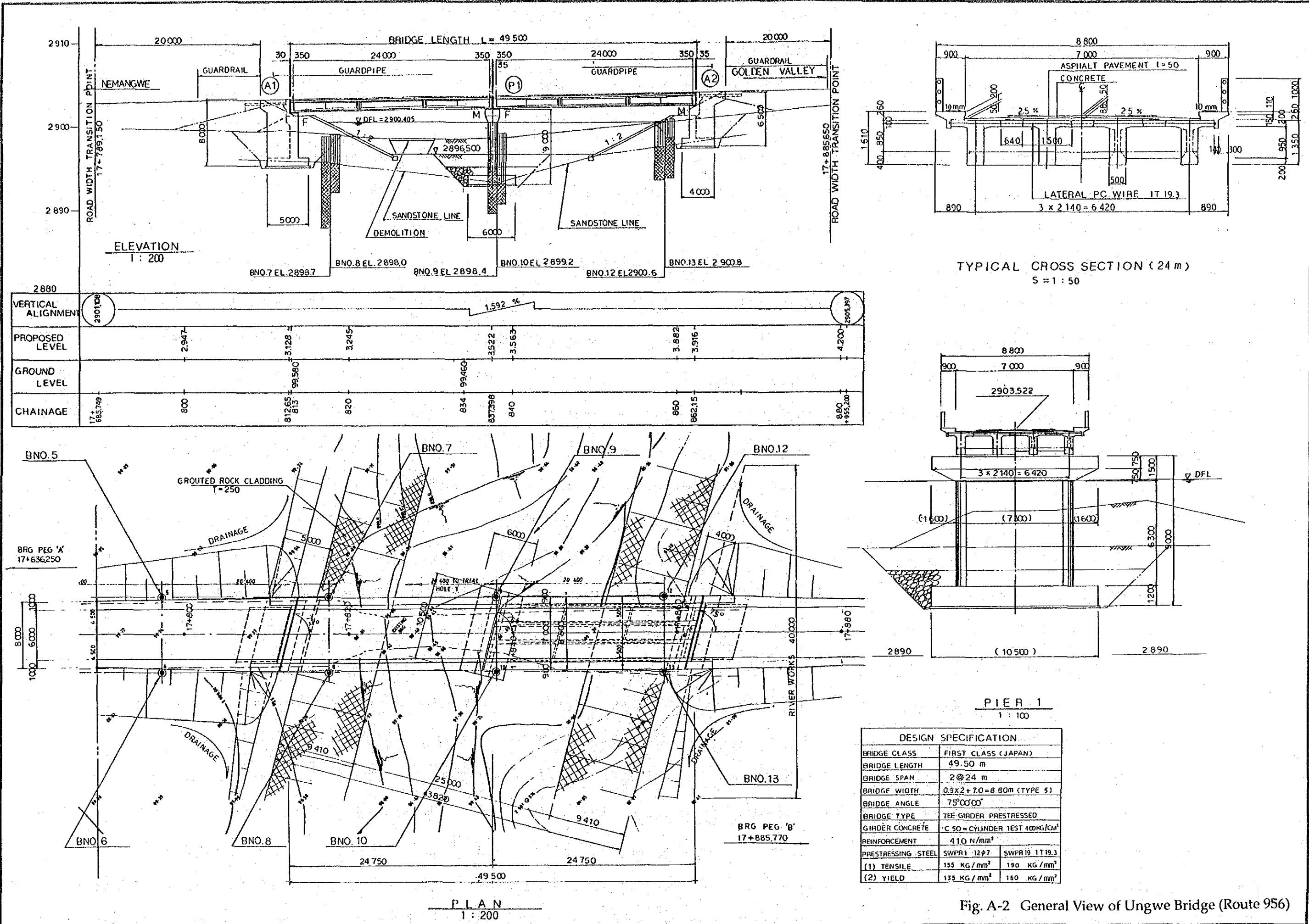
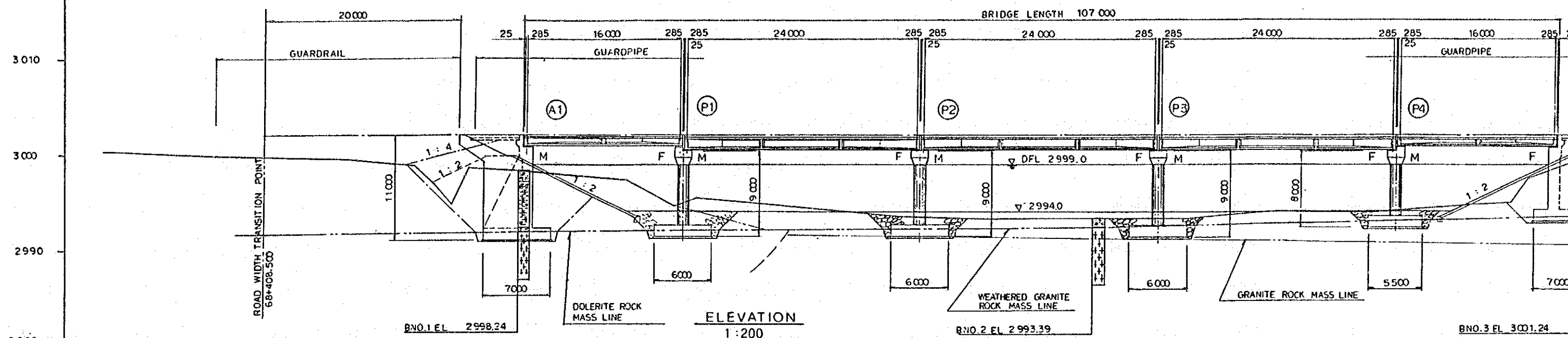
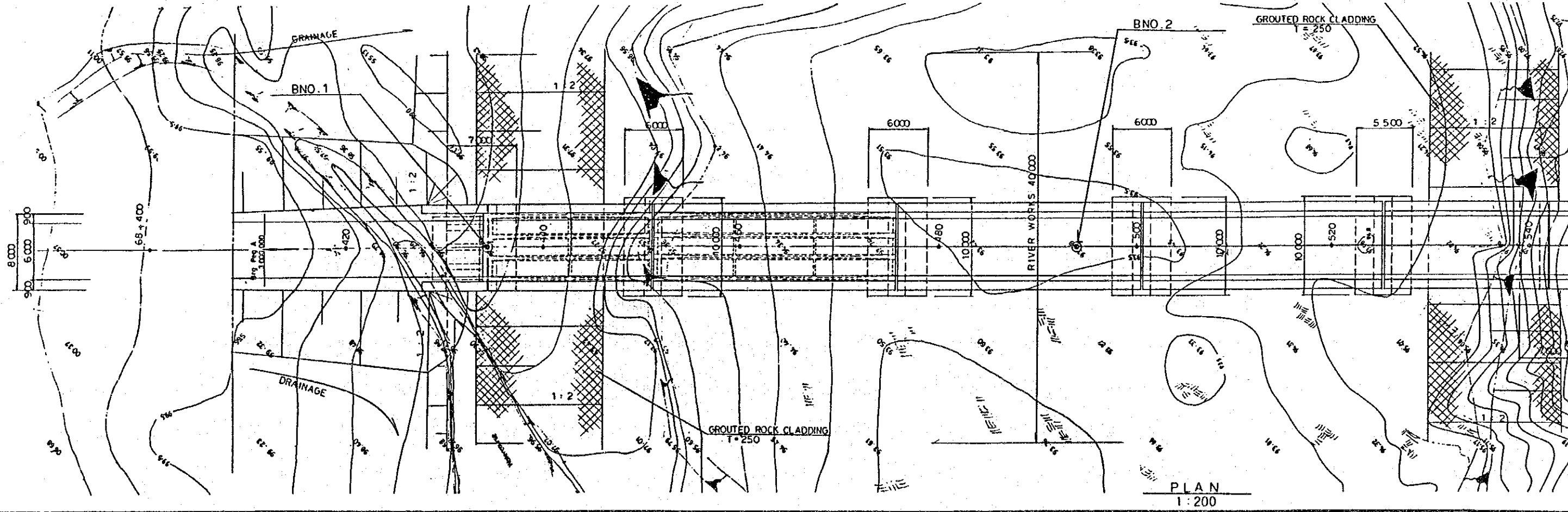
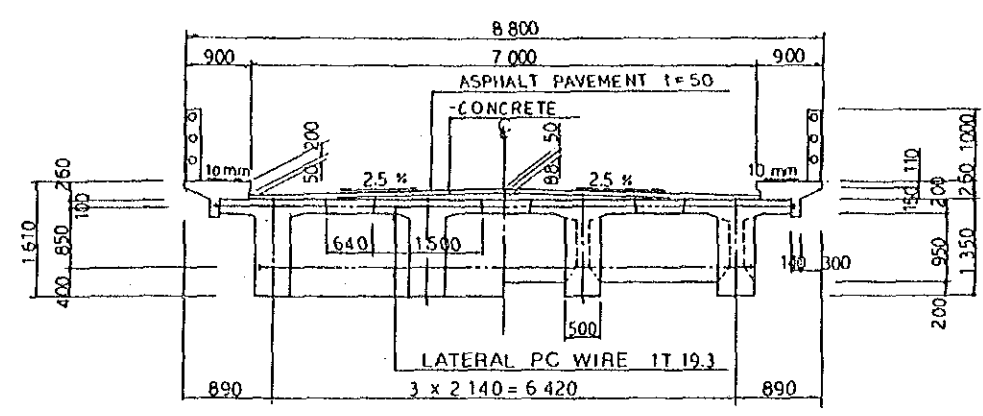
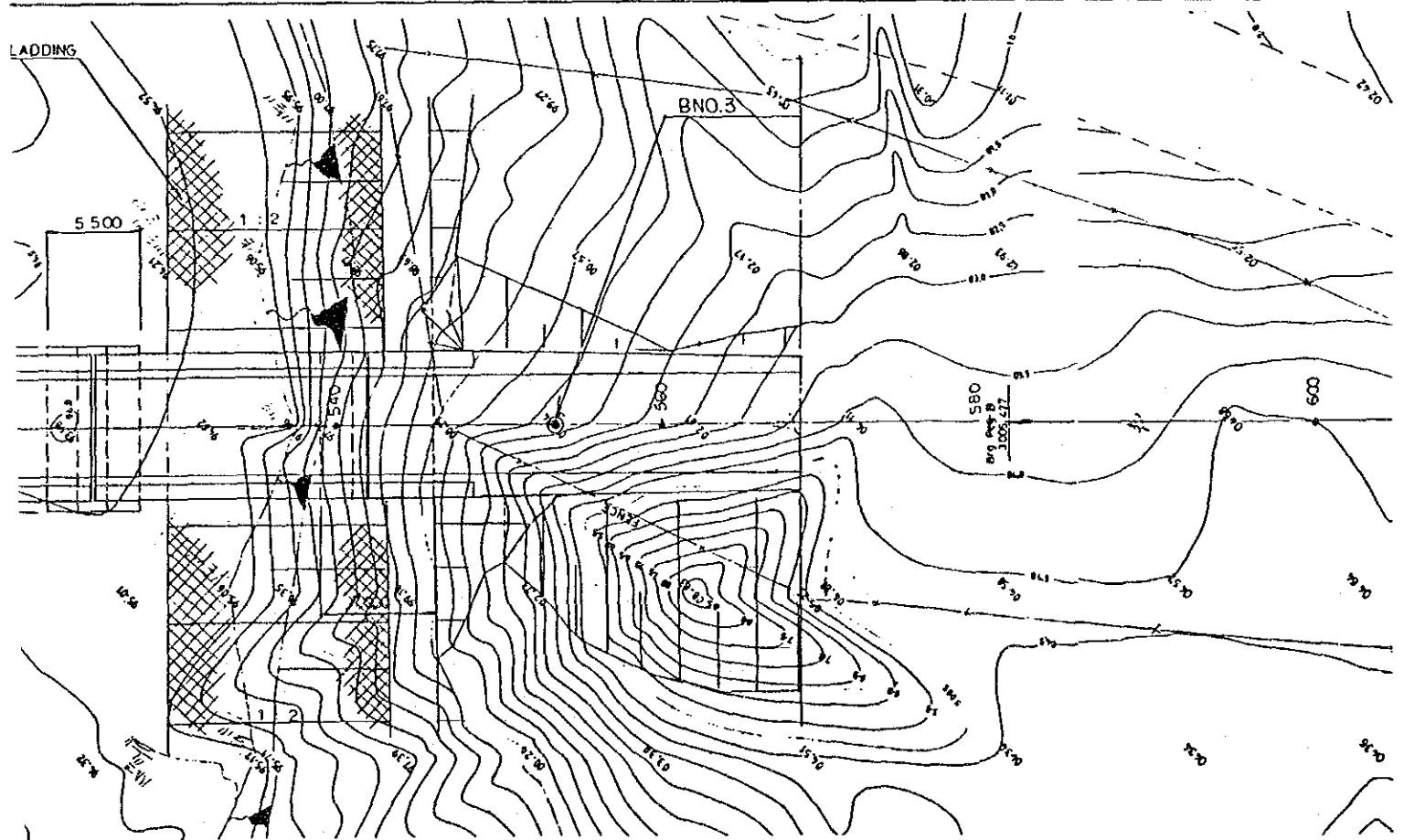
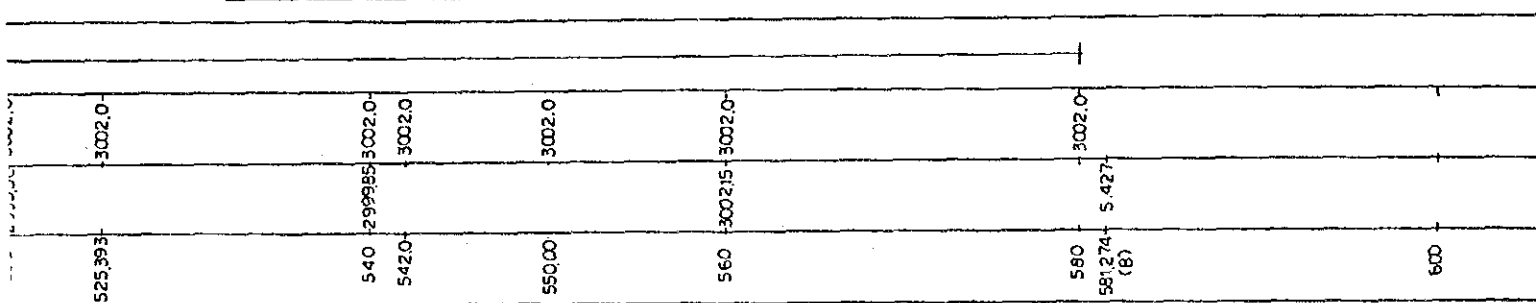
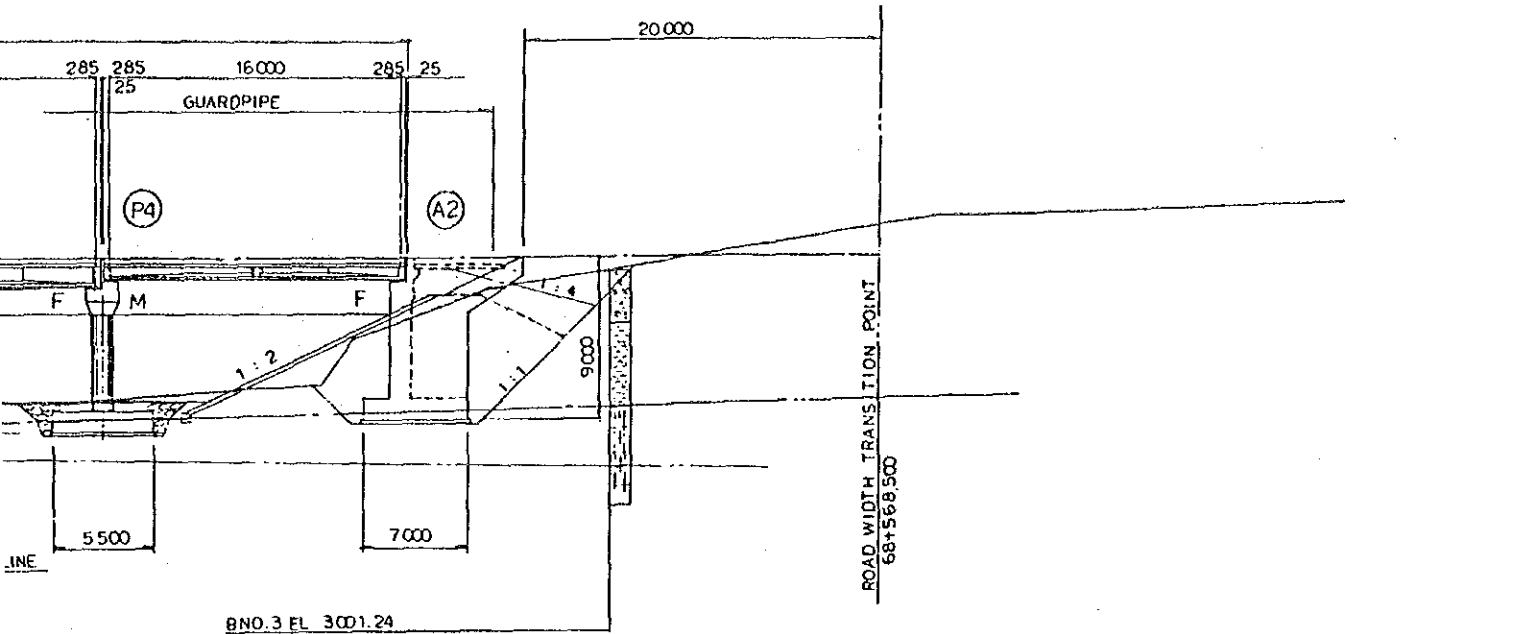


Fig. A-2 General View of Ungwe Bridge (Route 956)

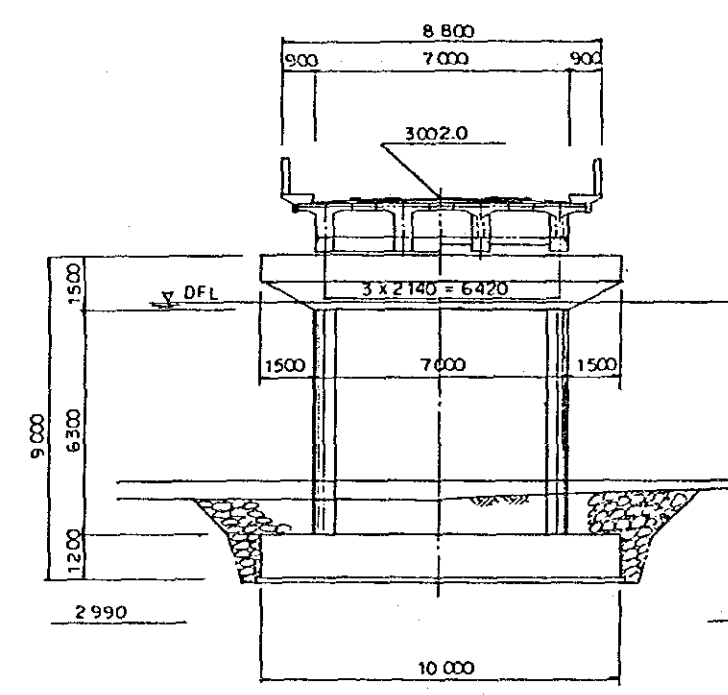


VERTICAL ALIGNMENT	0 %														
PROPOSED LEVEL	3002.0	3002.0	3002.0	3002.0	3002.0	3002.0	3002.0	3002.0	3002.0	3002.0	3002.0	3002.0	3002.0	3002.0	3002.0
GROUND LEVEL	3001.4	3000.0	2998.95	3002.0	2997.66	3002.0	2994.42	2993.3	3002.0	2993.3	3002.0	2993.56	3002.0	2999.95	3002.0
CHAINAGE	68+400	412.65	420	4350	440	451.608	460	476.203	480	500	500.798	520	525.393	540	542.0

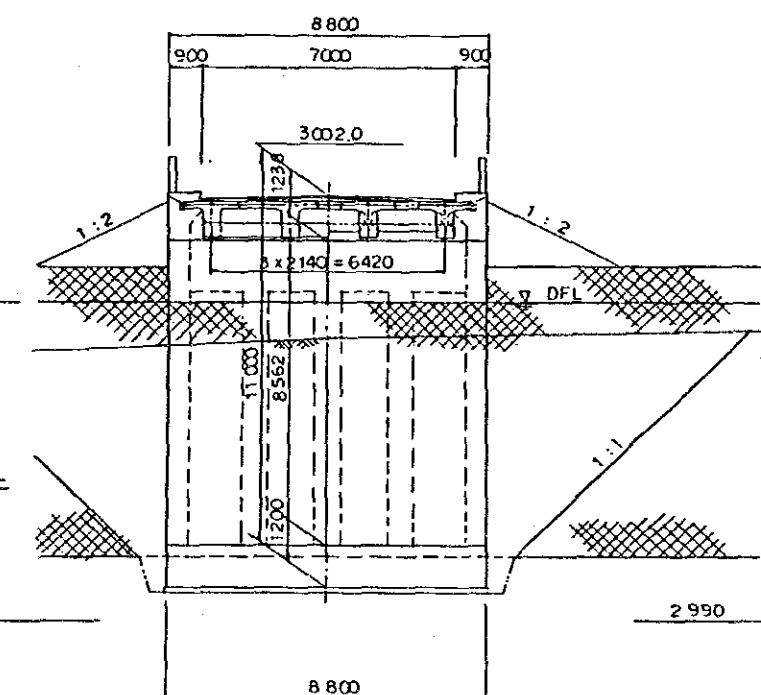




TYPICAL CROSS SECTION (24 m)
S = 1 : 50



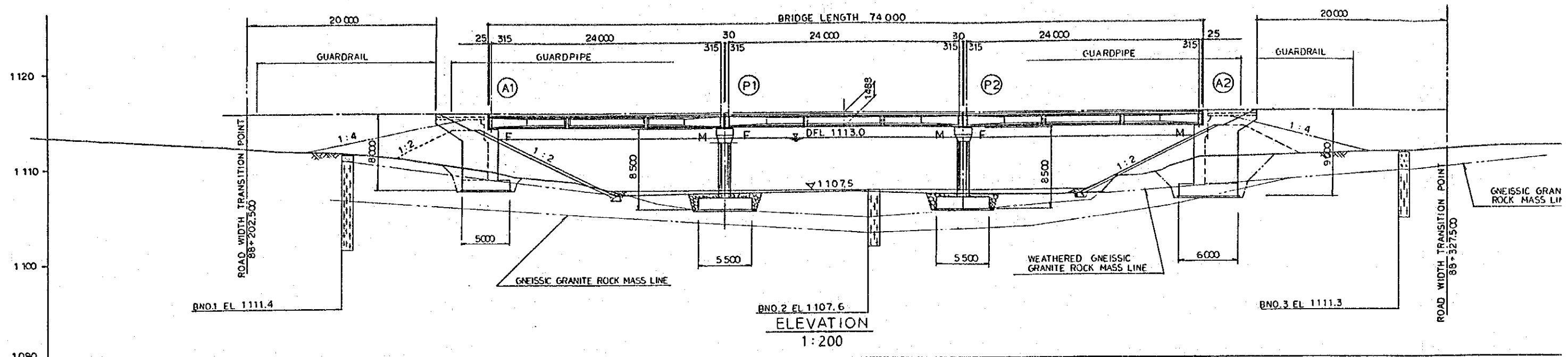
PIER 2
1 : 100



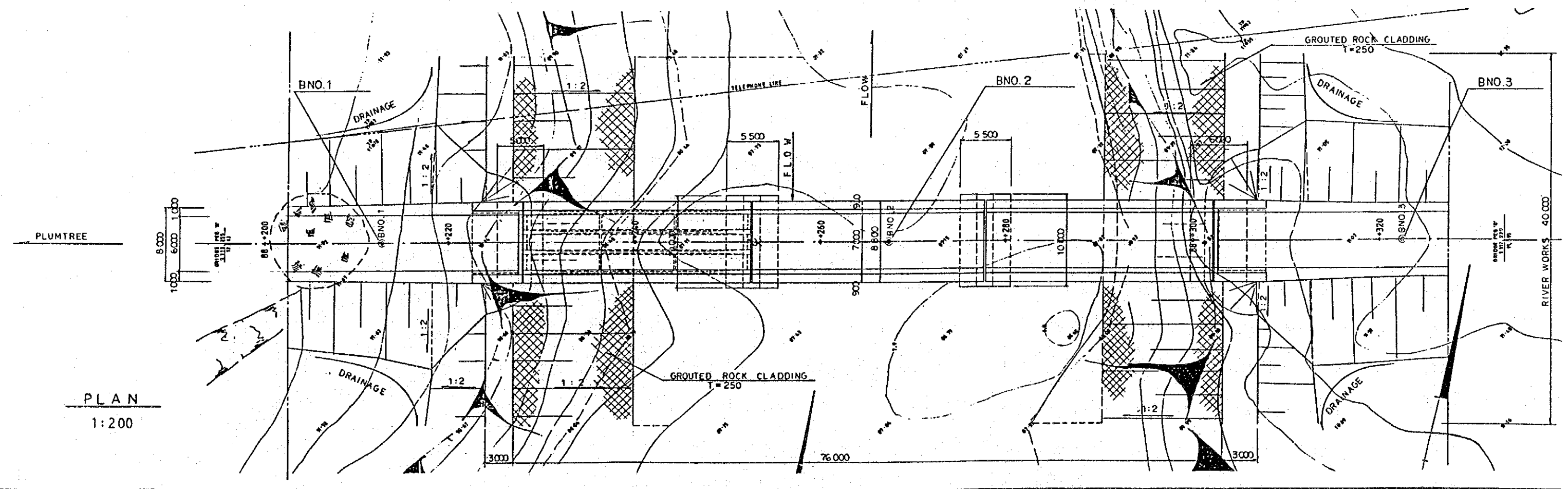
ABUTMENT 1
1 : 100

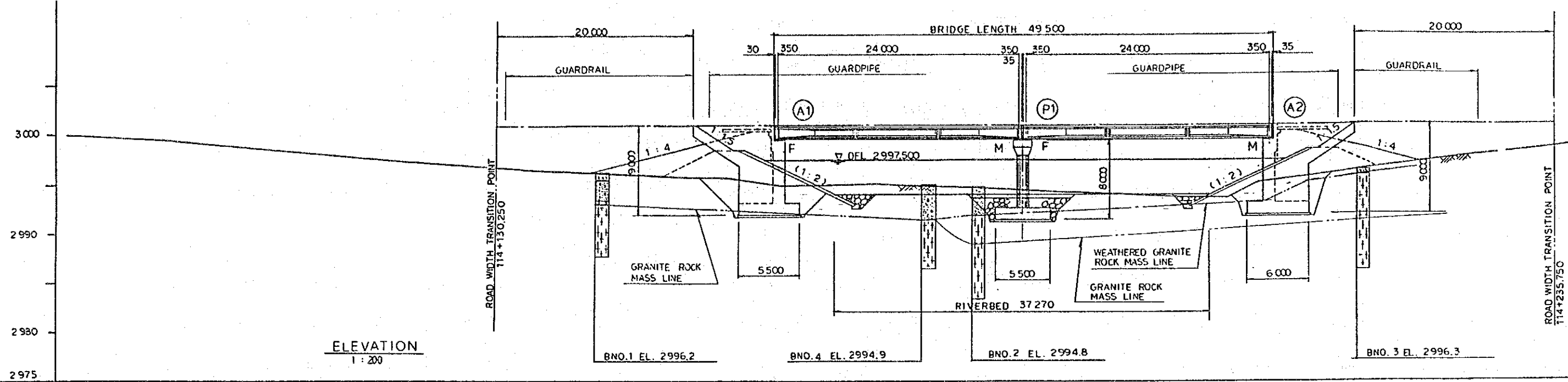
DESIGN SPECIFICATION		
BRIDGE CLASS	FIRST CLASS (JAPAN)	
BRIDGE LENGTH	107.0 m	
BRIDGE SPAN	3@ 24m, 2@ 16m	
BRIDGE WIDTH	0.9x2 + 7.0 = 8.80m (TYPE 5)	
BRIDGE ANGLE	90°00'00"	
BRIDGE TYPE	TEE GIRDER PRESTRESSED	
GIRDER CONCRETE	C 50 = CYLINDER TEST 400KG/CM ²	
REINFORCEMENT	410 N/MM ²	
PRESTRESSING STEEL	SWPR1 12#7	SWPR19 1T19.3
(1) TENSILE	155 KG/MM ²	190 KG/MM ²
(2) YIELD	135 KG/MM ²	160 KG/MM ²

Fig. A-3 General View of Devure I Bridge (Route 344)



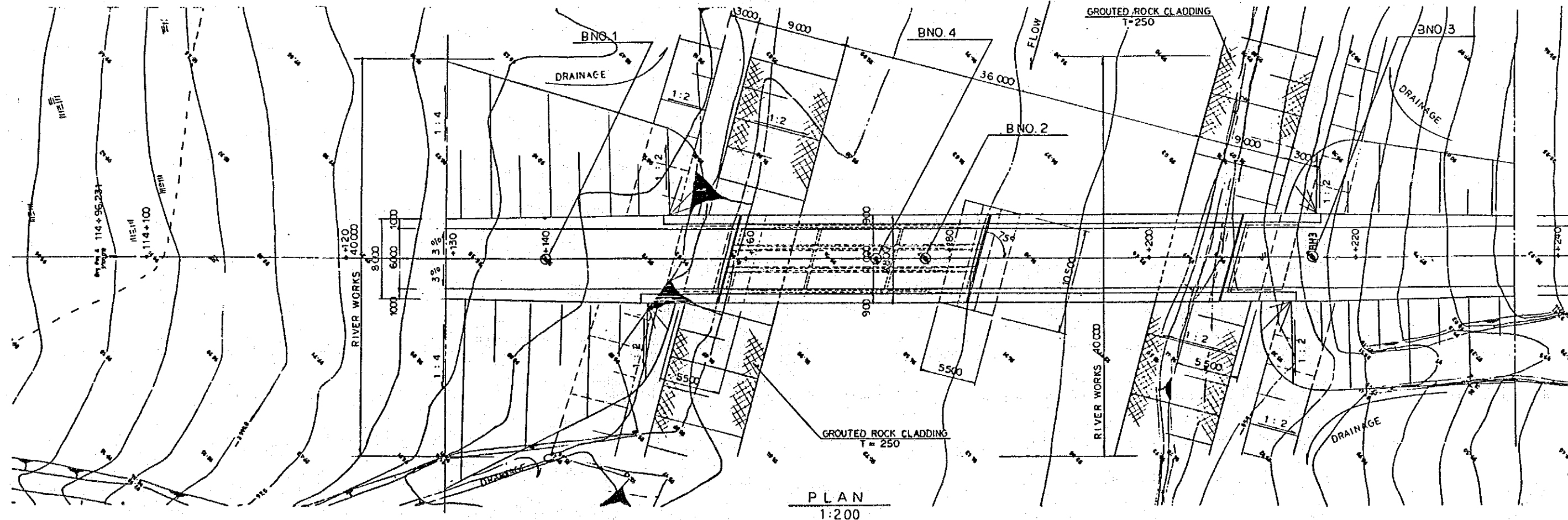
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PROPOSED LEVEL		1115.7	1115.7	1115.7	1115.7	1115.7	1115.7	1115.7	1115.7	1115.7	1115.7	
GROUND LEVEL	1195.369-112.63										1111.95	
CHAINAGE	200	220	228	240	252.67	260	277.33	280	300	302.00	320	334.07



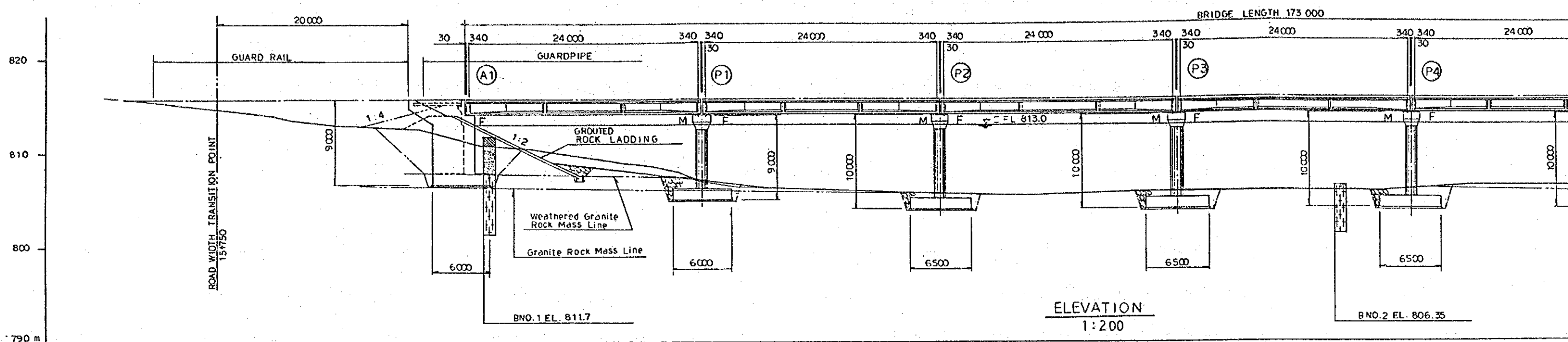


ELEVATION
1:200

VERTICAL ALIGNMENT	0 %										
PROPOSED LEVEL	300.10	300.10	300.10	300.10	300.10	300.10	300.10	300.10	300.10	300.10	
GROUND LEVEL											
CHAINAGE	114+96.231	114+100	120	130	140	158.250	160	180	200	220	240

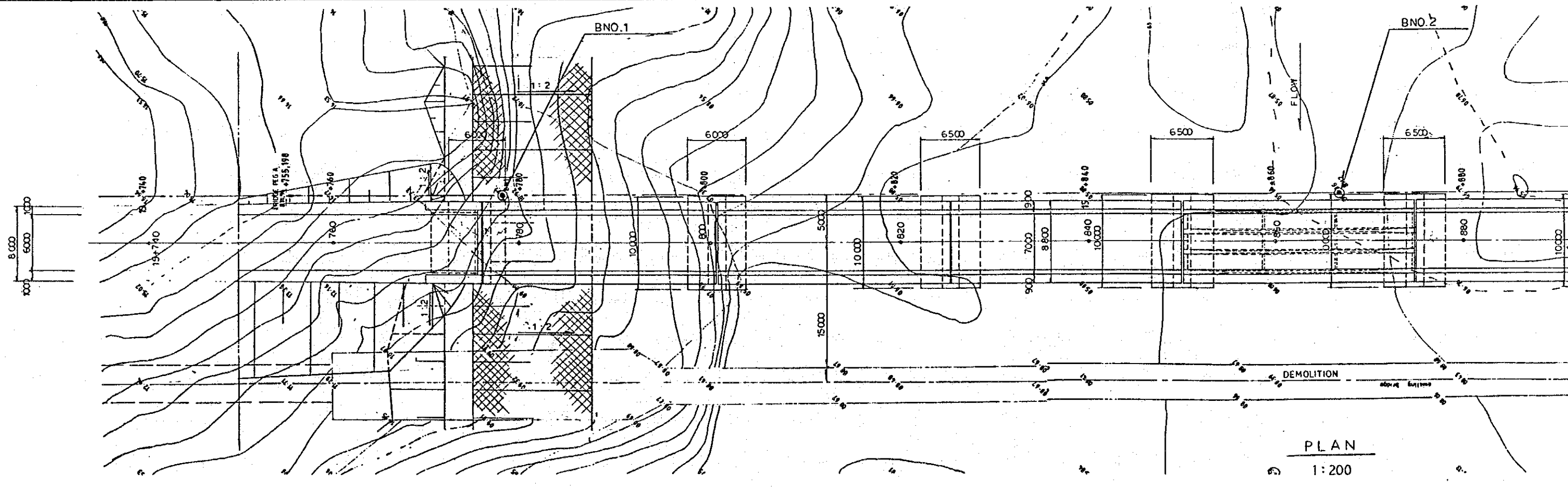


PLAN
1:200



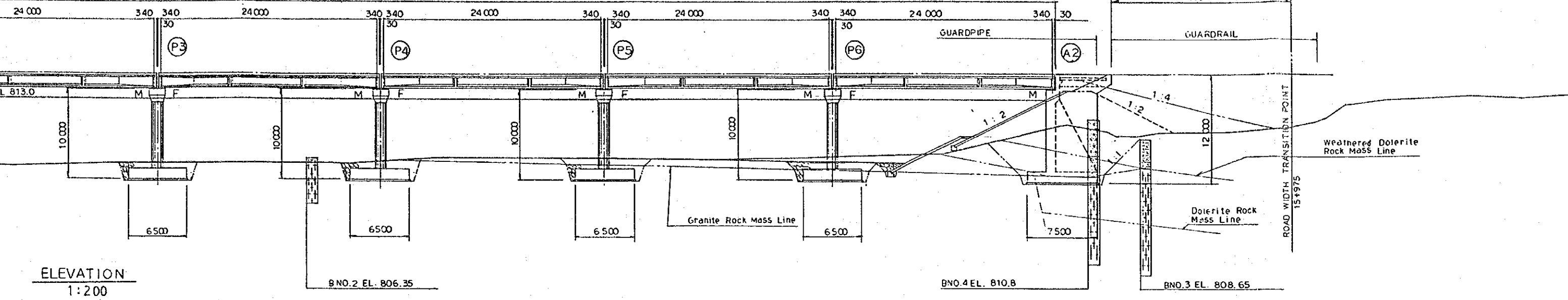
ELEVATION
1:200

VERTICAL ALIGNMENT	0 %												
PROPOSED LEVEL	81575	81575	81575	81575	81575	81575	81575	81575	81575	81575	81575	81575	
GROUND LEVEL													
CHAINAGE	15	755,198	760	776,0	780	800,600,725	820	825,435	840	850,145	860	874,855	880



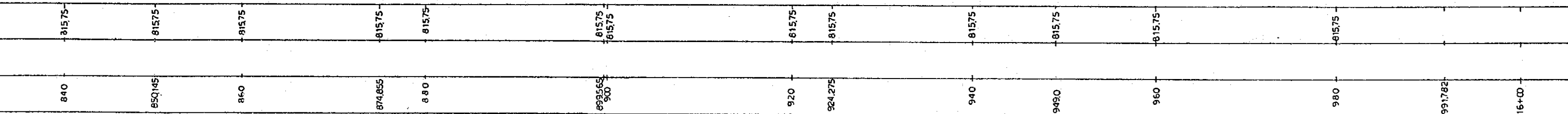
PLAN
1:200

BRIDGE LENGTH 173 000



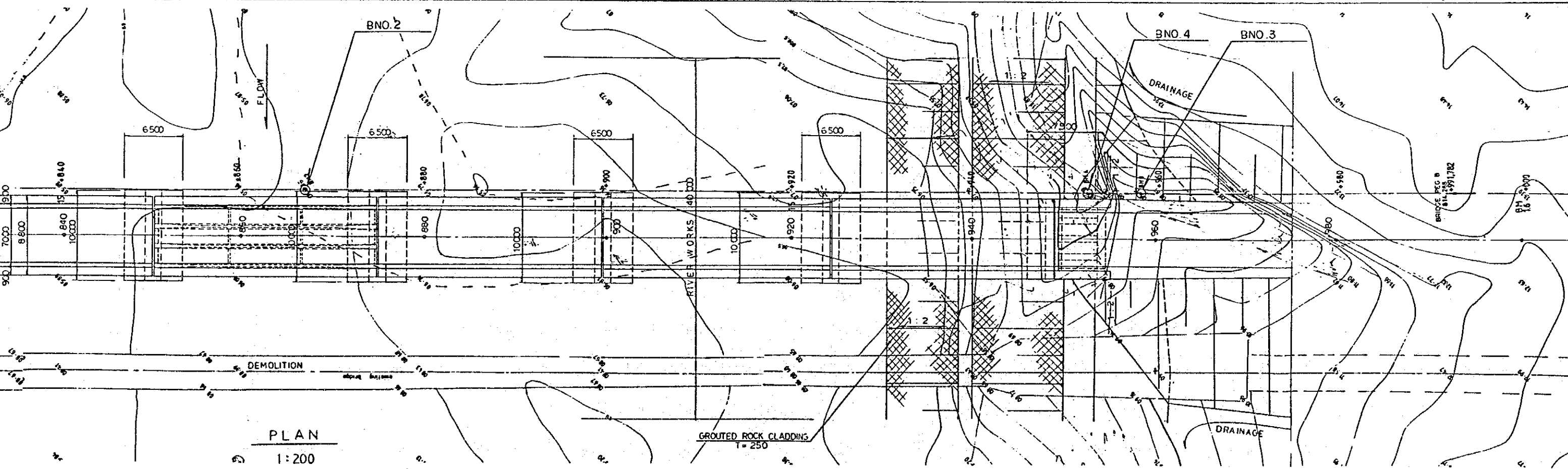
ELEVATION
1:200

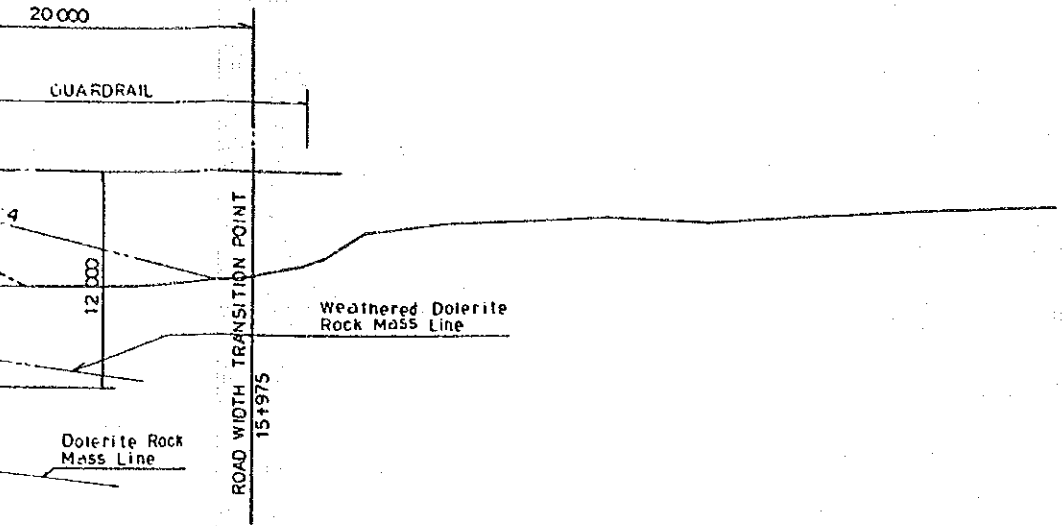
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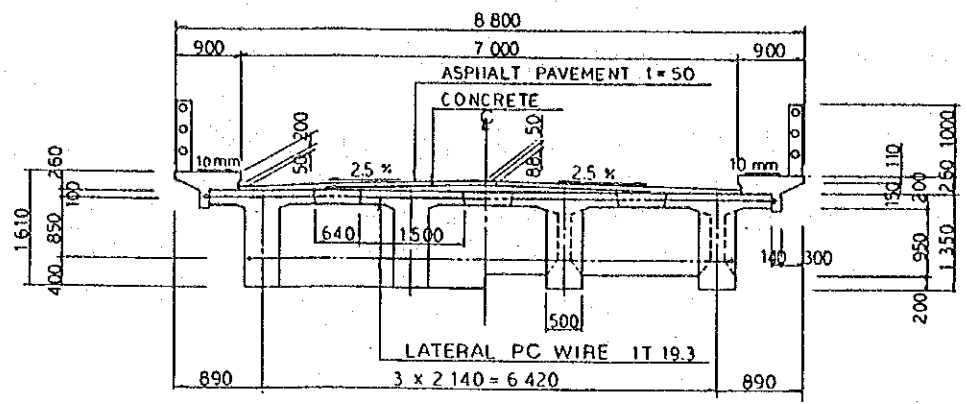
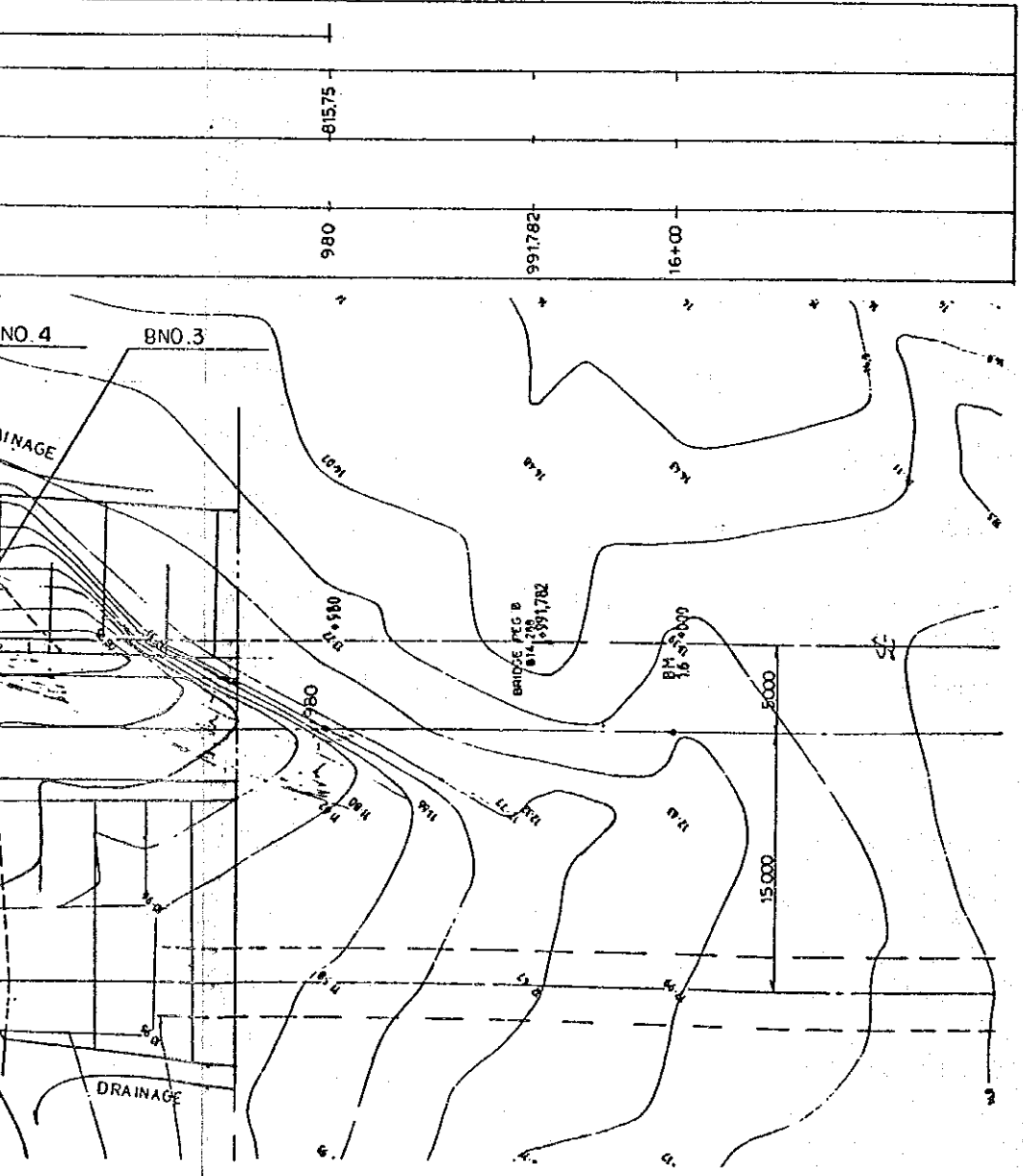
PLAN
1:200

GRouted ROCK CLADDINGS
1:250

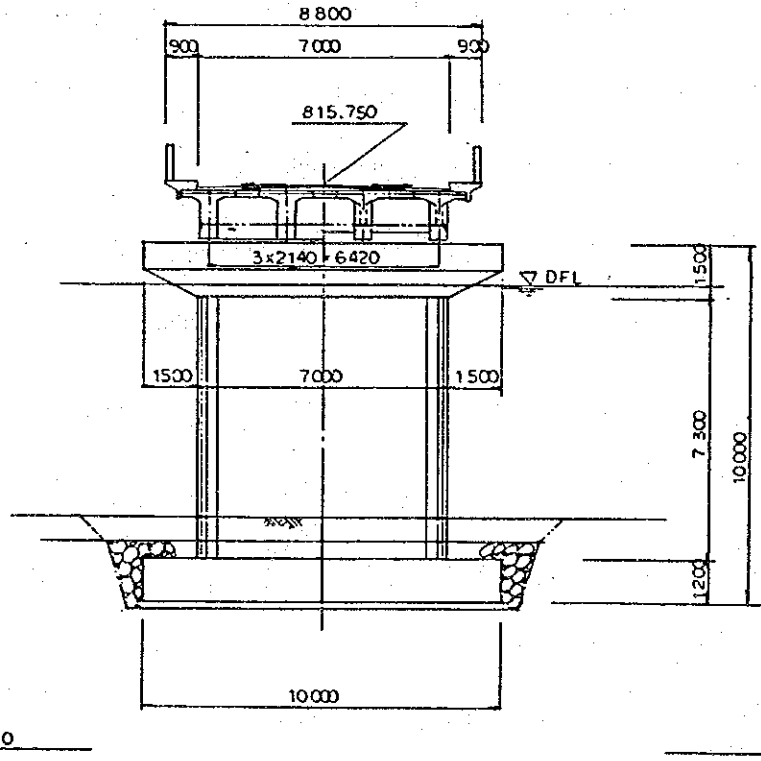




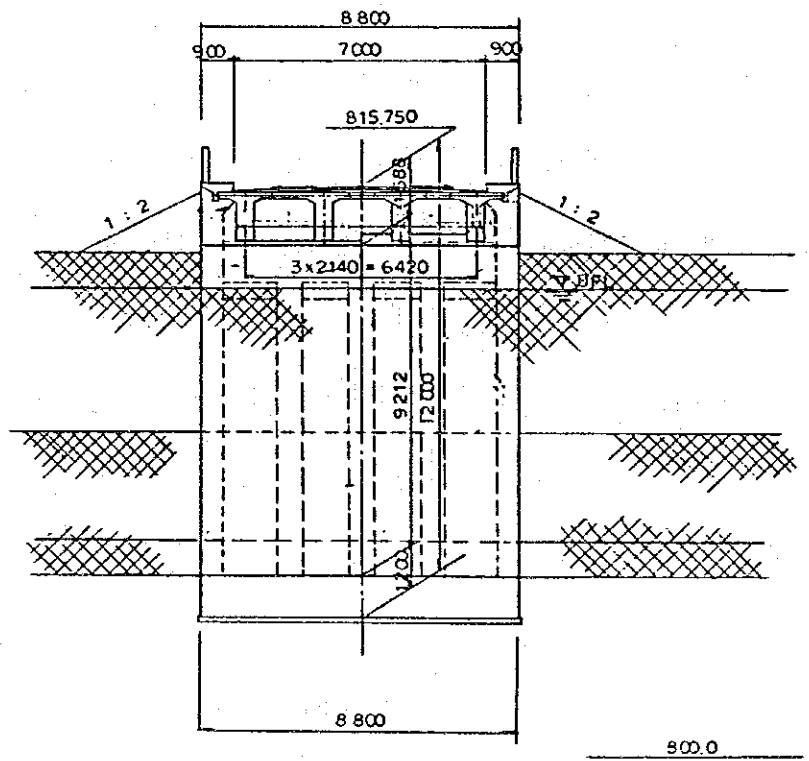
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TYPICAL CROSS SECTION (24 m)
S = 1 : 50



PIER 5
1 : 100

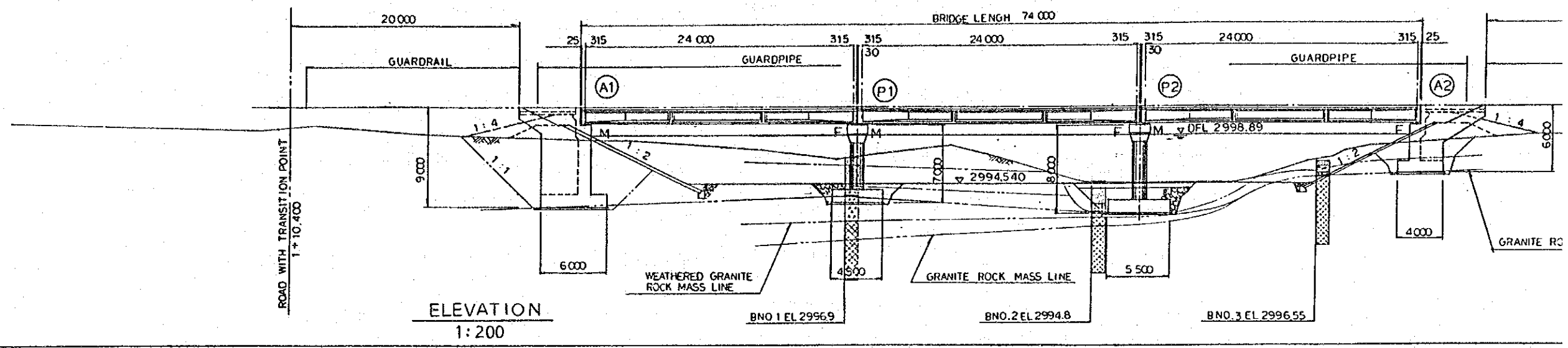


ABUTMENT 2
1 : 100

DESIGN SPECIFICATION		
BRIDGE CLASS	FIRST CLASS (JAPAN)	
BRIDGE LENGTH	173.0 m	
BRIDGE SPAN	7 @ 24 m	
BRIDGE WIDTH	0.9x2 + 7.0 = 8.80m (TYPE 5)	
BRIDGE ANGLE	90°00'00"	
BRIDGE TYPE	TEE GIRDER PRESTRESSED	
GIRDER CONCRETE	C 50 = CYLINDER TEST 40KG/CM ²	
REINFORCEMENT	410 N/MM ²	
PRESTRESSING STEEL	SWPR1 12#7	SWPR19 1T19.3
(1) TENSILE	155 KG/MM ²	190 KG/MM ²
(2) YIELD	135 KG/MM ²	160 KG/MM ²

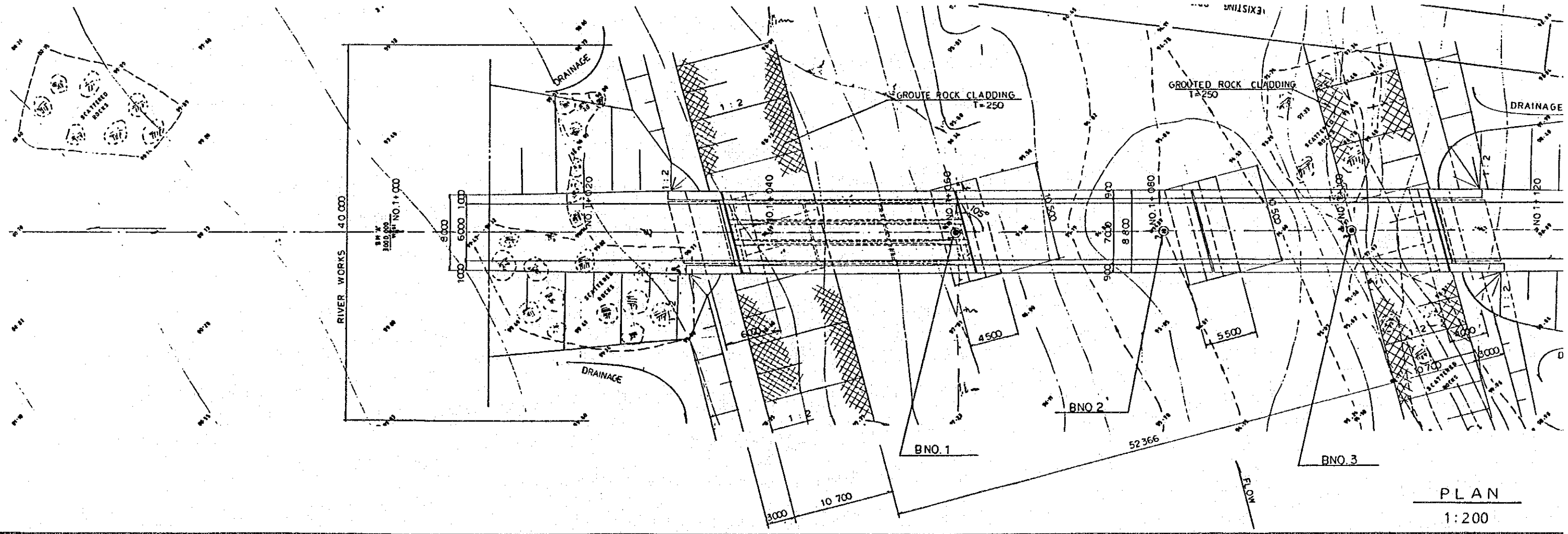
Fig. A-6 General View of Devure II Bridge (Route 359)

3010
3000
2990
2980

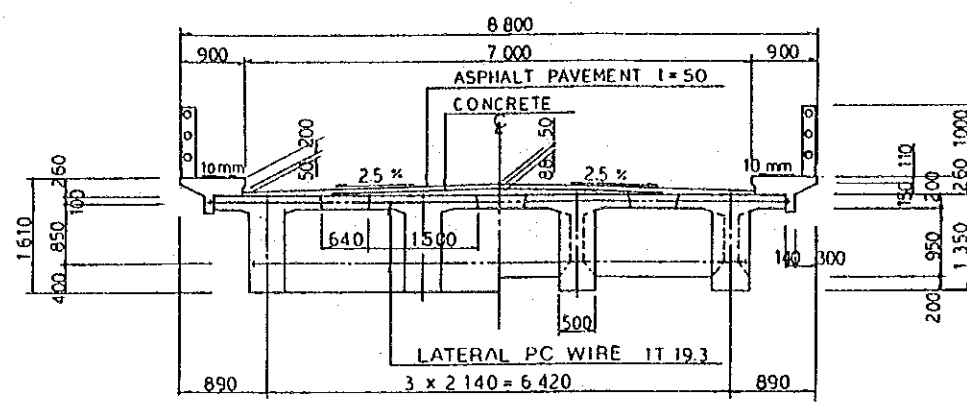
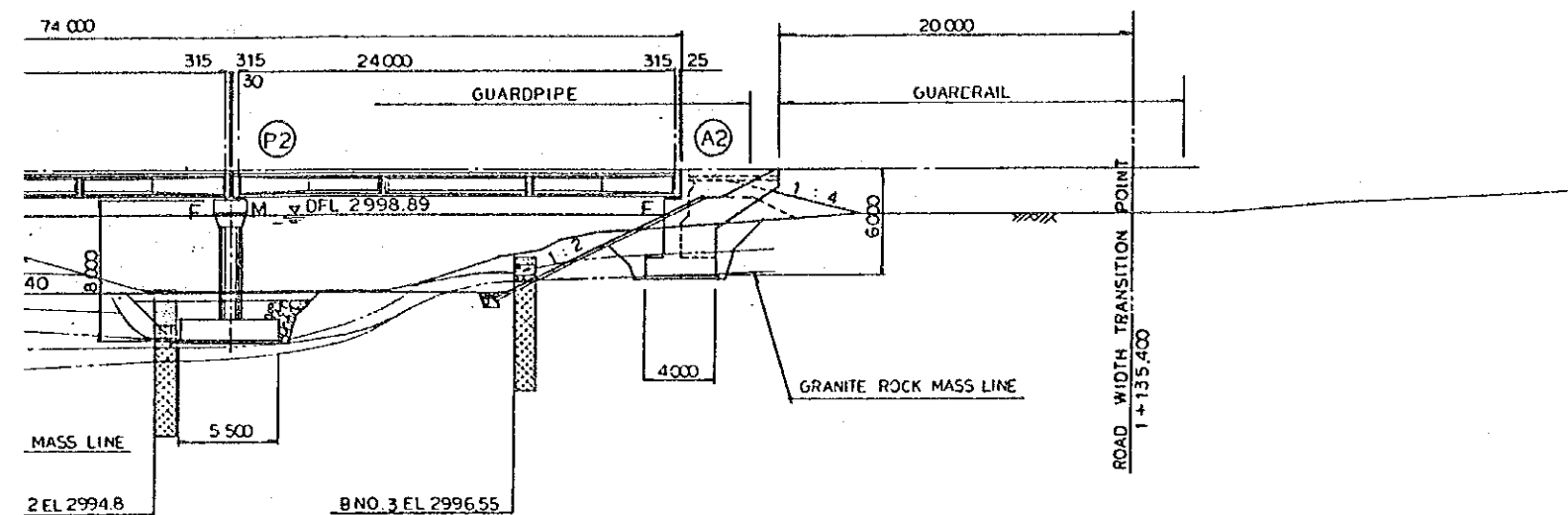


ELEVATION
1:200

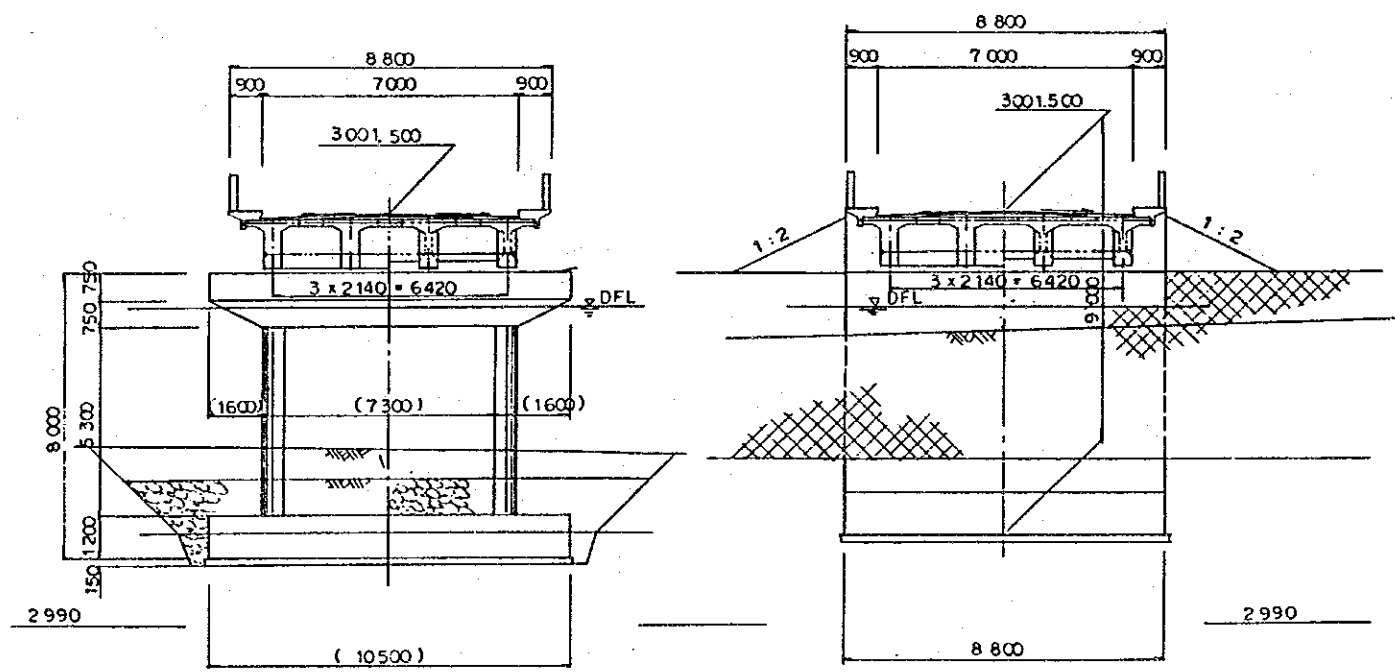
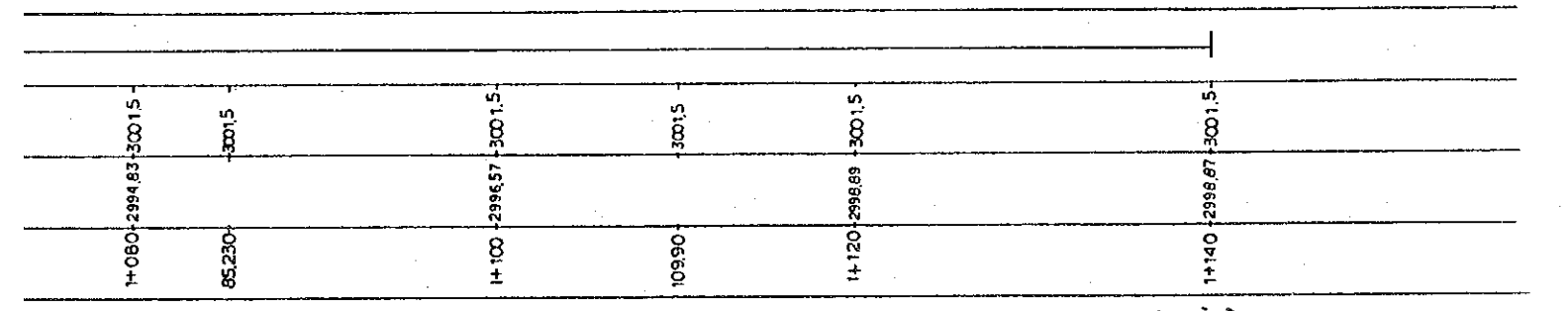
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PROPOSED LEVEL		3001.5	3001.5	3001.5	3001.5	3001.5	3001.5	3001.5	3001.5	3001.5
GROUND LEVEL	2999.61	2999.14	2998.49	2998.89	2996.89	2994.89	2996.57	2998.89	2998.89	2998.89
CHAINAGE	1+000	1+020	35+900	1+040	1+060	1+080	85+230	1+100	109+90	1+120



PLAN
1:200



TYPICAL CROSS SECTION (24 m)
S = 1 : 50



PIER 2
1 : 100

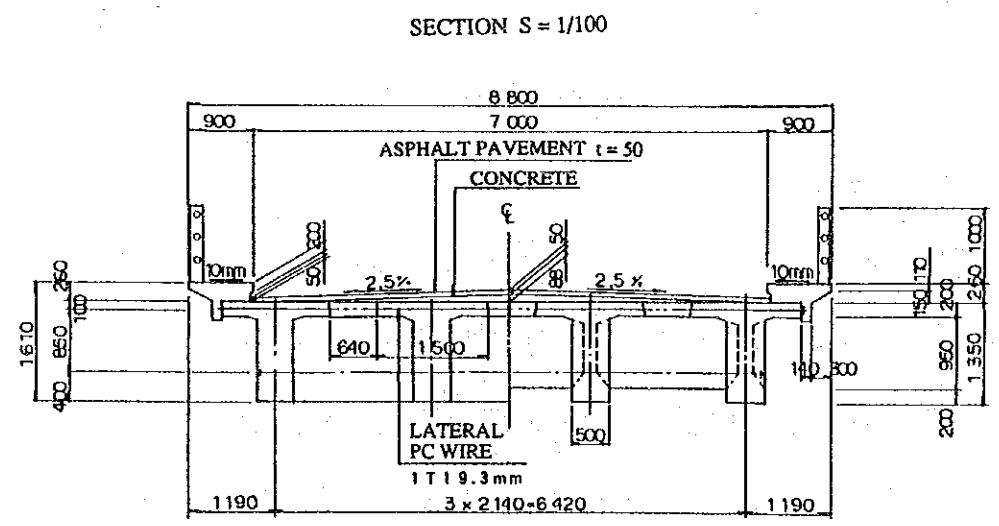
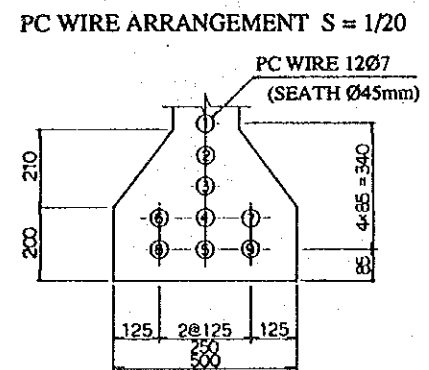
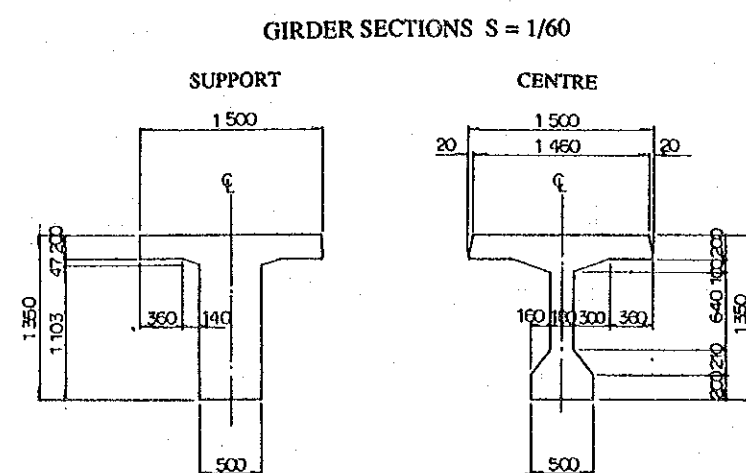
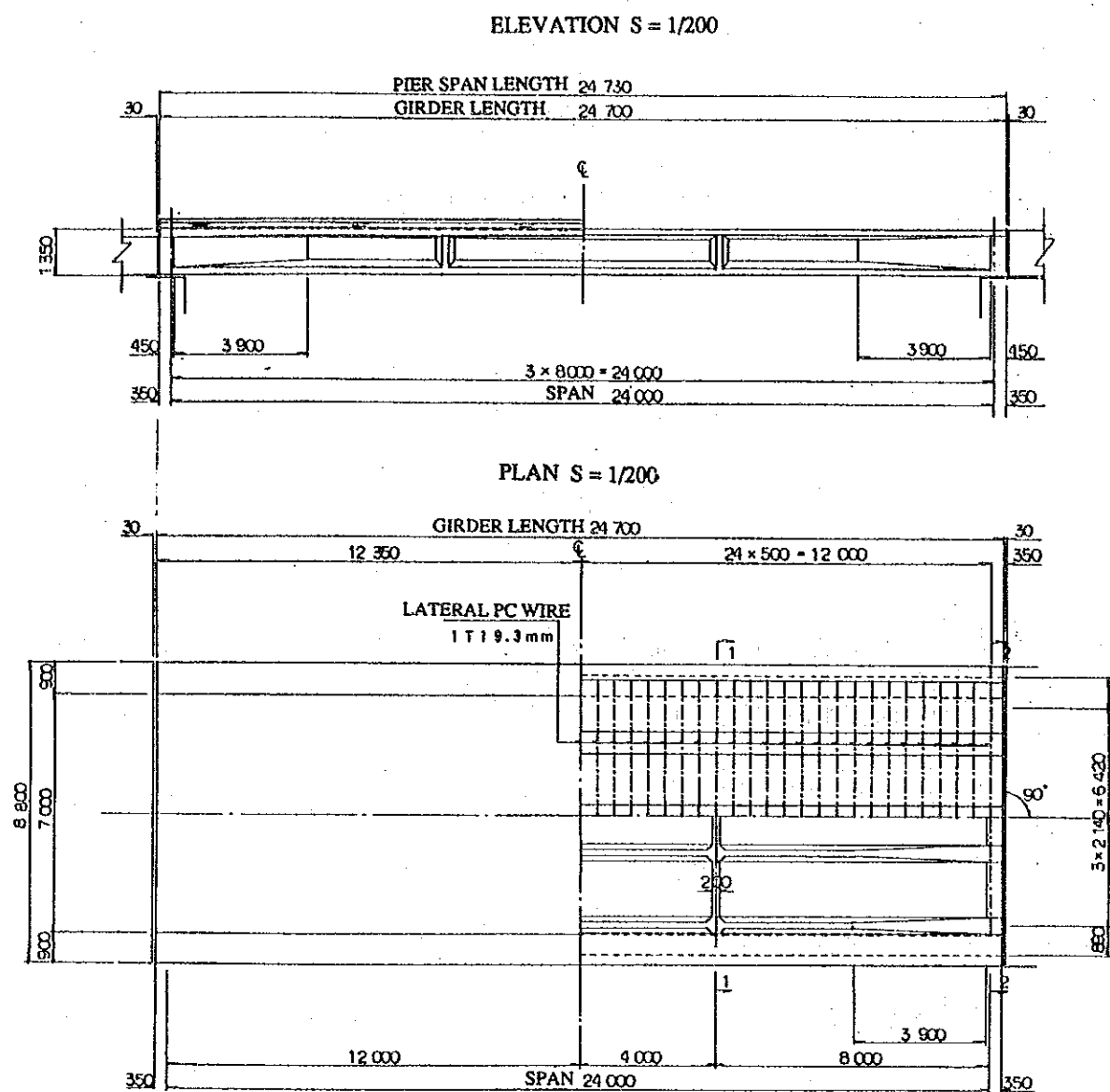
ABUTMENT 1
1 : 100

DESIGN SPECIFICATION		
BRIDGE CLASS	FIRST CLASS (JAPAN)	
BRIDGE LENGTH	74.0 m	
BRIDGE SPAN	3 @ 24 m	
BRIDGE WIDTH	0.9x2+7.0=8.80m (TYPE 5)	
BRIDGE ANGLE	105°00'00"	
BRIDGE TYPE	TEE GIRDER PRESTRESSED	
GIRDER CONCRETE	C 50 = CYLINDER TEST 400KG/CM ²	
REINFORCEMENT	410 N/mm ²	
PRESTRESSING STEEL	SWPR1 12#7	SWPR19 1T19.3
(1) TENSILE	155 KG/mm ²	190 KG/mm ²
(2) YIELD	135 KG/mm ²	160 KG/mm ²

Fig. A-7 General View of Nata Bridge (Route 759)

PLAN
1:200

STRUCTURAL DRAWING OF SUPERSTRUCTURE (SPAN 24m)



DESIGN CONDITIONS

BRIDGE TYPE	PRESTRESSED CONCRETE GIRDER
GIRDER LENGTH	24.70 m
SPAN	24.00 m
BRIDGE WIDTH	7.00 m
ROAD WIDTH	8.80 m
LIVE LOAD	FIRST CLASS LOADING IN JAPAN
SKRW	90°00'

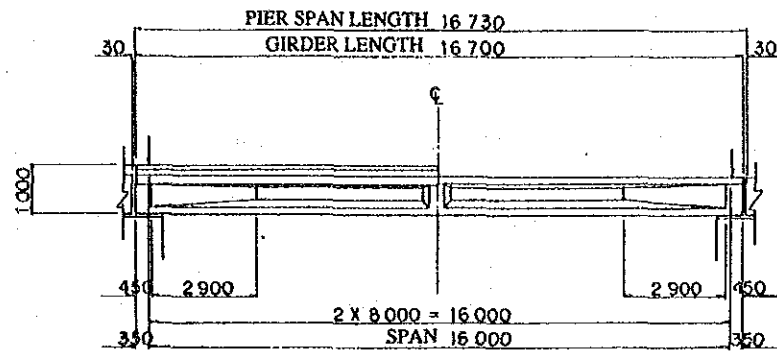
MATERIAL STRENGTH AND ALLOWABLE STRENGTH

DESCRIPTION	MAIN GIRDERS	CROSS BEAM AND DECK SLAB
CONCRETE CLASSIFICATION (kgf/cm ²)	CLASS C30 (400)	CLASS C40 (300)
COMPRESSIVE STRENGTH AT PRESTRESSING	350	250
ALLOWABLE COMPRESSIVE STRESS	IMMEDIATELY AFTER PRESTRESSING	180
	SERVICABILITY	140
ALLOWABLE TENSILE STRESS	IMMEDIATELY AFTER PRESTRESSING	-15
	SERVICABILITY	-15
ALLOWABLE SHEARING STRESS	SERVICABILITY	5.5
	MAXIMUM	5.3
PRESTRESSING WIRE (kgf/mm ²)	SWPR1 12Ø7	SWPR1 1T19.3
TENSILE STRENGTH	155	190
YIELD STRESS	135	160
ALLOWABLE TENSILE STRENGTH	AT PRESTRESSING	121.5
	IMMEDIATELY AFTER PRESTRESSING	108.5
	SERVICABILITY	93
REINFORCEMENT BARS (N/mm ²)	HOT ROLLED TENSILE STEEL 410(N/mm ²)	

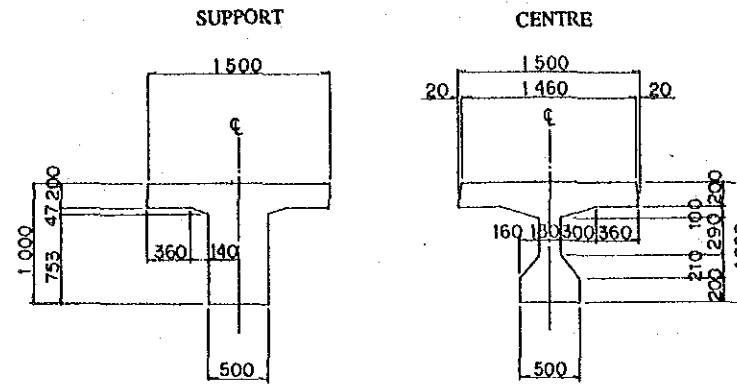
Fig. A-8 Structural Drawing of Superstructure (Span 24 m)

STRUCTURAL DRAWING OF SUPERSTRUCTURE (SPAN 16m)

ELEVATION S = 1/200



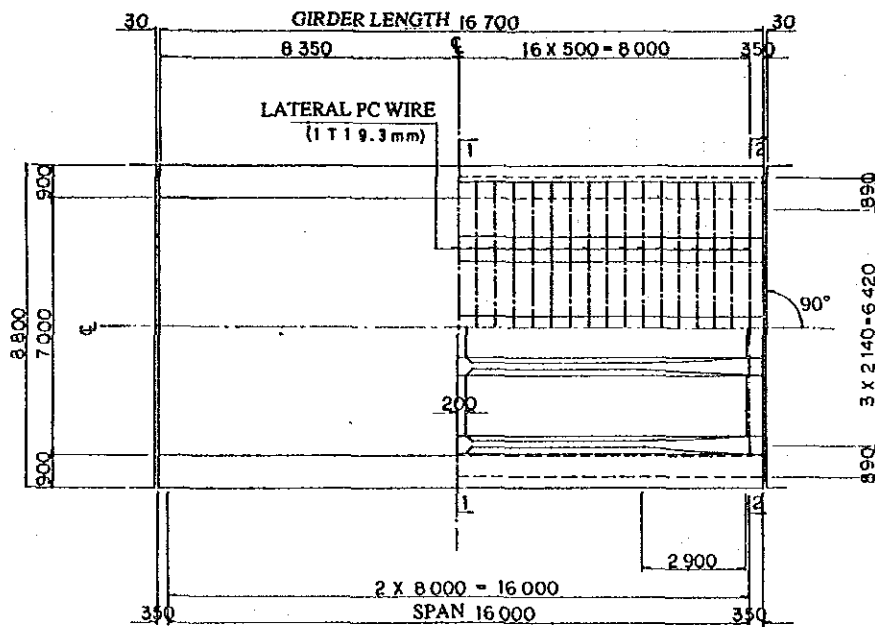
GIRDER SECTIONS S = 1/60



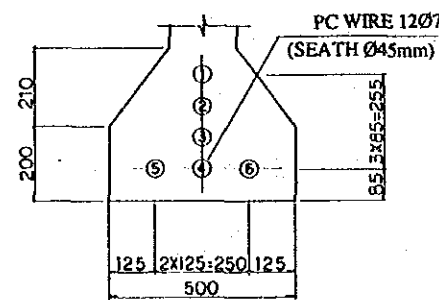
DESIGN CONDITIONS

BRIDGE TYPE	PRESTRESSED CONCRETE GIRDER
GIRDER LENGTH	16.70 m
SPAN	16.00 m
BRIDGE WIDTH	7.00 m
ROAD WIDTH	8.80 m
LIVE LOAD	FIRST CLASS LOADING IN JAPAN
SKEW	90°00'

PLAN S = 1/200



PC WIRE ARRANGEMENT S = 1/20



MATERIAL STRENGTH AND ALLOWABLE STRENGTH

DESCRIPTION		MAIN GIRDERS	CROSS BEAM AND DECK SLAB
CONCRETE CLASSIFICATION (kg/cm ²)		CLASS C50 (400)	CLASS C40 (300)
COMPRESSIVE STRENGTH AT PRESTRESSING		350	250
ALLOWABLE COMPRESSIVE STRESS	IMMEDIATELY AFTER PRESTRESSING	180	140
	SERVICABILITY	140	110
ALLOWABLE TENSILE STRESS	IMMEDIATELY AFTER PRESTRESSING	-15	0
	SERVICABILITY	-15	0
ALLOWABLE SHEARING STRESS	SERVICABILITY	5.5	-
	MAXIMUM	5.3	4.0
PRESTRESSING WIRE (kg/mm ²)		SWPR1 12Ø7	SWPR1 1T19.3
TENSILE STRENGTH		155	190
YIELD STRESS		135	160
ALLOWABLE TENSILE STRENGTH	AT PRESTRESSING	121.5	144
	IMMEDIATELY AFTER PRESTRESSING	108.5	133
	SERVICABILITY	93	114
REINFORCEMENT BARS (N/mm ²)		HOT ROLLED TENSILE STEEL 410N/mm ²	

SECTION S = 1/100

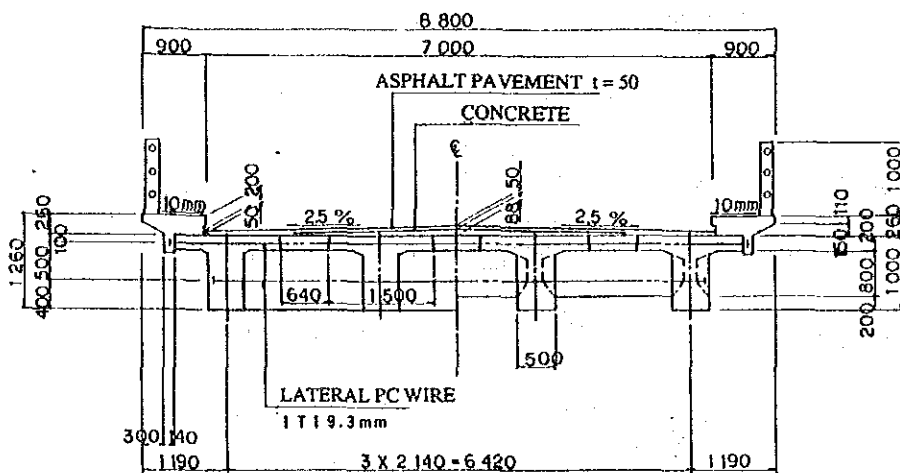
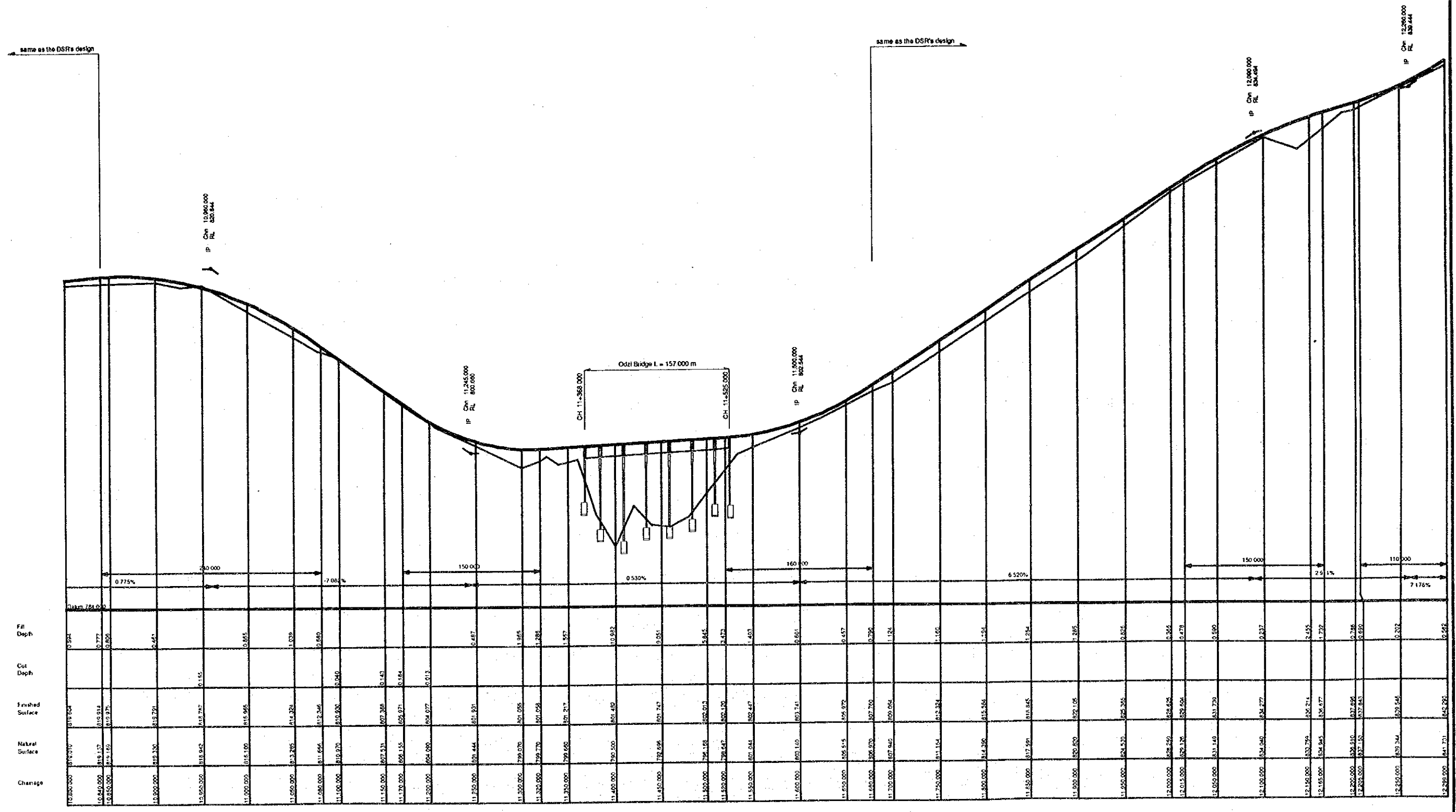
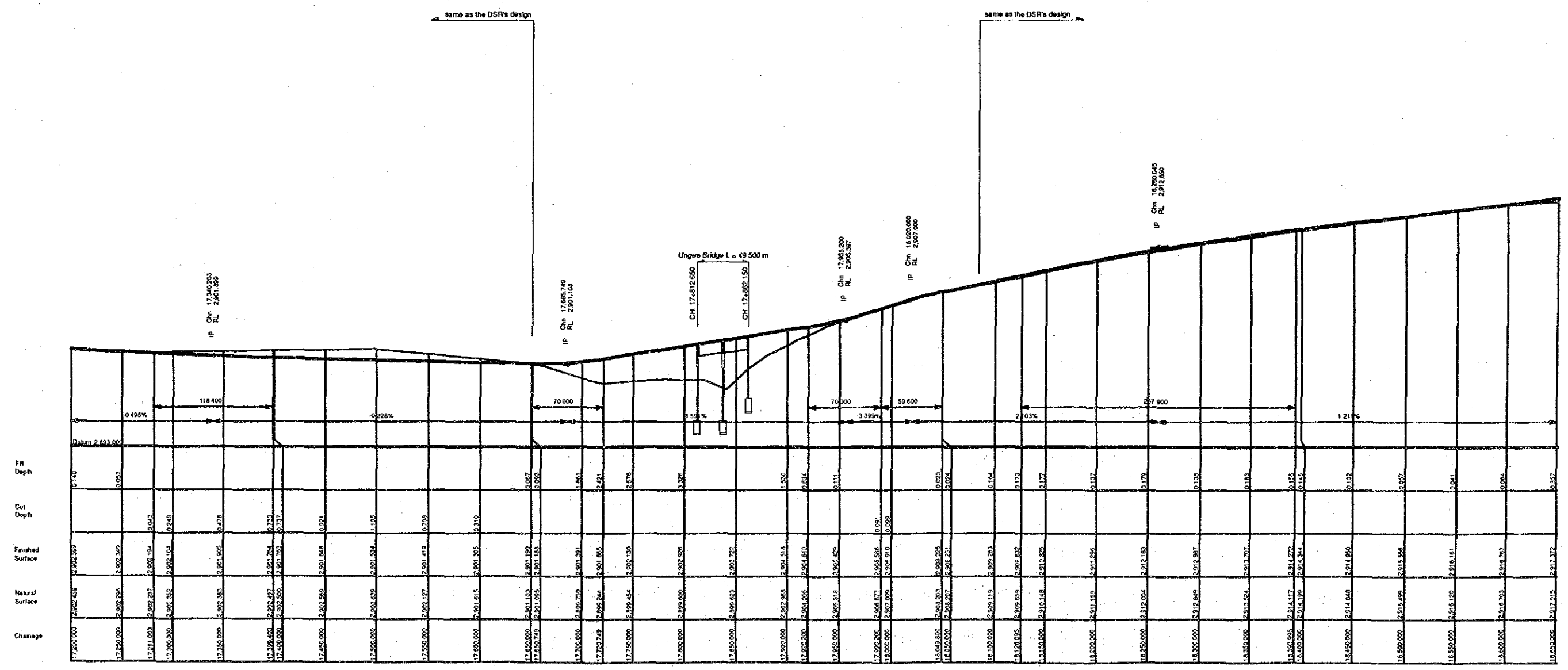


Fig. A-9 Structural Drawing of Superstructure (Span 16 m)

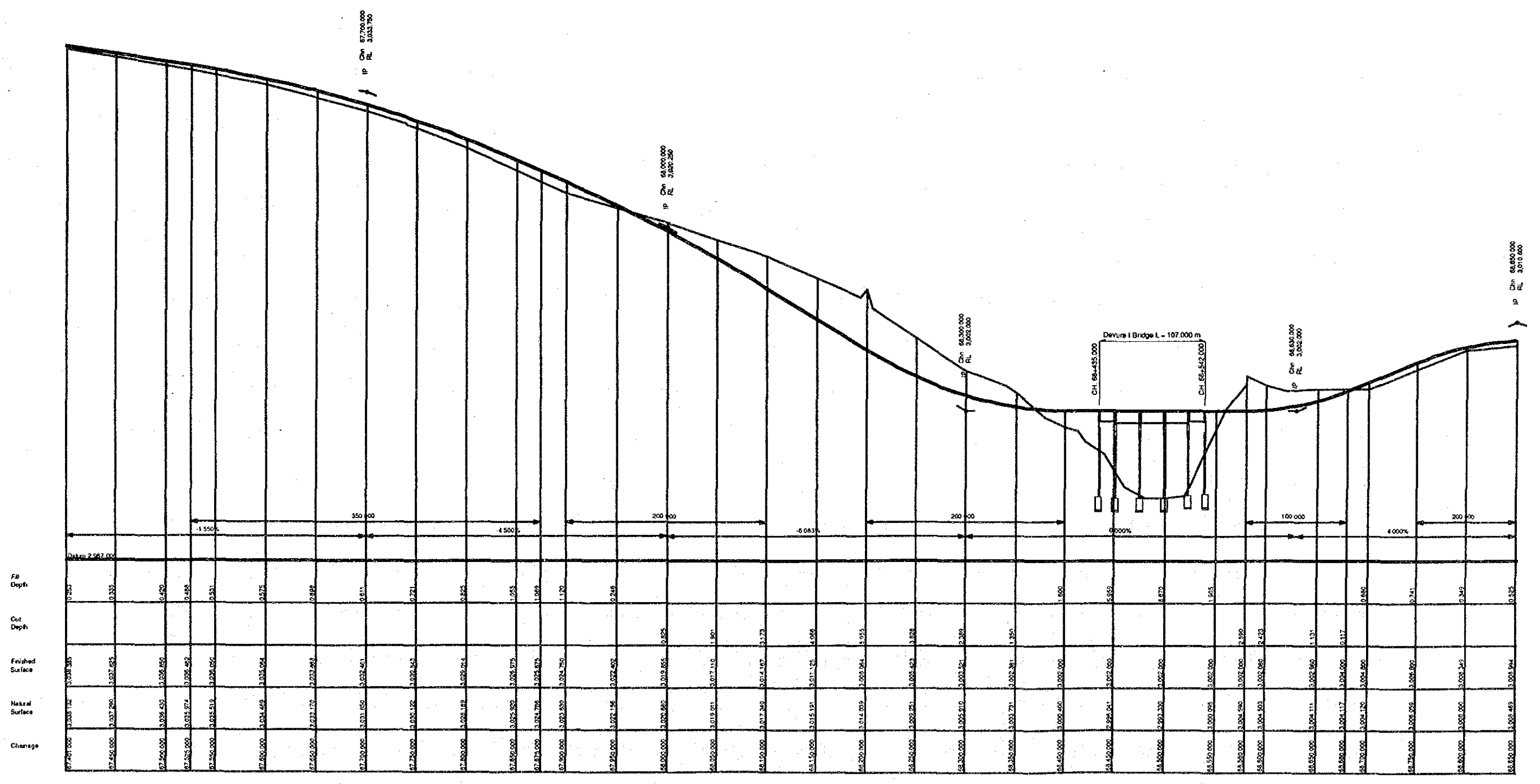
BASIC DESIGN STUDY ON THE PROJECT
 FOR
 REHABILITATION OF RURAL ROADS
 Fig. A-10 PROFILE (1/12)
 ODZI BRIDGE SITE (ROUTE 357)



BASIC DESIGN STUDY ON THE PROJECT
FOR
REHABILITATION OF RURAL ROADS
Fig. A-11 PROFILE (2/12)
UNGWE BRIDGE SITE (ROUTE 956)



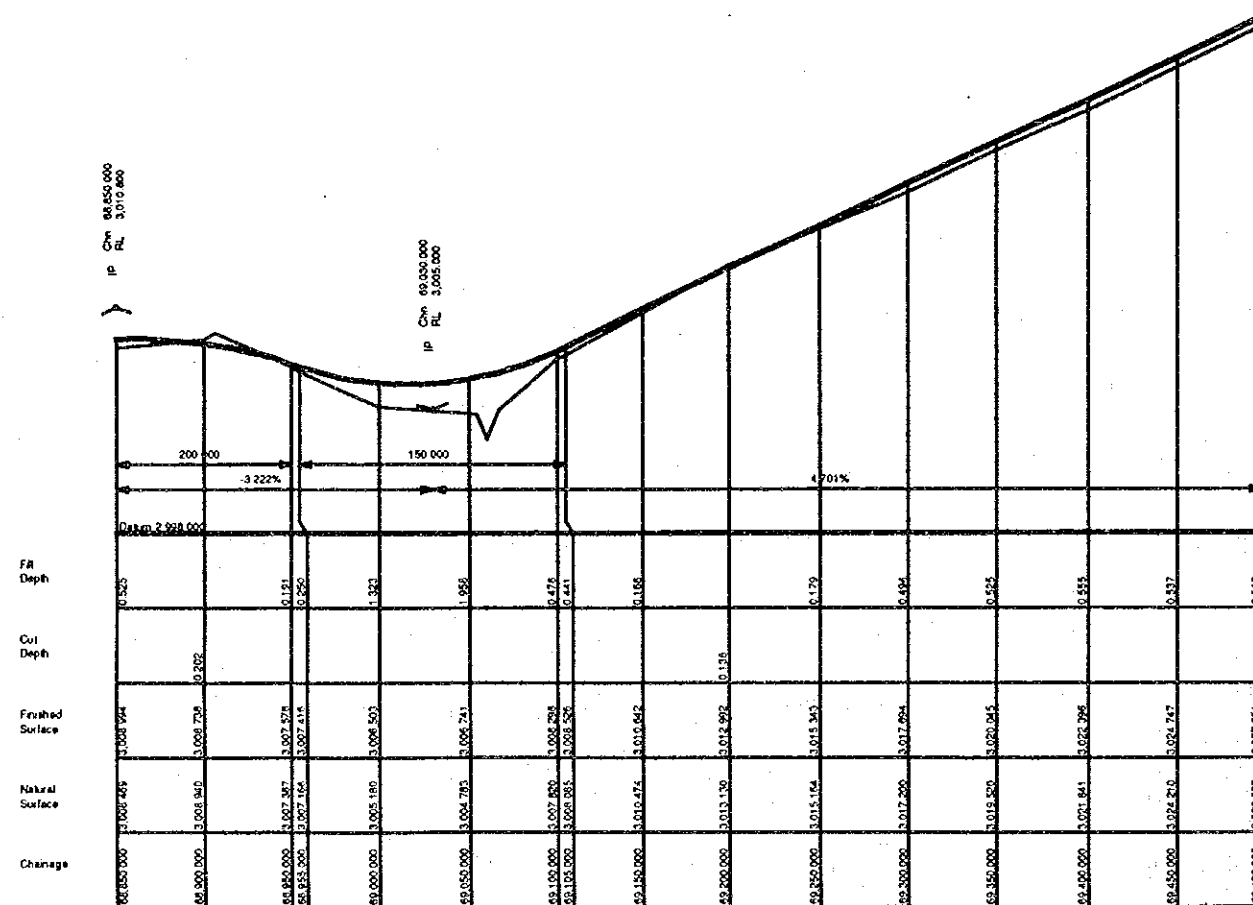
BASIC DESIGN STUDY ON THE PROJECT
 FOR
 REHABILITATION OF RURAL ROADS
 Fig. A-12 PROFILE (3/12)
 DEVURE I BRIDGE SITE (ROUTE 344) 1/2



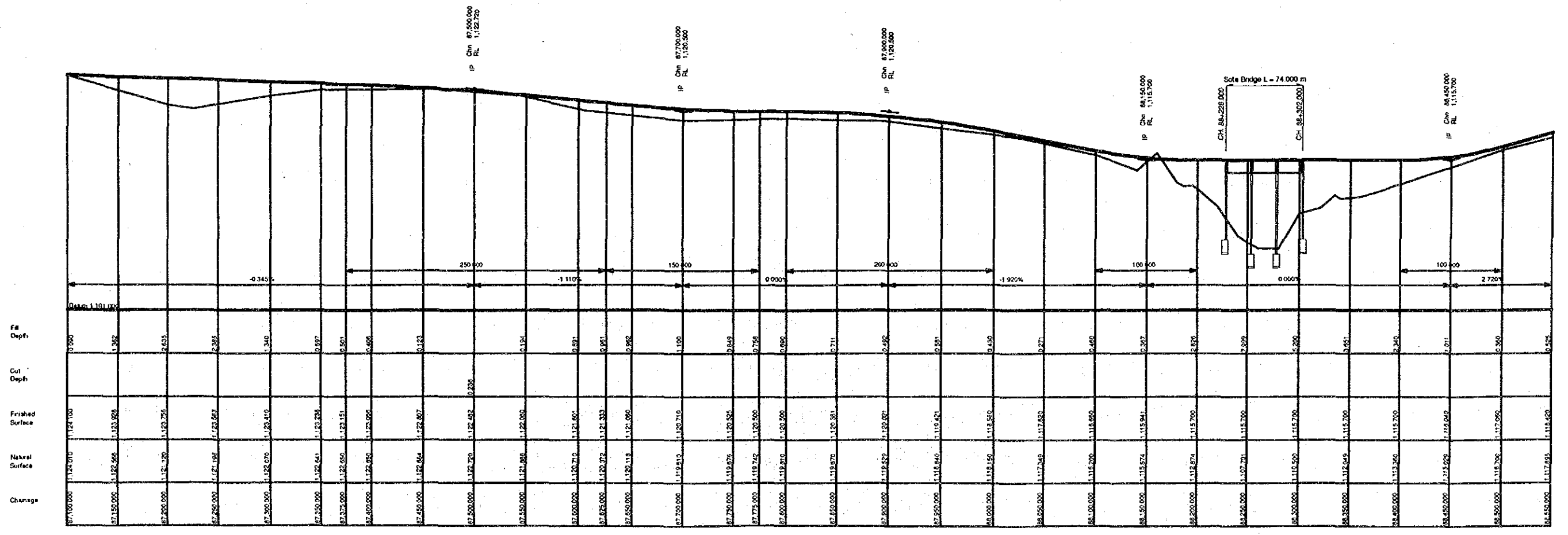
BASIC DESIGN STUDY ON THE PROJECT
FOR
REHABILITATION OF RURAL ROADS

Fig. A-13 PROFILE (4/12)

DEVURE I BRIDGE SITE (ROUTE 344) 2/2



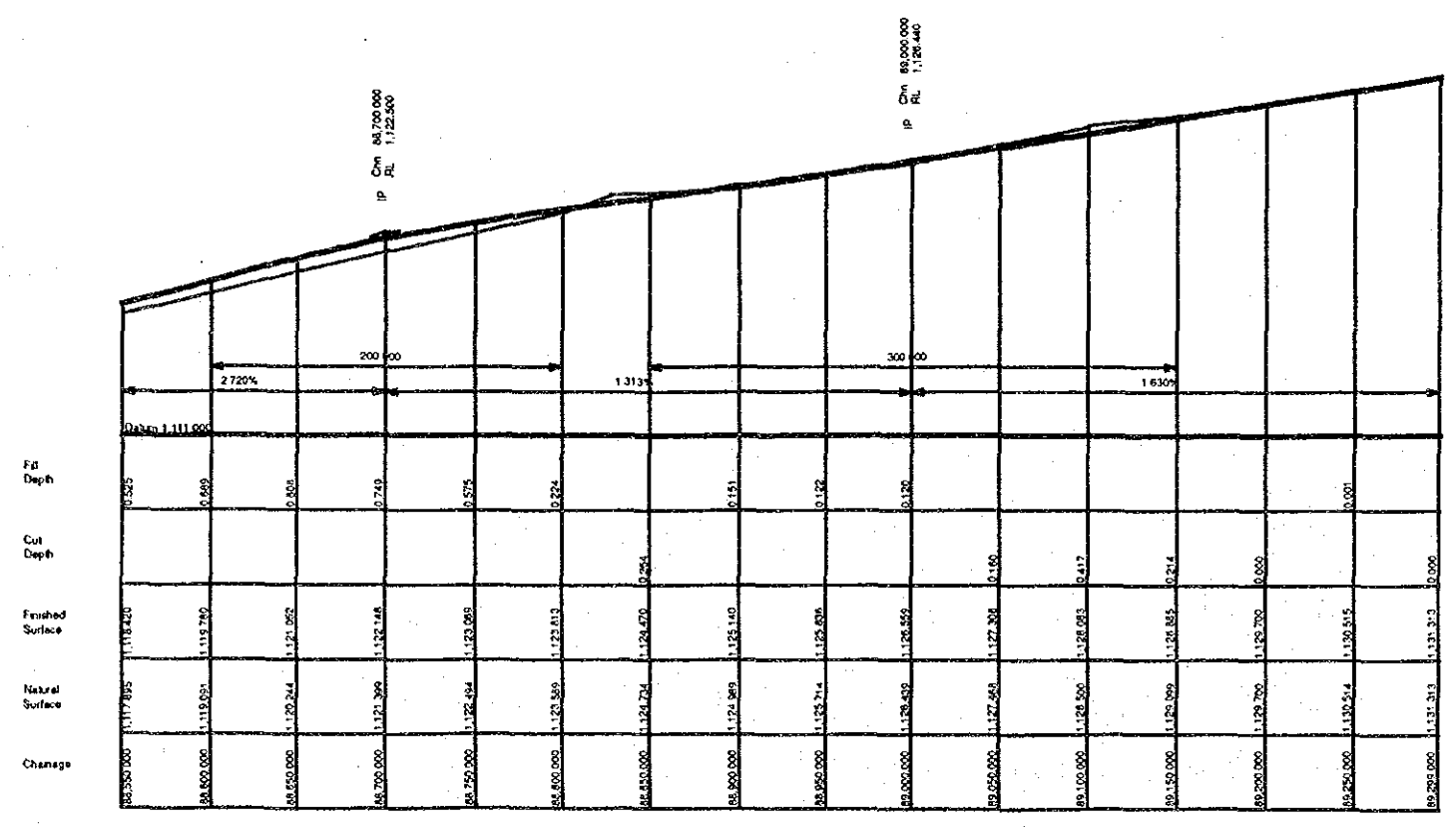
BASIC DESIGN STUDY ON THE PROJECT
 FOR
 REHABILITATION OF RURAL ROADS
 Fig. A-14 PROFILE (5/12)
 SOTE BRIDGE SITE (ROUTE 344) 1/2



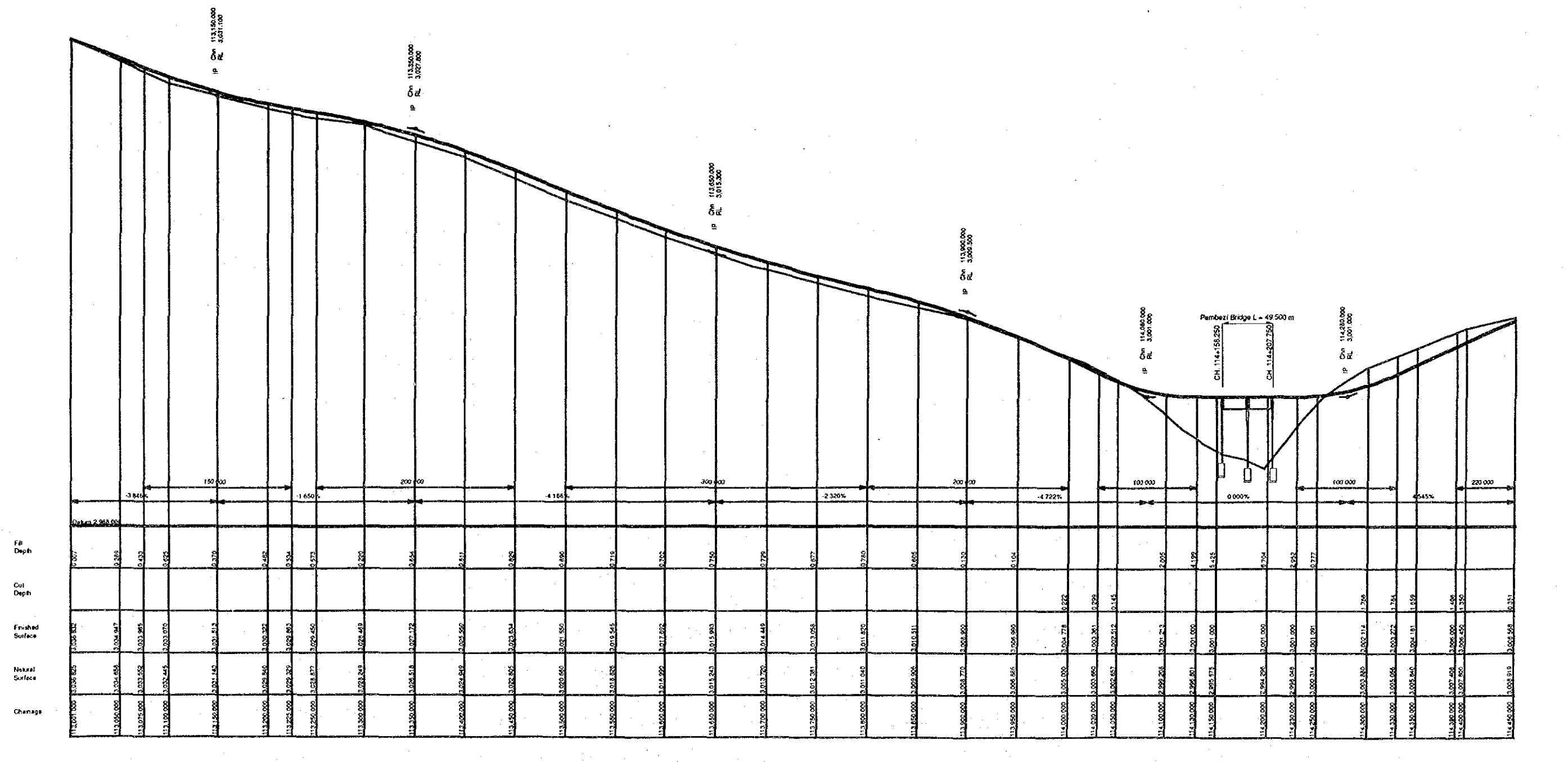
BASIC DESIGN STUDY ON THE PROJECT
 FOR
 REHABILITATION OF RURAL ROADS

Fig. A-15 PROFILE (6/12)

SOTE BRIDGE SITE (ROUTE 344) 2/2



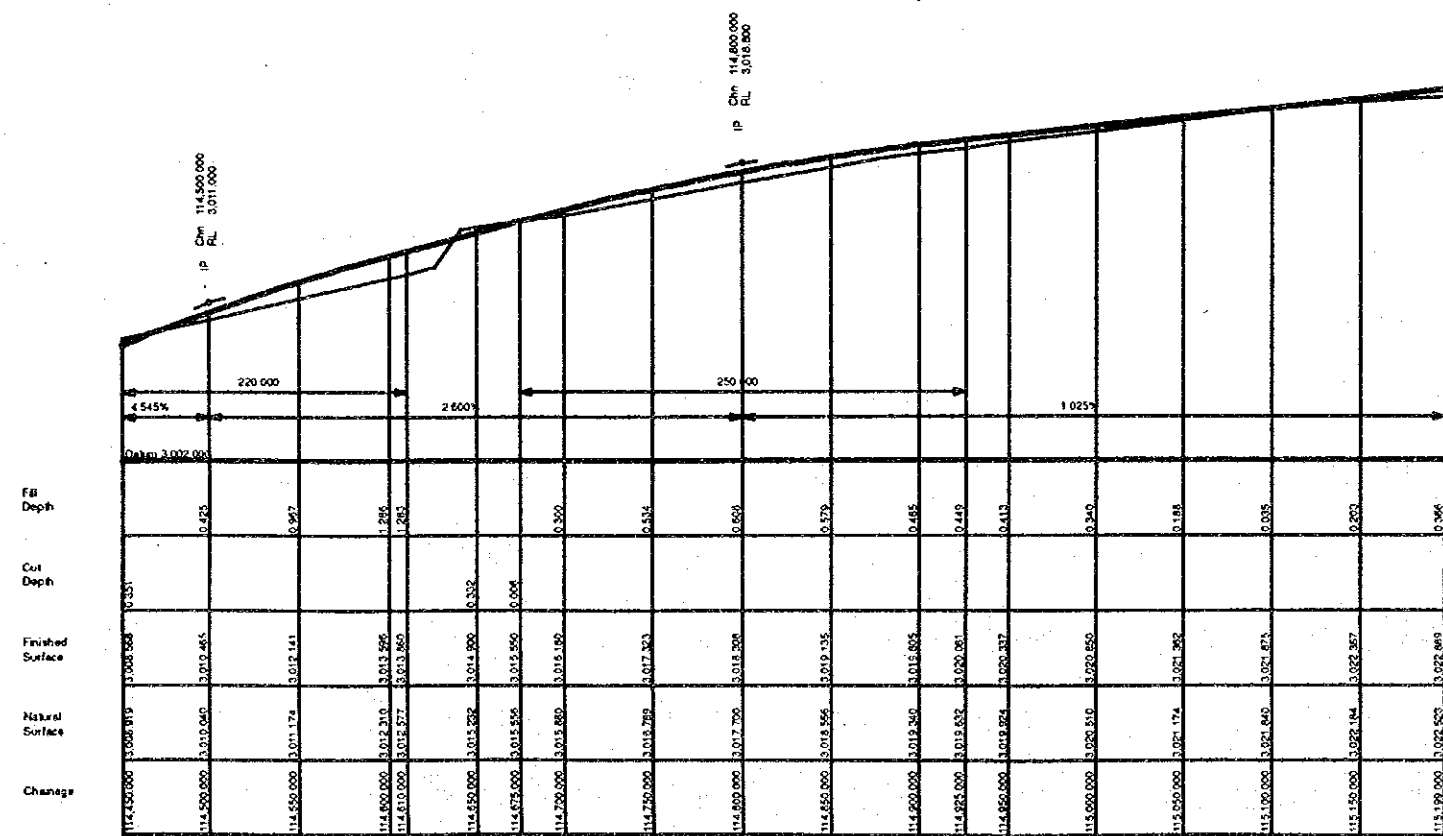
BASIC DESIGN STUDY ON THE PROJECT
FOR
REHABILITATION OF RURAL ROADS
Fig. A-16 PROFILE (7/12)
PEMBEZI BRIDGE SITE (ROUTE 344) 1/2



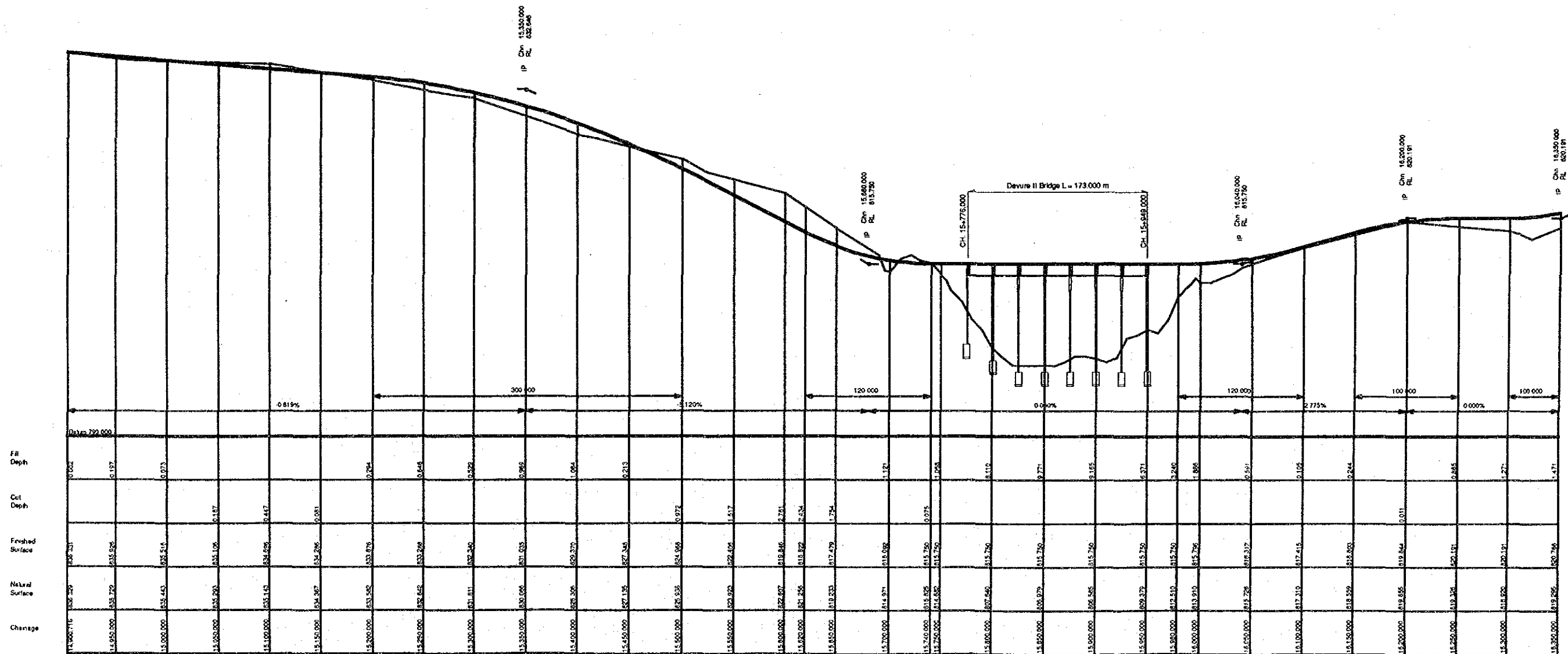
BASIC DESIGN STUDY ON THE PROJECT
FOR
REHABILITATION OF RURAL ROADS

Fig. A-17 PROFILE (8/12)

PEMBEZI BRIDGE SITE (ROUTE 344) 2/2



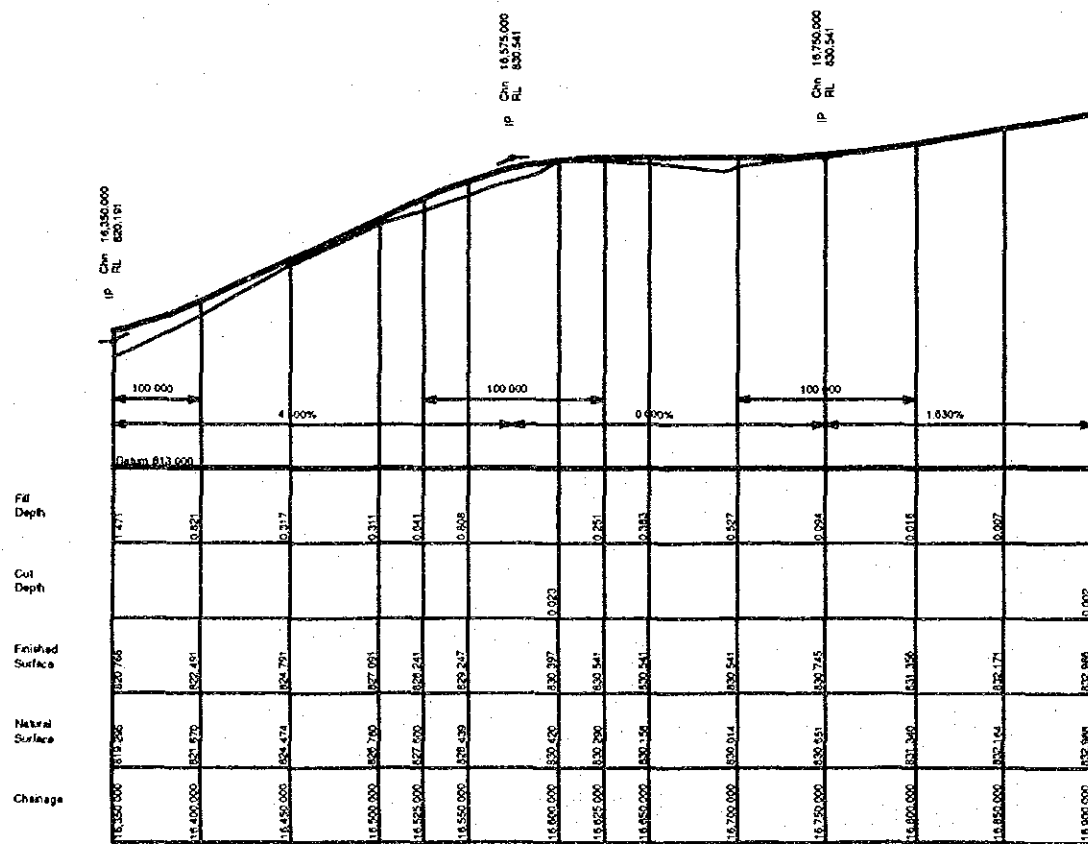
BASIC DESIGN STUDY ON THE PROJECT
 FOR
 REHABILITATION OF RURAL ROADS
 Fig. A-18 PROFILE (9/12)
 DEVURE II BRIDGE SITE (ROUTE 359) 1/2



BASIC DESIGN STUDY ON THE PROJECT
FOR
REHABILITATION OF RURAL ROADS

Fig. A-19 PROFILE (10/12)

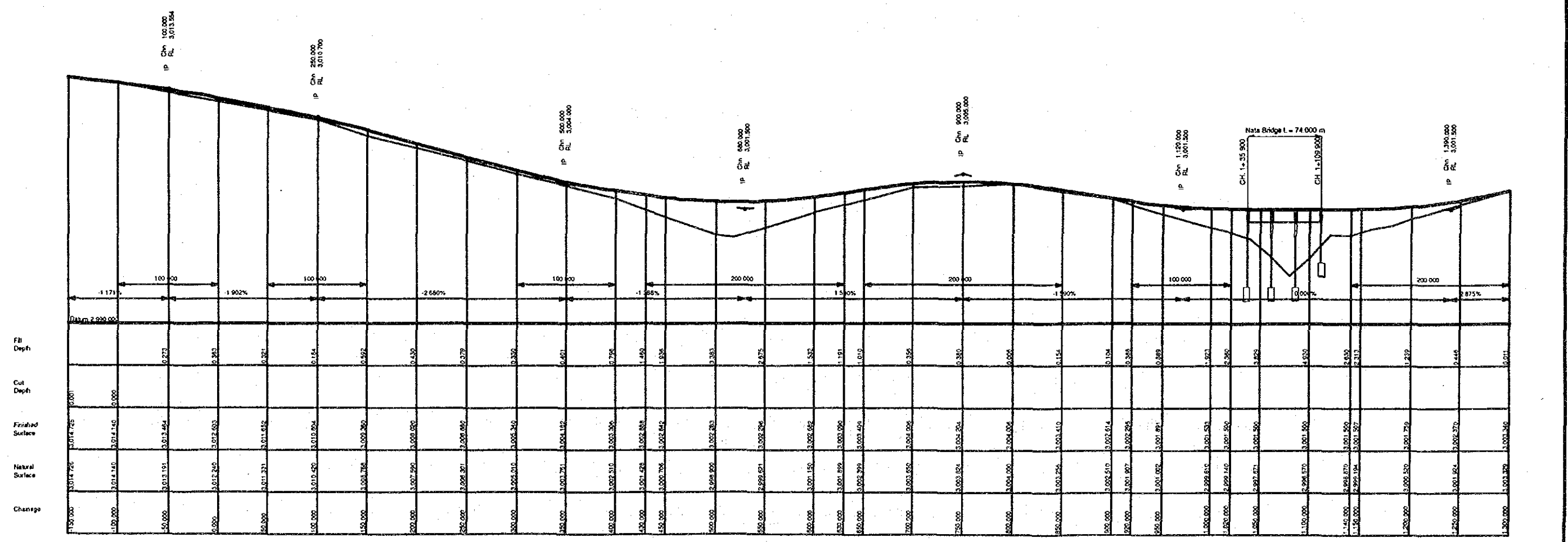
DEVURE II BRIDGE SITE (ROUTE 359) 2/2



BASIC DESIGN STUDY ON THE PROJECT
FOR
REHABILITATION OF RURAL ROADS

Fig A-20 PROFILE (11/12)

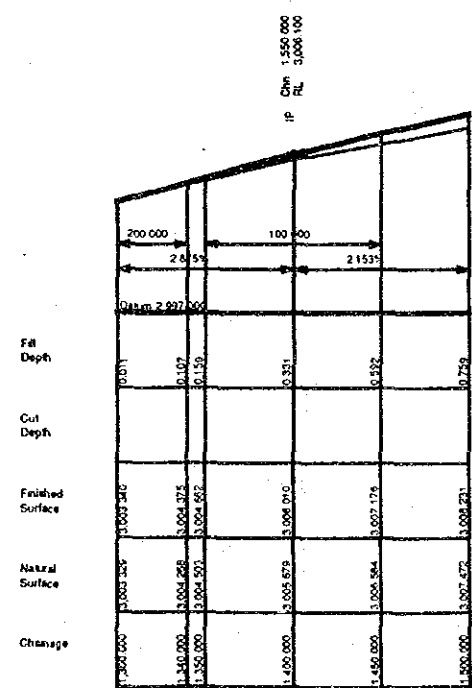
NATA BRIDGE SITE (ROUTE 759) 1/2



BASIC DESIGN STUDY ON THE PROJECT
FOR
REHABILITATION OF RURAL ROADS

Fig. A-21 PROFILE (12/12)

NATA BRIDGE SITE (ROUTE 759) 2/2



Photos of the Project Sites

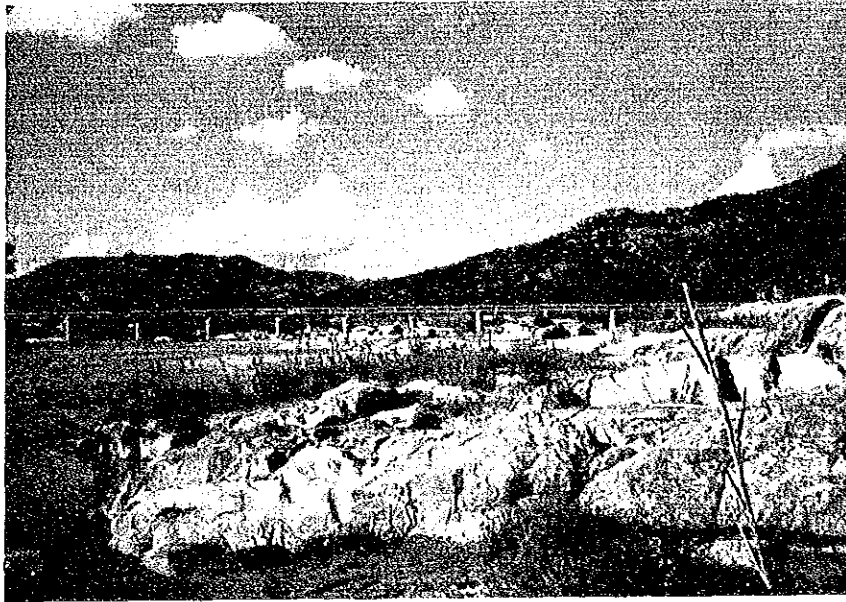


Photo-1 Odzi Bridge (Route 357)

Viewing the existing Odzi Bridge from the proposed new bridge site at the left bank. The existing bridge has 15 spans of a R.C. simply supported girder. The dimension is 146 m in total length and 3.7 m in width.

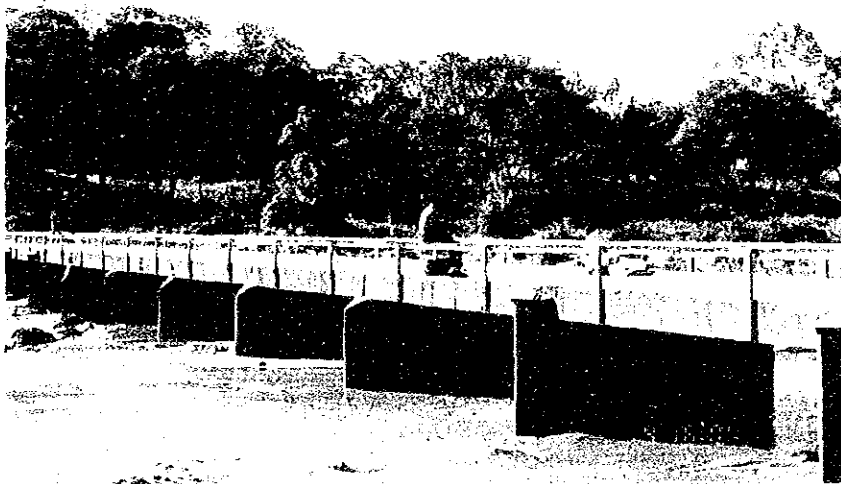


Photo-2 Odzi Bridge (Route 357)

Showing the existing bridge condition looking from the left bank of downstream. There was a warning board at the bridge entrance saying that (1) Speed 10 MPH (miles/h), and (2) No traffic if water over guard rails.

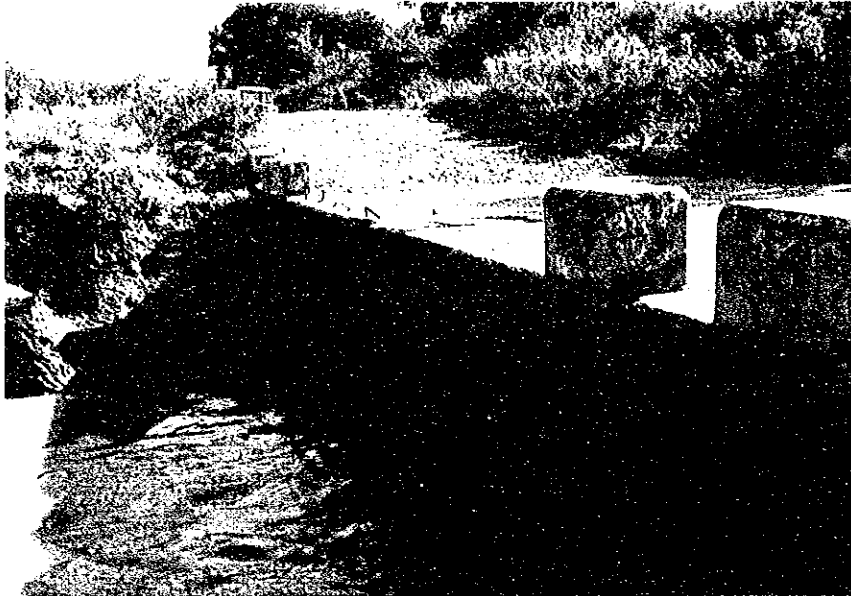


Photo-3 Ungwe Bridge (Route 956)

Showing the upstream side view of the existing Ungwe Bridge. The bridge consists of a R.C. slab and gravity type abutments. A bridge opening of 3.1 m is narrower than the river width. In the dry season, Ungwe River has no flow.



Photo-4 Route 956

Showing the existing condition of Route 956. This route was once upgraded to a gravel surface road, 8 m in width, including the improvement of alignment.



Photo-5 Devure I Bridge (Route 344)

Viewing the existing bridge from the left bank of upstream. The dimension of the bridge was 101 m in total length, and 4.0 m in total width.



Photo-6 Devure I Bridge (Route 344)

Viewing the existing bridge from the left bank of downstream. As the photo was taken in March, after the rainy season, the river flow was observed, but, in the dry season, the river has no flow. Almost half of the pipe openings were blocked by driftwood, debris, and sediments.



Photo-7 Sote Bridge (Route 344)

Viewing the existing bridge from the left bank of downstream. According to the DSR's definition, this bridge will be categorised as a arch causeway.



Photo-8 Sote Bridge (Route 344)

Viewing the existing bridge from the right bank (Gutu side). The bridge dimension was 89 m in total length, 4.3 m in total width, and 3.7 m in effective width.

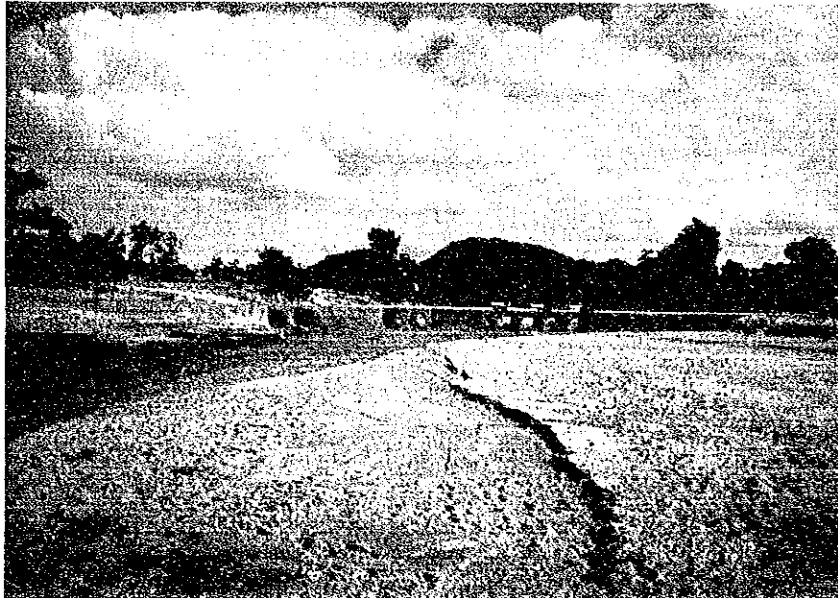


Photo-9 Pembezi Bridge (Route 344)

Viewing the perspective of existing bridge from the upstream. The structure type was a piped drift combined with R.C. and stone masonry. The dimension of the existing bridge was 53 m in length and 8.6 m in width.



Photo-10 Pembezi Bridge (Route 344)

Showing the downstream side of existing bridge. According to the information from DSR's staff, this bridge was newly constructed with around 3 weeks construction period, after the former structure was washed away by the flood in January.



Photo-11 Devure II Bridge (Route 359)

Viewing the existing bridge from the right bank of upstream. The bridge had buttress at the upstream side. The bridge length was 170 m, and the width was 4.2 m.



Photo-12 Devure II Bridge (Route 359)

As shown in the photo above, which was taken in March, the stack of driftwood and sediments, brought by the flood in January, blocked many openings of the bridge.

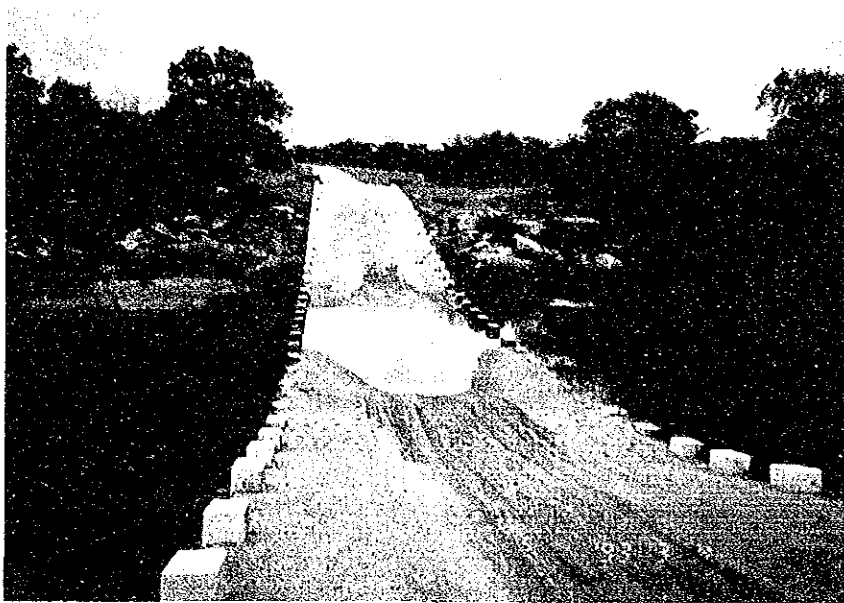


Photo-13 Nata Bridge (Route 759)

Viewing the existing structure from southwest (Plumtree side). The structure type was a drift with a 100 m of length, and 5.5 m of width. Nata River has no flow in the dry season.



Photo-14 Nata Bridge (Route 759)

Viewing the existing structure from northeast (Samenani side). According to the hearing at the site, the flood water level has not reached the river bank elevation.

