(7) Foundation structure types

The positions of the bearing stratum layers of bridges in this project varies from shallow to deep. The foundation structure types of the deeper positions will basically be pile foundation. As shown in Table-2.3.14, among the various types (RC pile, PC pile, H steel pile, steel pipe pile, and cast-in-place concrete pile), cast-in- place concrete pile has been selected for the following reasons.

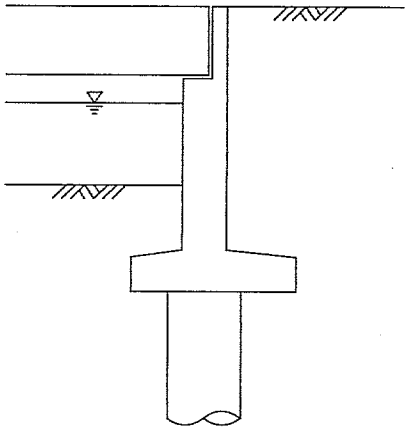
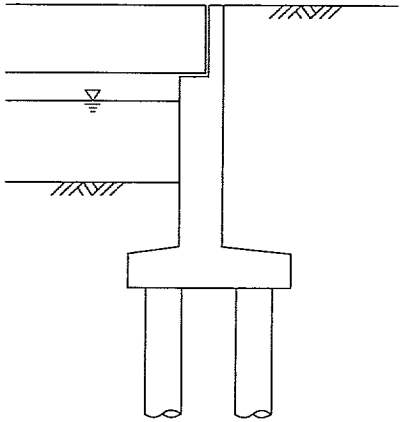
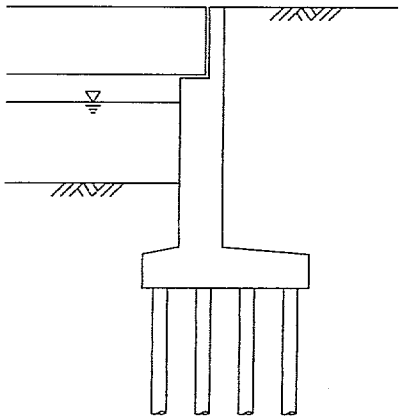
① Pile length is comparatively short, making for greater ease in construction and is avorable economically
② On-site construction is simplified
③ Construction in water is untroublesome
④ Seismic effects are almost non-existent, making concrete piles a possibility

The selection process is shown in Figure-2.3.4 and the appropriate foundation structure is indicated in Table-2.3.15.

Table-2.3.14 Characteristics of each adaptable pile

Pile Type	Sphere of pile length	Supply route	Characteristics
RC pile	approx. 20m	Domestically manufacturable	-Driving method is expected, and this type is appropriate for softer upper stratum with less than 20m supporting stratum. -Applied for lighter vertical and horizontal loads. -Inappropriate for short piles. -Fairly advantageous economically.
PC pile	approx. 30m	Imported from Thailand, Singapore, or Japan	-Driving method is expected, and this type is appropriate for softer upper stratum with less than 30m supporting stratum. -Applied for lighter vertical and horizontal loads. -Grater strength compare to RC pile; less cracking and other damage during installation. -Inappropriate for short pile. -Fairly advantageous economically.
H steel pile	approx. 30m	Imported from Thailand, Singapore, or Japan	-Applicable for long piles, welding causes few problems with joints. -Applied for lighter vertical and horizontal loads. -Need for rust proof treatment. -Less advantageous economically
Steel pipe pile	15 to 60m	Imported from Thailand, Singapore, or Japan	-Applicable for long piles, welding causes few problems with joints. -Most effective in situations where heavier vertical and horizontal load. -Need for rust proof treatment. -Fairly less advantageous economically
Cast- in-site pile	15 to 60m	Domestic supply except excavator	-Applicable for long piles with no problems of joints. -Most effective in situations where heavier vertical and horizontal load. -Applicable for rock excavation. -Advantageous economically

Table 2.3.15 Comparison Table of Foundation Type for Abutment

	Cast-in-site pile (deep foundation pile)	Cast-in-sit pile (reversed pile)	Pre-cast pile (RC pile, PC pile)
General View			
Structure	-Pile diameter is more than 2m. -Less effect as pile, in the case of less than 8m pile length. In this case, embedded depth into supporting layer is grater in order to keep vertical resistance. (△)	-Pile diameter is 1 to 1.5m. -In the case of short pile, the whole of pile including footing becomes rigid and stable structure. (△)	-Pile diameter is 0.3 to 0.4m. -In the case of short pile, the whole of pile including footing becomes rigid and stable structure. However, due to small rigidity against pile, this type requires more foundation pile than (△)
Construction	-Only after completion of structure excavation. -It is difficult in the case ground water level is close to the surface. (×)	-This can be constructed before structure excavatic -This can be excavated regardless of ground water level. (○)	-After structure excavation is better. -It is difficult to place into supporting layer or hard layer. -This can be constructed regardless of ground water level. (△)
Evaluation	Ground water level around the site is very close to the surface even in the dry season. Therefore, deep foundation pile is not adequate. This type is affordable in terms of construction safety. (×)	The depth between below footing section and supporting layer is not so deep. This type requires some extent embedded depth into supporting layer for stability, however, there is no problem with excavation for reversed pile method. This is much safer than deep foundation pile in terms of construction safety. (○)	The depth between the section below slab and supporting layer is not so deep. This type requires some extent embedded depth into supporting layer for stability. It is impossible to place pre-cast pile into supporting layer. This type is not adequate. (△)

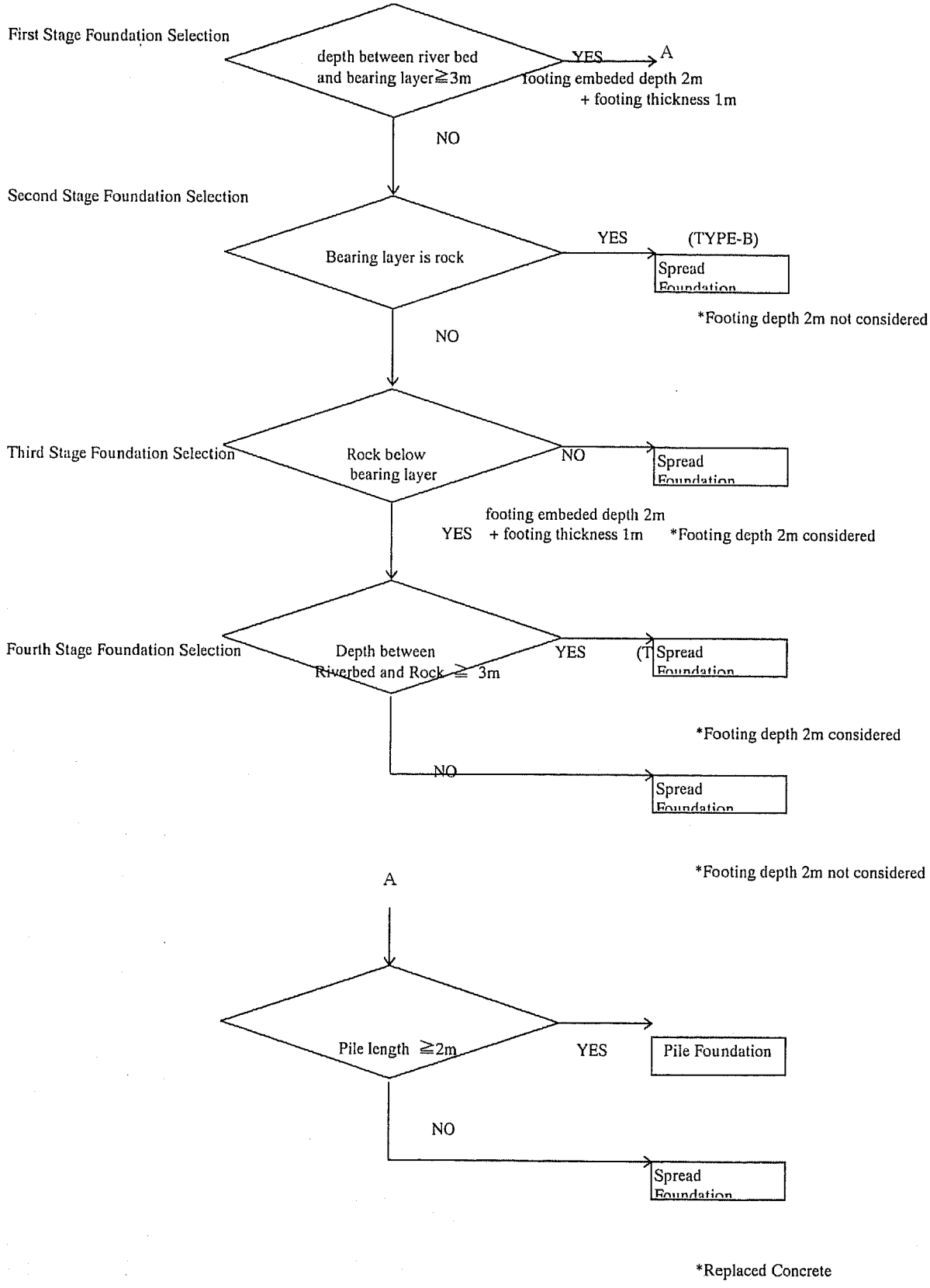


Figure-2.3.4 Flow Chart for Pile Foundation Selection

(8) Types of embankment / riverbed protection

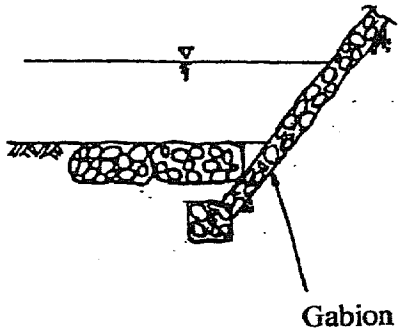
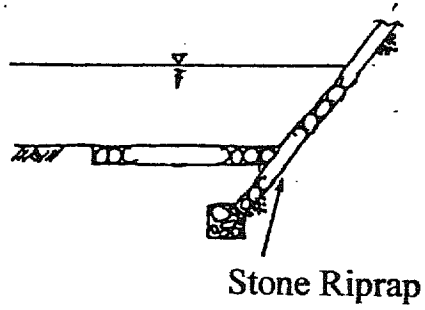
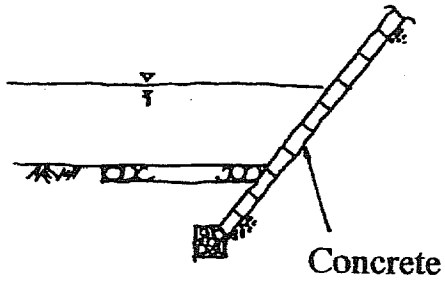
The course of the river is greatly influenced by embankment and/or riverbed protection. The basic concepts for such facilities which are to be installed for the stability of the river course and bridge safety is shown in Table 2.3.16.

2) Attached Road

The road works are already completed from Thakek to Xeno, but not yet completed from Xeno to Pakse.

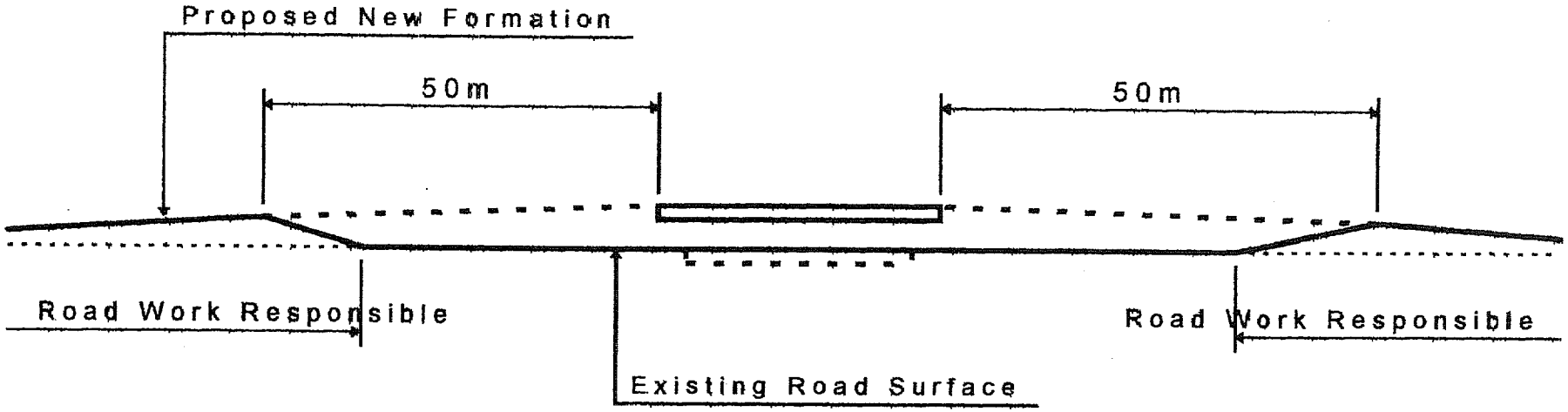
The attached road profile is in **Figure-2.3.4 Attached Road Profile**

Table 2.3.16 Comparison Table of River Bank Protection

	Alternative 1: Gabion	Alternative 2: Stone Riprap	Alternative 3: Concrete Block Pitching
General View			
Structure	– There are two types which are cylinder and mattress, made from wire mesh. – The structure is flexible. ○	– The stones should be regularly set. – The structure is not flexible. △	– The concrete block should be regularly set. – It needs the leveling gravel under the concrete black. – The structure is not flexible. △
Construction	– It is easy to make the gabion because of setting the stones in the wire mesh. ○	– After the ground was grading , the stone riprap are set. And the stone are connected by mortar or concrete. – It needs the curing period for mortar or concrete. △	– After the ground was grading , the concrete blocks are set. And the concrete blocks are connected by mortar or concrete. – It needs the curing period for mortar or concrete. △
Maintenance	– Easy because of stone ○	– Difficult to set the same shape stone △	– Difficult to set the few concrete blocks ×
Economy	1.00 ×	1.20 ○	1.30 ×
Evaluation	○	△	×

ROAD PROFILE

① Road Work Advance ahead of Bridge Work (Thakek - Xeno)



② Bridge Construction Advance ahead of Road Work (Xeno - Pakse)

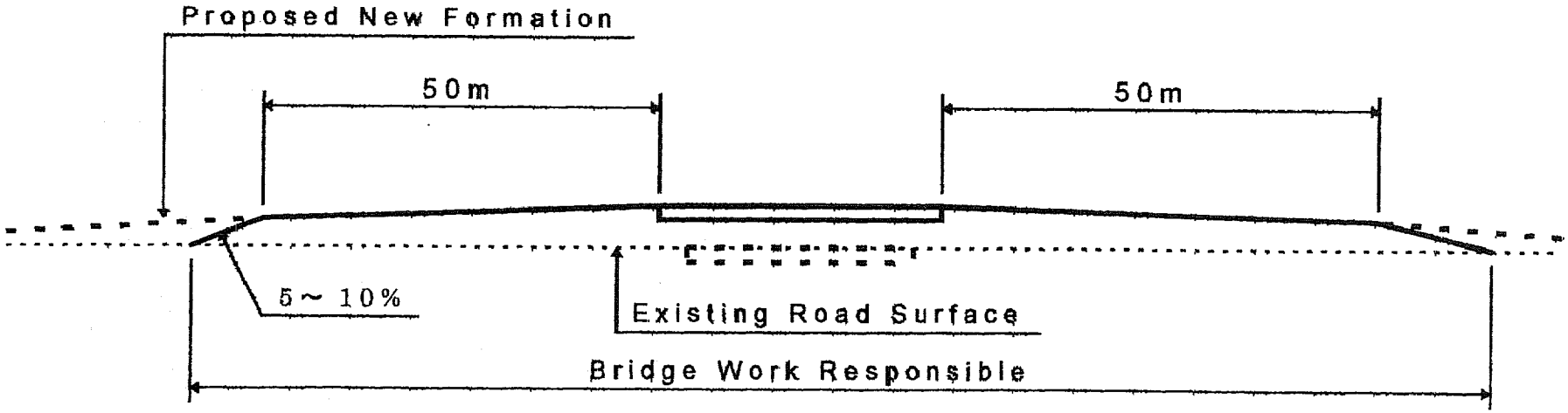


Figure-2.3.4 Attached Road Profile

Chapter 3: Implementation Plan

CHAPTER 3 IMPLEMENTATION PLAN

3-1 Implementation Plan

3-1-1 Implementation Concept

Based on the above mentioned field surveys, it is recommended that the project implementation plan be prepared as follows.

(1) Construction Period

The construction work will consist of the following main work items;

- Mobilization
- Preparation work
- Temporary detour work
- Removal of existing bridges
- Bridge work (sub-and superstructure)
- Miscellaneous work

The construction period is expected to last for thirty seven (37) months from March 1998 to March 2001. In Lao PDR, the five-month period from middle of May to Middle of October is the rainy season in which, in principle, neither bridge construction nor earth work is conducted, as it is almost impossible to carry out bridge construction work across a river at flood level.

However, sub-base course work and fabrication of concrete girders may be carried out even during the rainy season.

(2) Construction Methods of Individual Work Items

The flow chart of Conctrction is shown in Figure-3.1.1.

1) Detour Construction

During the period of the bridge construction work, the detour route is to be used for general traffic. The detour route will be constructed temporary accesses road with RC pile and by temporary bailey bridge and will need to be repaired once during the service period of four to five months.

2) Removal of existing bridges

Following the completion of the previously-mentioned construction of detour routes, a passageway for construction machinery, etc., will be laid out within the riverbed, and removal of the existing bridge will commence immediately. In instances where there exists a foundation pile, only the portion above the riverbed will be removed.

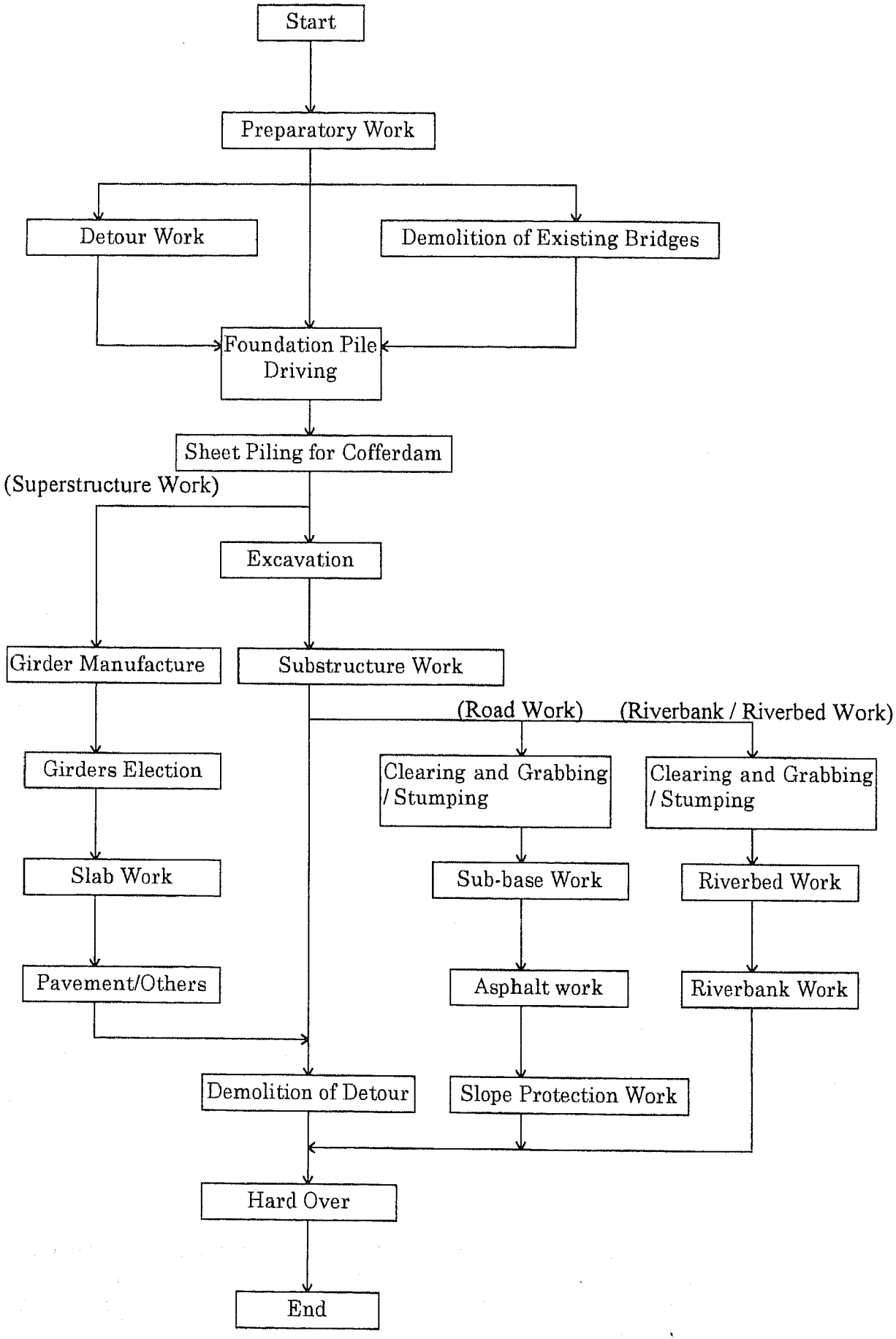


Figure-3.1.1 Flow Chart

3) Construction of foundations

Bridges in this project will be constructed by either cast-on-site piles or by direct foundation. In the case of pile foundation construction underwater, for the stability of the porous wall a reverse excavating drill will be employed while plugging with Bentonite during the drilling process. Following the completion of excavation, the pre-constructed cage made of reinforcing steel rods is sunken into place and underwater concrete poured into place.

Excavating machinery is procured or imported from Singapore or Japan and brought to the site. Since most of the bridges are to be built at the same position of the present ones, pre-existing structures which prove to be a hindrance to pile construction will be removed ahead of time. In cases where such is not the case, removal of old structures will take place at the same time as the construction of the new piles.

4) Substructure construction

Types of substructure adopted for the project include reverse "T" abutment, box-type abutment, and wall-type piers. Since construction will for the most part take place within the river, a number common structure methods will be employed, as follows:

a Excavation will be conducted open-cut style. In cases of high water level, the excavation will be conducted while shutting out with a stopper.

b Excavation will be conducted with a back hoe. In case of excess excavation depth, great care must be taken and wales and strut placement employed when necessary.

c After attaining the predetermined depth, the bottom surface of the excavation is evened out, laid with cobblestone, after which flooring concrete is poured.

d For pile foundations, after pile head is treated with reinforcing bars, footing reinforcing bar is assembled, mold placed, footing concrete poured, and substructure is constructed from the bottom up.

e Substructure is built up while removing struts and wales.

f After attaining predetermined height, surrounding base ground is returned to its original form.

g Bank protection work (wire mesh cages) is carried out simultaneously.

Since construction within the river is susceptible to natural mishaps due to flooding, construction during the rainy season is to be avoided, in particular during the main part of the season.

5) Construction of Superstructure

The superstructure is a PC girder-bridge with a 25 m span, adopting the following construction method:

a Girder manufacturing yard and stockyard are to be set up near the site while the substructure is being constructed

b The proper number of girders required for each bridge are to be manufactured. Concrete is to be supplied by a portable concrete plant set up nearby.

c Materials required for girder construction (reinforcing bars, molding material, PC steel material, cement, etc.) will be prepared beforehand. Gravel will be supplied from the Mekong River.

d Following completion of the substructure, temporary rails will be laid atop the abutment and girders will be pulled vertically to the gate-type crane which will put it in place.

e After the girder has been put into place, pouring of joint concrete and horizontal beam, horizontal tensing, etc., will be conducted, followed by bridge surface work.

f Bridge pavement will consist of alternating layers of gravel and asphalt emulsifier (DBST).

(3) Local technicians

The most experienced engineers in Lao PDR are those that were educated or have had work experience in the People's Republic of China, the former Soviet Union, and former Soviet bloc countries in eastern Europe. They have little knowledge of the technology and/or level of quality of "western" nations, and it would not be an exaggeration to say that there is a lack of engineers and skilled labor. Therefore, from the viewpoint of the advancement of skill transfer, it would be most advantageous to make maximum use of employees of the MCTPC as well as construction equipment and materials of nationally operated companies.

(4) Utilization of Local Contractors

Local contractors are not technically competent enough to handle the construction work of the project by themselves. Therefore, they will have chance to work for the project as sub-contractors under the supervision / control of Japanese contractors except for work items which require special engineering skills. This work arrangement will help Lao PDR develop its construction technology.

(5) Japanese Engineers

The project will require engineers from Japan in such work items as production / assembly of prestressed concrete beams, prestressing work, bridge erection, earth work and pavement work.

(6) Local Executing Agency

The Department of Comunication (DOC), will be the local executing agency of the Project. The DOC is one of the organizations under the Ministry of Cominication, Transport, Post and Consturuction (MCTPC)

3-1-2 Implementation Condition

A practical construction schedule should be prepared based on the distinct meteorological conditions (the dry and rainy seasons) in Lao PDR and the local market of machinery / materials procurement.

(1) Work Items to Execute During the Dry Season

In Lao PDR, there are two extreme seasons in a year, namely the dry and rainy seasons mentioned above; the latter lasting from May to October.

There are some work items whose efficiency would be very poor if executed during the rainy season and should be handled during the dry season. Consequently, it is necessary to establish a machinery operation schedule and materials procurement plan suitable for intensive work during the dry season. Such work items as mobilization and preparatory work should be done as soon as possible after the construction contract is concluded between the Lao PDR Government and a Japanese contractor.

Some equipment and materials are to be imported from Japan and it will take two to three months before they arrive at the Klong Toey Part and the Laem Chabang Port in Thailand. Therefore, the Japanese contractor may make the best use of some equipment of the domestic contractors.

(2) Land Acquisition

The contractor should be always ready to keep necessary land space required for the site office, prestressed concrete fabrication yard, etc, shortly after having entered into the construction contract with the Lao PDR Government.

(3) Customs Clearance Procedure

Machinery and materials procured in Japan will be unloaded mainly at the Port of Klong Toey and Laem Chabang. It is of utmost importance that the contractor get the Lao PDR Government to ensure that the cargo is smoothly processed by the customs.

(4) Safety Measure

The safety measure at the site TX No.15 bridge is indispensable since the construction work requires convey of heavy material and work at elevated area. Traffic safety measures at other sites are required as well, due to heavy traffic.

The site office is to be located at Thakek, Savannakhet, and Pakxe and telephone contact is available at present. In addition, radio facilities such as satelaite phone should be installed at each office for emergencies.

3-1-3 Scope of Works

The project should be executed by thoroughly Japanese Goverment.

3-1-4 Consultant Supervision

Japanese consultants will handle the detailed design, tender documents preparation and bidding after completion of consultancy services contract. The Japanese consultants consist of the following professionals;

1 Project Manager
2 Road Engineers
3 Bridge Engineers
4 Surveyor and Geologist
5 Tender / Contract Specialist
6 Quantity Surveyor / Construction Planner
7 Resident Engineer

Each role of the above engineers / specialists is as follows;

(1) Project Manager

The project manager will manage and supervise all the jobs in connection with the detailed design, bidding, construction supervision and relevant works.

(2) Road Engineers

Road engineers will be responsible for the detailed design of the road and road-related structures and the preparation of the working drawings and quantity surveying in connection with their jobs.During the construction work, they will supervise the earth work, base-course work and pavement work.

(3) Bridge Engineers (Superstructure / Substructure)

Bridge engineers will be responsible for handling the detailed design of the bridges; relevant structures such as river revetment, bridge approach cushion slab, temporary equipment and the preparation of the working drawings and quantity surveying. During the construction, they will supervise the temporary works, confirmation of geological conditions, foundations, bridge substructures, superstructure, river revetments work, and other auxiliary works.

(4) Surveyor and Geologist

The surveyor and geologist will be responsible for conducting additional topographic surveys, geological investigation and CBR test required for the detailed design based on the field engineering survey data during the basic design work.

(5) Tender / Contract Specialist

The tender / contract specialist will be responsible for the preparation of tender and contract documents.

(6) Quantity Surveyor / Construction Planner

The quantity surveyor / construction planner will be responsible for the study of detailed construction plans and preparation of the final cost of the project based on the tentative construction cost estimate prepared during the basic design study.

(7) Resident Engineer

The resident engineer will be responsible for both the technical aspect of schedule and quality control of the project and the administration aspect of the site office management throughout the entire construction period. He will also be responsible for the supervision of earth work, road work, pavement work, bridge works and other auxiliary works.

3-1-5 Procurement Plan

(1) Construction Materials

The following are the present conditions of the local supply of equipment / materials.

1) Cement

Domestically made cement chiefly consists of Kitang Cement which is made in a factory constructed with Chinese capital 100 km north of Vientiane. However, quality is inconsistent, and there remain doubts as to whether or not it would be sufficient to withstand more than 200 kg per square centimeter.

On the other hand, three brands of Thai-made cement (Siam Cement, Siam City Cement, and Jor Batang) are on the market and can be purchased in 50-kg sacks. However, there is a tendency of shortages during the dry season. In order to avoid unexpected shortages or poor quality due to long-term storage, it is best to import the cement directly from Thailand. In the case of importing, one must consider the initial import application procedures, which take about 6 weeks.

2) Mixed concrete

There are only two companies which operate plants within Lao PDR, both of which are located in Vientiane.
1= Concrete Factory KM-5
2= Vilaysack Ready-Mixed Concrete
Both are of the same capacity, i.e., 15 to 20 cubic meters. Since Vientiane is too far from the site of this project, It will be required to mix and produce the concrete on site.

3) Steel materials (reinforcing rods, piles, sheet pile, specialized bridge materials, structural steel materials)

a Reinforcing rods

Thai-made materials are on the market, and present no problem in terms of quality, availability, or timing. There are also Russian and Vietnamese products, but these are of inconsistent quality. Rods of more than 20 mm in diameter tend to be short in stock, thereby requiring that they be imported directly by project. Time from ordering to procurement is about one to two months.

b Steel sheet pile / H-steel pile / steel pipe pile / specialized bridge material / general structure materials

It will be required to either import from Thailand or from a third country, including Japan, through Thailand. The quality of Thai materials can be guaranteed up to SM490A, but beyond that it should be considered that there can be problems. Also, steel sheet pile and large size H- piles can not be produced in Thailand.

c Points to consider regarding bridge steel materials and manufacturing of steel

girders

Girders will be manufactured in Thailand, and it should be kept in mind that when importing into Laos, an import tax of 27% of the cost of materials is levied in Thailand when manufacturing procedures do not take place in a bonded area.

d PC cables/steel poles

These are not stocked within the republic and therefore need to be imported. Thai products are on the market.

4) Concrete aggregates and road fill / road base materials

Aggregates for use in concrete (gravel, sand) as well as crushed rock for road base material are found in abundance in the Mekong River region. These are obtained by a dredge boat equipped with a pump and supply is stable. Granite and sandstone are the chief components and the texture is of hard quality and favorable for use. Near National Route 13, the site of this project, are dredge sites and shipping piers (or slip-way) in Thakek, Savannakhet, 25 km north of Savannakhet, Ban Namuang, and Pakxe. These locations are spaced at intervals of about 50 km, using Route 13. Among these sites, the site at Savannakhet is one of the largest quarries of the entire Mekong River area.

A crushing plant, which separates aggregates according to size (approximately 100 to 200 tons per day), is located about 25 km south from the shipping point on the shore at Savannakhet along Route 11. The quarrying equipment and crushing plant are privately operated locally, and have the capacity of supplying large quantities for construction along route 13 and beyond. However, quarrying is impossible during the rainy season, and therefore recommended that materials be warehoused in the dry season.

Stable supplies of roadfill material (chiefly sand and laterite-based subsoil) is found in abundance in the hills along Route 13. Stones used in gabion for river protection can be supplied from the rocky slopes of limestone mountains along Route 13, where they are found in abundance.

5) Paving materials (Asphalt)

The type of surface paving to be employed for this project is BST (Bitumen Surface Treatment). Bitumen itself is not produced or sold domestically, but importing from Singapore or Thailand appears to be a dependable mode of supply. There is no firmly established importer or trader within Lao PDR, but it may be available from government-run corporations under the auspices of the MCTPC in the event that there is inventory.

6) Lumber

With 47% of the country being forested, the lumber industry provides Lao PDR with its greatest source of foreign exchange. At present, the government has taken a stance of forestry conservation in which cutting is only permitted in areas slated to be inundated by dam construction or designated as reforestation areas. In any case, lumber is widely available throughout the republic and stable supply can be expected.

7) Procurement plan of construction materials

Procurement plans for all construction materials including those not mentioned above are shown in Table-3.1.1. In the recent past, Lao PDR shared a strong economic relationship with its neighbor Vietnam, but in conjunction with the changing international scene, imports into Lao PDR now rely heavily on Thai products or those routed through Thailand to Lao PDR.

Table-3.1.1 Procurement Plan of Construction Materials/Equipment

Material / Equipment	Lao PDR	Japan	Remarks
Cement	○		from Thailand
Concrete mixer	○		from Thailand
Reinforcing steel	○		from Thailand
Steel sheet pile		○	Special steal
Structural steel	○		from Thailand
PC steel wire / bar		○	Quality maintenance
Bitumen	○		from Singapore or Thailand
Crushed rock	○		
Sand	○		
Earth for road	○		
Timber	○		
Mold (plywood、steel)	○ plywood		Steel from Thailand
Scaffolding, supports	○		
Expanding-contracting joints (rubber type)		○	Quality maintenance
Support (rubber type)		○	Quality maintenance
Concrete pipe	○		
Gabions	○		Domestically obtainable but not many

(2) Construction Machinery

1) Construction machinery maintained by the MCTPC

There are six construction companies operating under the auspices of the MCTPC which are responsible for projects related to roads and bridges. These maintain machinery provided by aid from the former Soviet Union and other socialist states and carry out construction and maintenance of roads within Lao PDR independently. However, a large portion of the soviet-made machinery is antiquated and seems to interfere with the construction process.

In 1993, construction machinery which was granted and distributed by Japan as construction equipment for the national project Road Construction Enterprise No. 8 and put to good use for the project. At present, that project has been completed and the machinery is being used in other government projects or being leased to other firms.

Construction machinery of government-run firms is used for independent projects undertaken by those firms and although a small number of machines are available for lease (though not regularly), these would not be sufficient for application in new construction projects, and are not necessarily well-maintained.

2) Construction machinery procurable or leasable domestically

Caterpillar, Inc., in Vientiane conducts sales chiefly in construction equipment of drilling and excavating machinery, bulldozers, roadrollers, and their parts. However, they are not necessarily constantly stocked with spare parts, which are ordered from Japan or Singapore when needed. As one must deal with the agent rather than directly with Caterpillar, expense is greater and delivery takes longer (about three months).

There are several companies in Vientiane which specialize in leasing construction equipment. There are also companies which sub-contract in projects maintaining their own machinery and lease when not in use. Many of these pieces of equipment are Caterpillar or Komatsu by make but are not well maintained; and supply and repair takes too much time to consider them dependable for anything more than auxiliary equipment.
Types of machinery found on the market are shown in Table-3.1.2. The number of cranes available is few.

Table-3.1.2 Machinery found on the market

Plant & Equipment	Type
Back hoe	0.4～0.7m3
Bulldozer	D4～D8
Tire Loader	1.0m3～3.4m3
Motor Grader	
Tire Roller	20t
Vibration Roller	6t～10t
Truck Crane	15t , 20t , 35t
Dump Truck	10t
Generator	10KVA～430KVA
Water Tanker	6KL～10KL

3-1-6 Implementation Schedule

After the Exchange of Notes, the project will be executed in accordance with the following procedures.

(1) Consultancy Services Contract and Detailed Engineering

After conclusion of the consultancy services contract, the detailed engineering design is to be carried out, followed by the preparation of drawings, specifications and tender documents.

(2) Construction Bidding and Contract

A construction contract is made directly between the Lao PDR Government and a Japanese contractor. In selecting a Japanese contractor, a competitive tendering system is open only to Japanese construction firms. In advance of the invitation of tenderers, the consultants will help the Lao PDR Government consult with JICA about the criteria for examining the qualifications of contractors. The consultants will handle the qualification work on behalf of

Table-3.1.3 Construction Machinery Supply Plan

Name of Equipment		Capacity	LAO	Japan
Bulldozer	D7	21ton	○	
Excavator		0.6m3	○	
Bus		15person	○	
Truck Crane		15ton	○	
Truck Crane		25ton	○	
Crawler Crane		35ton		○
Crawler Crane		50ton		○
Fork Lift Truck		3.5ton		○
Electric Generator		100kva		○
Electric Generator		200kva		○
Electric Generator		50kva		○
Jeep				○
Truck		10ton	○	
Truck with Crane		4ton／3t	○	
Trailer		35ton	○	
Tank Lorry		2000L	○	
Water Tank Lorry		6000L	○	
Motor Grader	GD505A	3.7m	○	
Vibration Roller	CA 25D	9.75ton	○	
Steel Roller	KD120B	12.5ton	○	
Tire Roller	TS200	20ton	○	
Air Compressor		5m3/min		○
Vibro-pile Driver		60kw		○
Hammer Grab				○
Reverse Circulation Drill		75kw		○
Winch		3t		○
Water Pump		φ100		○
Water Pump		φ50		○
Grout Mixer		MG-100, 3.7kw		○
Grout Pump		ND-32M(s), 0.7kw		○
Concrete Bucket		1.0m3		○
Concrete Vibrator		φ45mm		○
Portal Crane		40ton		○
Hydraulic Jack		50t		○
PC Cutter		L-140s		○
Jack for Stressing				○
Pump for Stressing				○
Bar-vender				○
Engine Welder		300A		○

the Lao PDR Government. Government officials of Lao PDR, the consultants and tenderers need to examine the tenders and determine a successful bidder in the presence of JICA officials. After approval by the Japanese Government, the construction contract follows.

Parallel to the signing of the construction contract, the Lao PDR Government will conclude a banking arrangement with an authorized foreign exchange bank in Japan to open a special account for the purpose of receiving the funds granted by Japan and make the payments to the Japanese contractor.

The banking arrangement serves as the basis for the Lao PDR Government to issue the Authorization to Pay (A/P). The A/P is indispensable for applications to be submitted by the Japanese contractor to the Ministry of International Trade and Industry of Japan to obtain approvals for exports of products, as well as for receipt of advance payments described in the contract.

Following this, verification of the contract by the Japanese Government is required. The contract verification means that the Japanese Government confirms the contract and its appropriateness as a subject for grant aid. The official verification is one of the requirements which give authorization to the contract.

The Japanese Ministry of Foreign Affairs receives the written contract from the recipient country (Lao PDR), usually through the Japanese Embassy of the recipient country and ,makes a decision regarding the verification of the contract.

Then, the Japanese contractor fulfills the contract after receiving the verified written contract and Authorization to Pay (A/P).

(3) Construction Work

The construction work starts with preparatory work, road work, detour work, removal of the existing bridges, sub- and superstructure work and relevant work such as river revetment, and ends with removal of construction machinery and temporary materials. As the rainy season is from May to October, the construction work around the river and earth work will be restricted during that period.

Table-3.1.4 shows implementation schedule. Overall construction period is assumed as 37 months.

Table-3.1.4 Implementaion Schedule

	Month	1	2	3	4	5	6	7	8	9
Detailed Design	Field Survey									
	Works in Japan									
	Project Confirmatin									

8. 5Months

Phase I	Month	1	2	3	4	5	6	7	8	9	10	11	12	13
Construction and Procurment	Preparation work													
	Demolishing Work													
	Foundation Work													
	Substructure Work													
	Superstructure work													
	Attached Road Work													
	River Work													

13Months

Phase II	Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17 #	19 #	21	22	23	24	25	26	27	28	29	30	31
Construction and Procurment	Preparation work																													
	Demolishing Work																													
	Foundation Work																													
	Substructure Work																													
	Superstructure work																													
	Attached Road Work																													
	River Work																													

31Months

3-2 Operation and Maintenance Plan

3-2-1 Maintenance Costs

Following the completion of this project, maintenance and management of the improved bridges will become the responsibility of the DCTPC. Types of required maintenance / management foreseen for the next ten years and costs are shown in the Table-3.2.1.

(1) Maintenance work and expenses

Table-3.2.1 : Contents and Expenses of Maintenance Works

Frequency	No	Works	Unit Cost	Ten Year Cost
Yearly	1	General cleaning and weeding, drainage US$0.11 x whole area (33,000m2)	US$3,630	US$36,300
	2	Repair on shoulders US$1.0 x surface area (6,300m2)	US$6,300	US$63,000
	3	Repair on abutment protection (minor) US$1.5 x bank area (35,000m2)	US$52,500	US$525,000
	4	Repair on river-bed and training (minor) US$2.0 x facility area (12,000m2)	US$24,000	US$240,000
	5	Pavement patch-up US$3.0 x ten percent of surface area (3,700m2)	US$11,100	US$111,000
Five Yearly	6	Repair on embankment (medium) US$2.0 x bank area (19,000m2)	US$38,000	US$76,000
	7	Pavement over-lay US$3.0 x total surface area (37,000m2)	US$111,000	US$222,000
Ten Year Total of Maintenance				US$1,273,300

Note: A bridge components repair on as-need basis shall be conducted when necessary.

(2) Operation costs

Operation costs estimated for routine checkups and scheduled checkups are shown below

- Personal costs : US$25,000/year
- Inspection vehicle fuel cost : US$5,000/year

Total : US$30,000/year

3-2-2 Maintenance Methods

In order to utilize a limited budget effectively, early discovery of damage and eary repair should be the central theme of routine and/or periodic inspections as a maintenance policy. The major damage can be prevented altogather.

(1) Routine Inspection

A routine check-up is conducted by travelling over the assigned route, looking out for any irregularities in road surface, shoulders by three staff members are required: one inspector, one recorder, one driver.

(2) Periodic Inspection

This inspection should take place after the general water level has reached post-rainy season levels over the stretch of road between Thakhek and Pakxe as the inspector inspects for damage and draws up plans for repairs. Based on these inspections, the engineer judges necessity of repair and where necessary conducts immediate repair to prevent further degradation.

Chapter 4: Project Evaluation and Recommendation

Chapter 4 Project Evaluation and Recommendation

4-1 Project Effect

National Road Route 13 does not only connect both the northern and southern parts of the country with the capital Vientiane, thus serving as a central transport access, but it also holds the starting points of East-west Routes 8, 9, and 12, among others. By replacing the 51 bridges along the 370-km Thahkek-Pakxe stretch along Route 13 with permanent two-lane bridges, road improvements now taking place along the route will be greatly complemented to bring great advancements in the economy and living standards of the Vientiane economical sphere as well as to the cities of Thahkek, Savanahket, and Pakxe, to say nothing of its improved function as part of the network of an international route linking with bordering countries.

Present Situation and Problems	Measure Proposed by the Study Team	Effects
The bridges in the study area are mostly Bailey bridges with vehicle weight limits of 20 tons or less, thus severely limiting activities of heavy-load trucks.	Present bridges are replaced by reinforced concrete bridges adopting "B" live load to allow the passage of large-size trailers.	Function of road as national trunk route is enhanced, contributing to economic development of the country and region
In the rainy season, it is not uncommon for the water level to exceed the bridge height and thus stop traffic.	In conjunction with the on-going road improvement construction, bridge height will be raised so as to reduce inundation problems to nil.	Stoppage of traffic is prevented, allowing for greater social and economic stability
Both the bridge and the abutments are old and unsafe during the rainy season.	In conjunction with the raising of the bridge height, a structure which withstands the effects of water flow will be adopted through anchoring of abutment slope protection of access road, etc.	By guaranteeing year-round use of the route, stabilization of public security and (medical) welfare in times of emergency, etc., can be anticipated
As there is no pedestrian walk on the bridge, safety problems arise as pedestrians, bicycles and automobiles must share the same lane.	Pedestrian walkway and vehicle traffic lane will be separated	By separating pedestrian traffic, safety is improved

The Study Team recognizes that this Project is appropriate as a grant aid project for the following reasons;

(1) Flow of traffic will be improved by replacement with permanent bridges which allow the passage of heavier vehicles
(2) The social environment of people whose lives are affected directly and indirectly by

National Route 13 will greatly improved if river crossing is made possible year-round and economic paralysis can be avoided.

(3) As this route also serves as the starting point of east-west National Routes 8, 9, and 10, and provincial routes 12 and 13A, it is hoped that its improved function will more effectively activate relations with Thailand and Viet Nam.

(4) While working to increase the effectiveness of two bridges now being planned by Japanese aid (First Mekong Bridge Project, or Pakxe Bridge Project; and Second Mekong Bridge Project in Kampong Cham, Cambodia), the project will also contribute to the development of Asia Highway Route 11 (Vientiane-Sihanoukville, Cambodia), and in turn to the economic and other international activities among countries of the region.

(5) The Project satisfies the requirement of the Japan's Grant Aid System.

4-2 Recommendation

It is concluded that the implementation of the project by Japanese grant aid system is evaluated as appropriate. The following are needed for each bridges in the project;

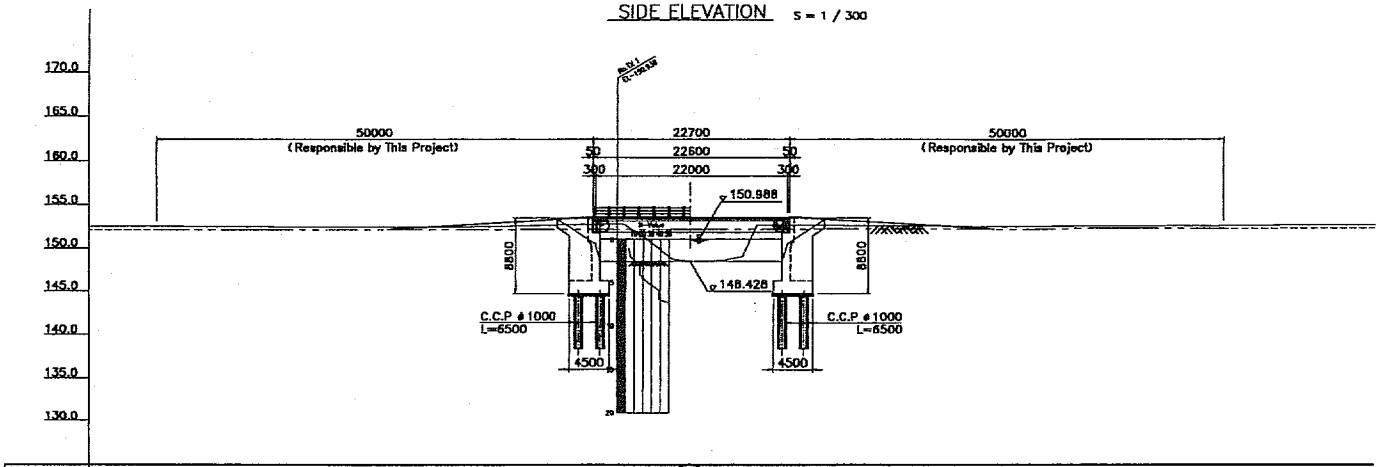
(1) The manufacturing yard or stockyard of concrete girders, heavy construction equipment, equipment storage yard. Besides these are also needed site offices at about four strategic locations, a common materials yard, and concrete plant. The procurement of the land space needed for the above is to be the responsibility of the Lao government and to verified before the beginning of construction.

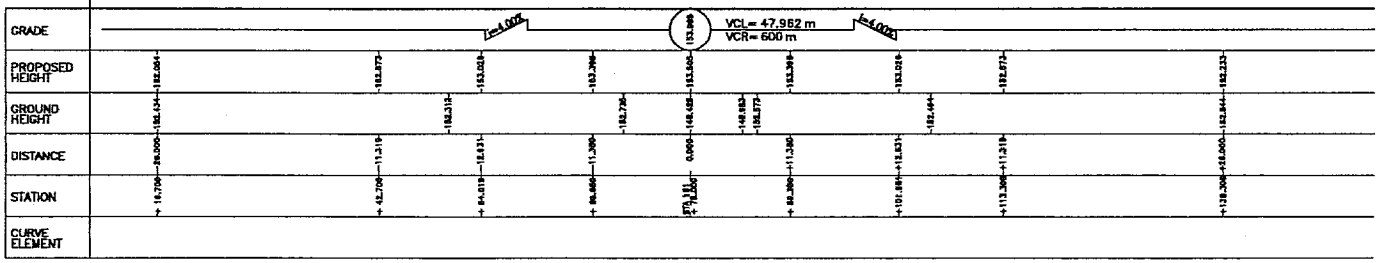
(2) temporary bridges or roads will be necessary for use as means of crossing the river between the time of removal of Bailey bridges and completion of replacement. Therefore, presently used Bailey bridges bust be kept maintained for future use as such.

Drawing

GENERAL VIEW
(TX No. 1)

SIDE ELEVATION S = 1 / 300





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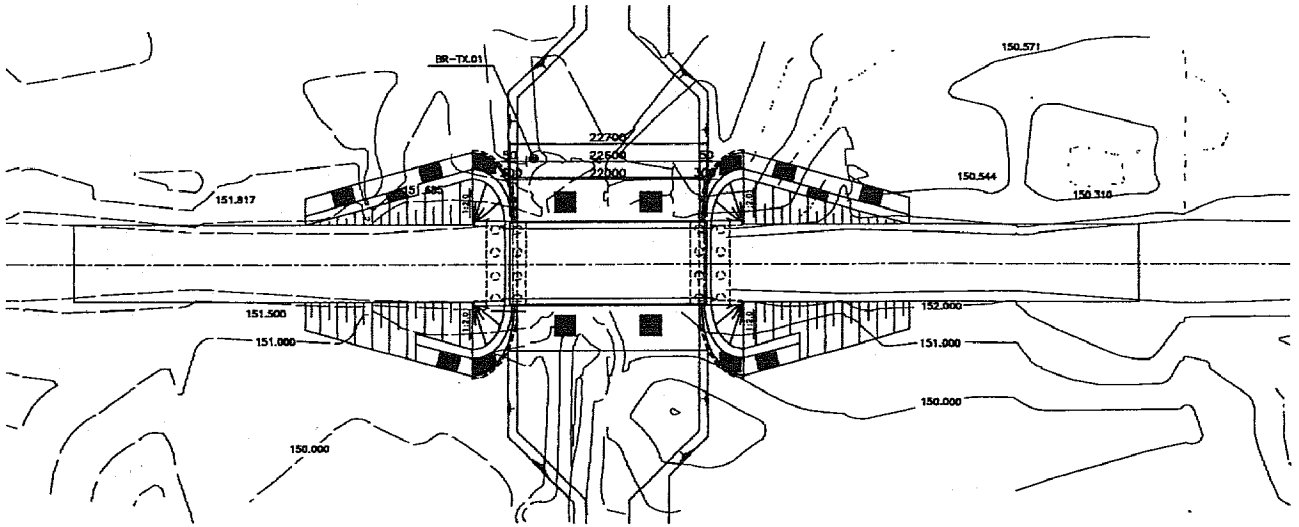
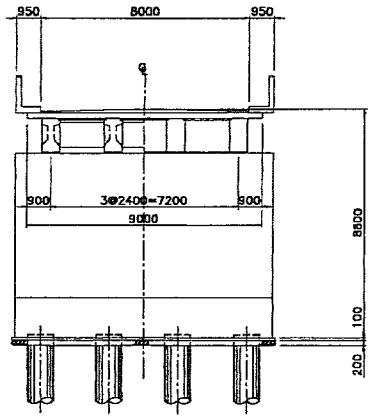


DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	22.700
GIRDER LENGTH	22.600
SPAN	22.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

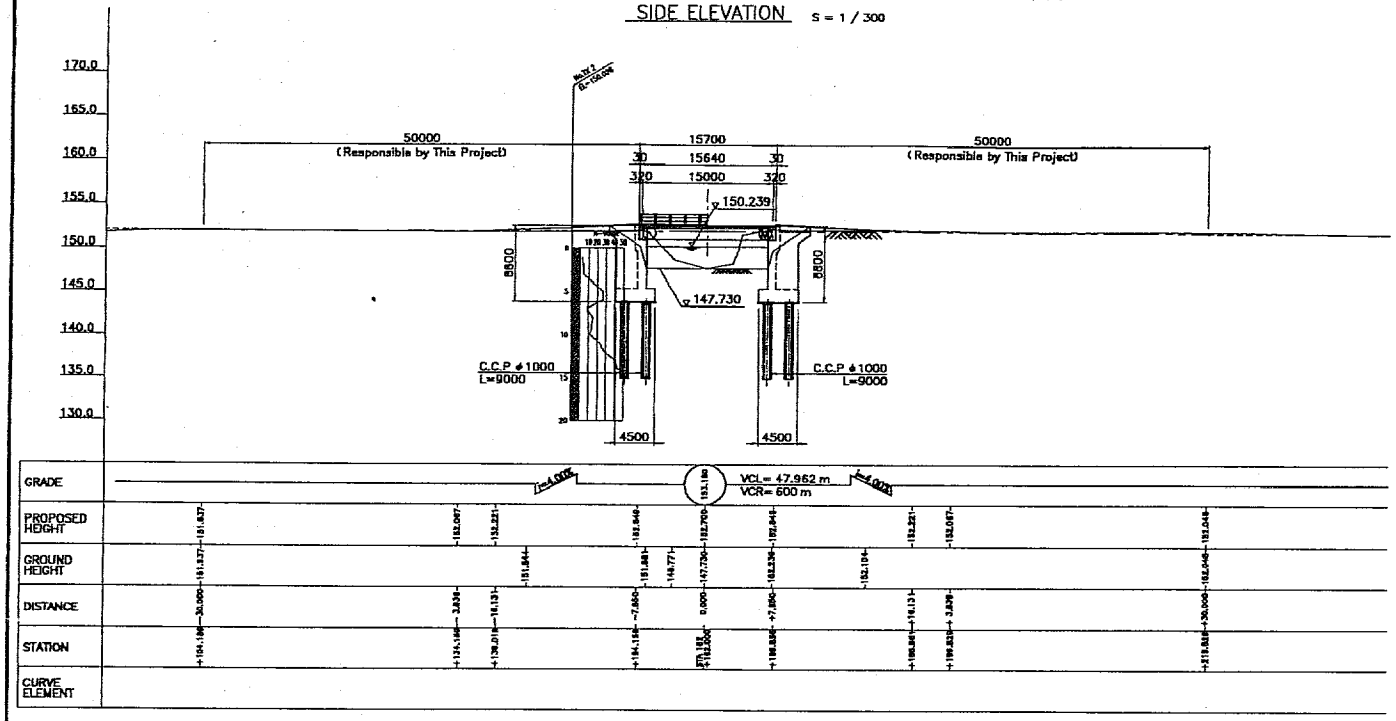
CROSS SECTION S = 1 / 100



LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE II			
Drawing Title	GENERAL VIEW (TXNo. 1)		
Scale	1 : 300	Drawing No.	1
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(TX No. 2)

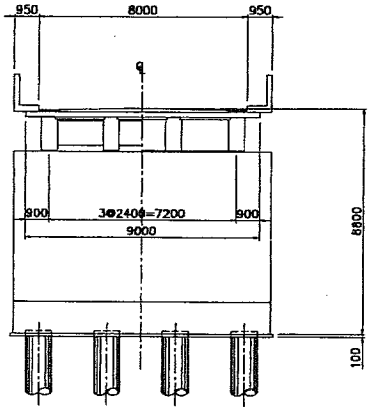
SIDE ELEVATION S = 1 / 300



DESIGN CONDITION

TYPE	RC 1 span I-girder bridge
BRIDGE LENGTH	15.700
GIRDER LENGTH	15.640
SPAN	15.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



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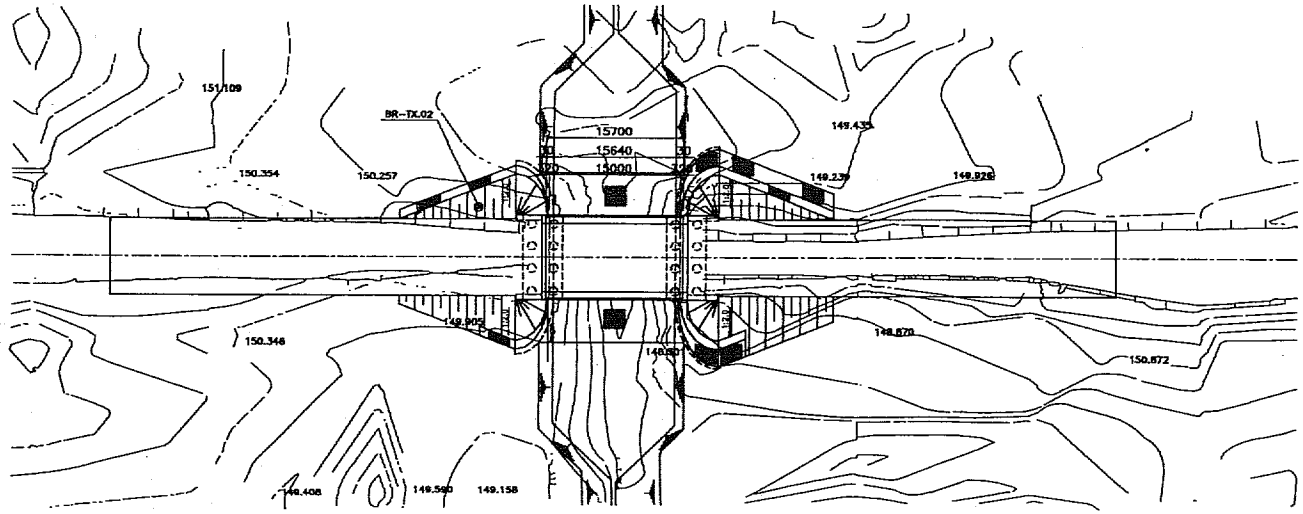
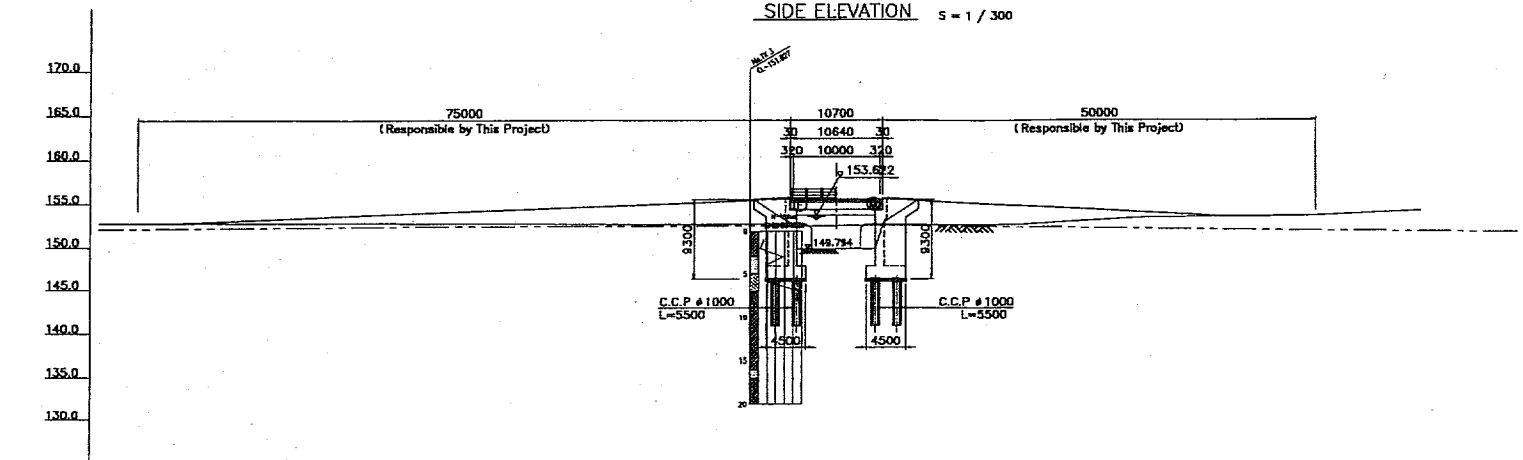
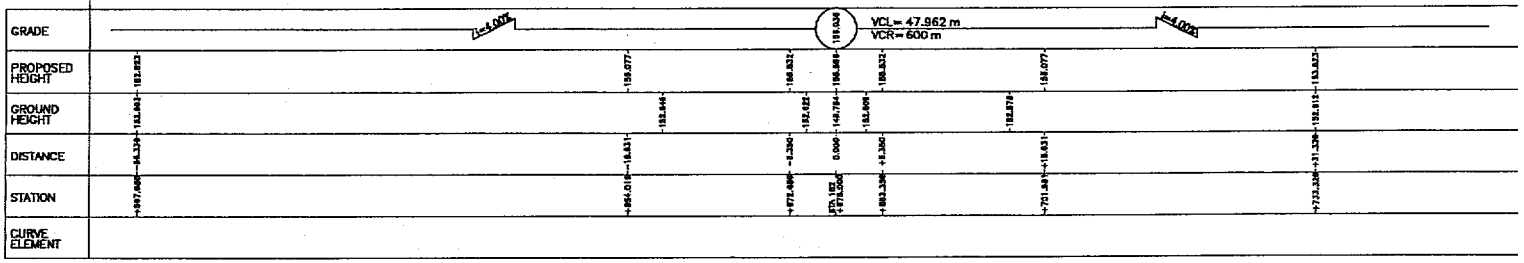


LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE I			
Drawing Title	GENERAL VIEW (TX No. 2)		
Scale	1 : 300	Drawing No.	2
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(TX No. 3)

SIDE ELEVATION S = 1 / 300

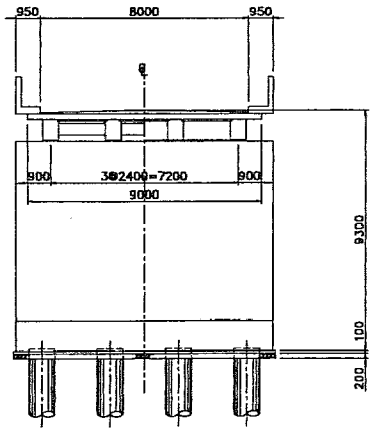




DESIGN CONDITION

TYPE	RC 1 span I-girder bridge
BRIDGE LENGTH	10.700
GIRDER LENGTH	10.640
SPAN	10.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



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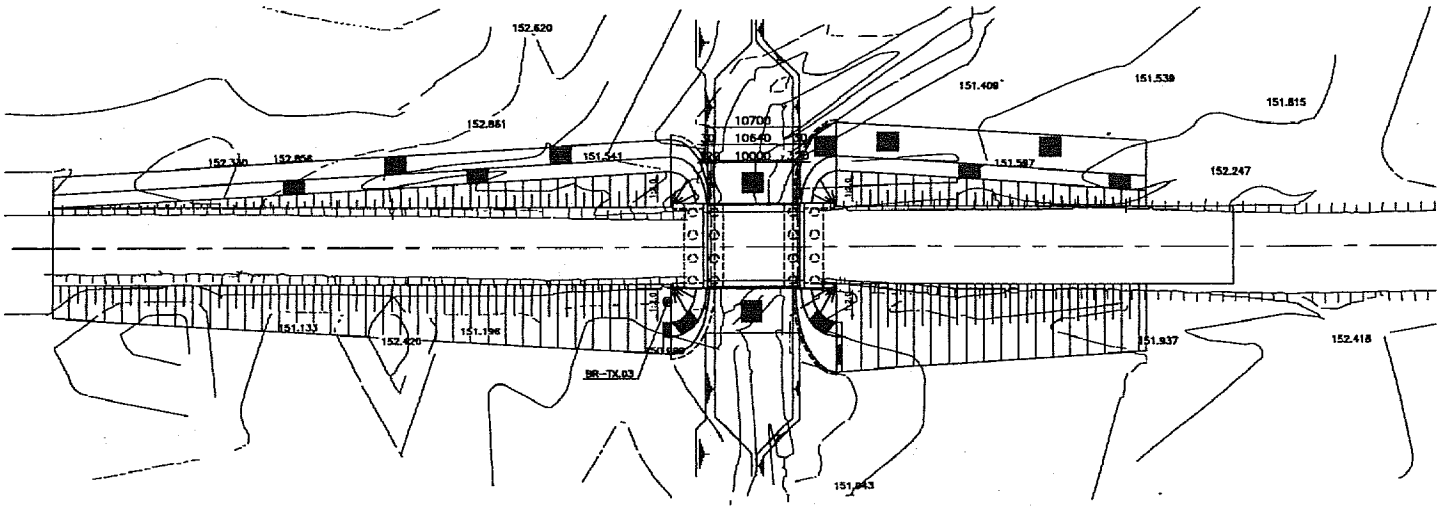
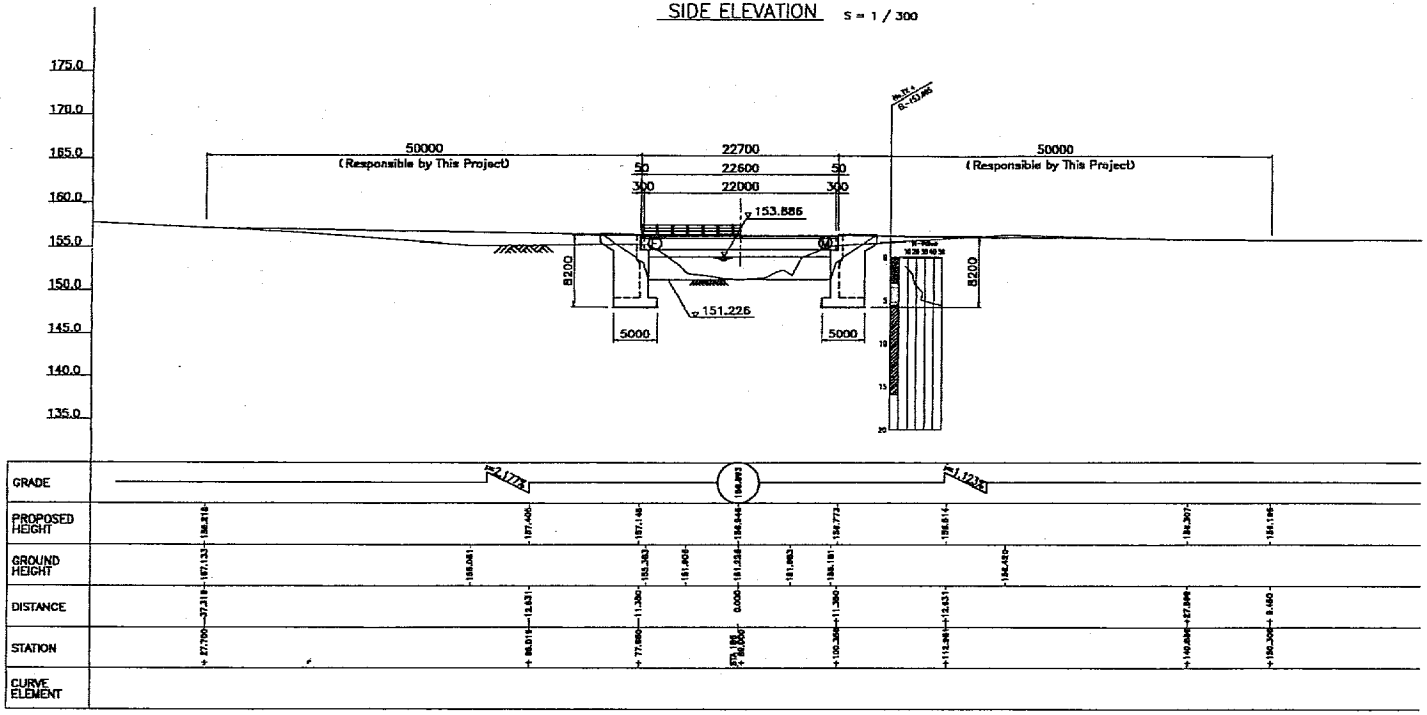


LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE II			
Drawing Title	GENERAL VIEW (TXNo. 3)		
Scale	1 : 300	Drawing No.	3
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(TX No. 4)

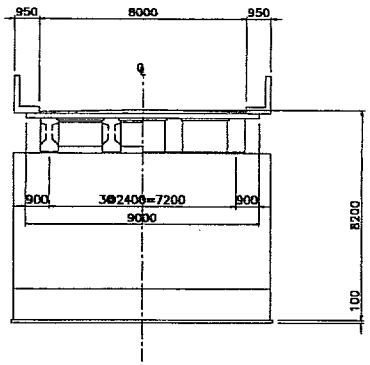
SIDE ELEVATION S = 1 / 300



DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	22.700
GIRDER LENGTH	22.600
SPAN	22.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



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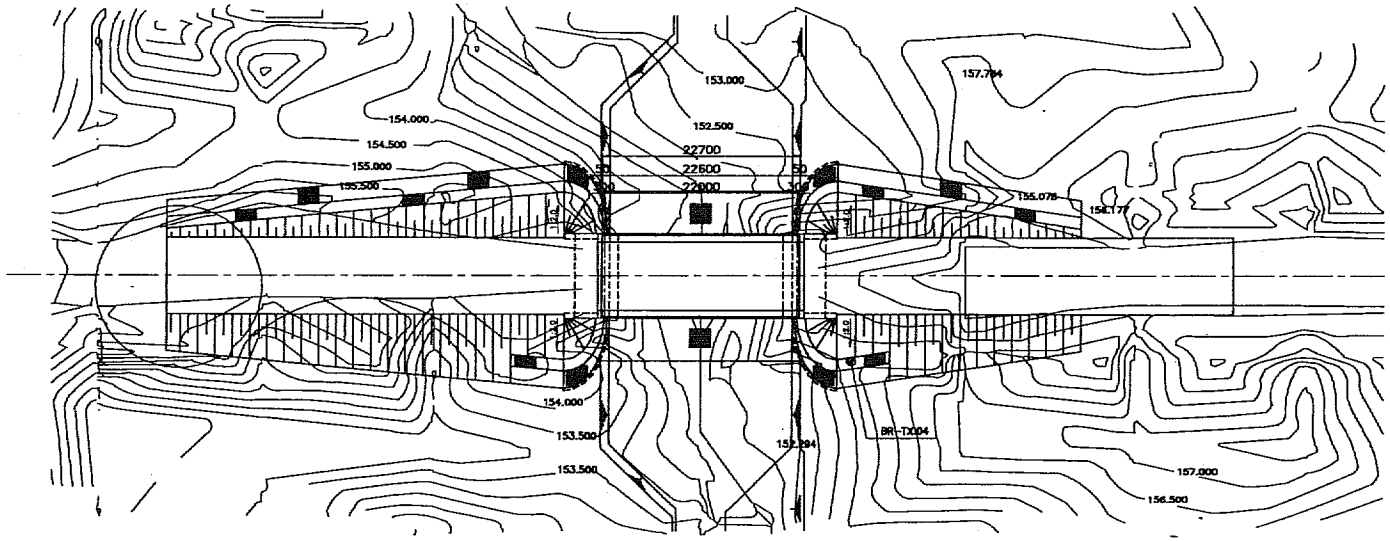
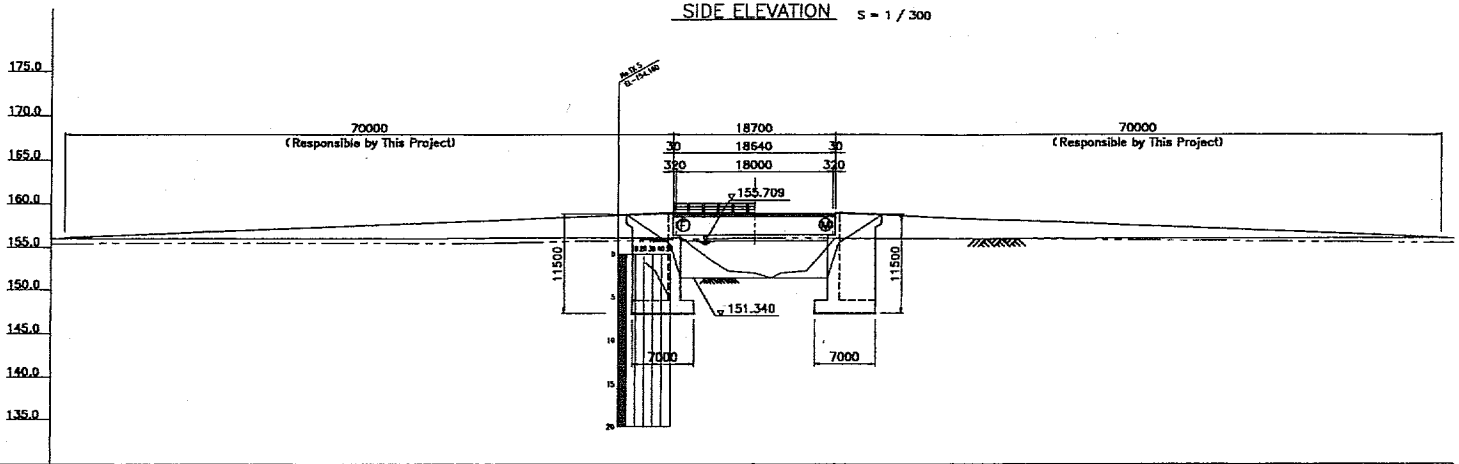
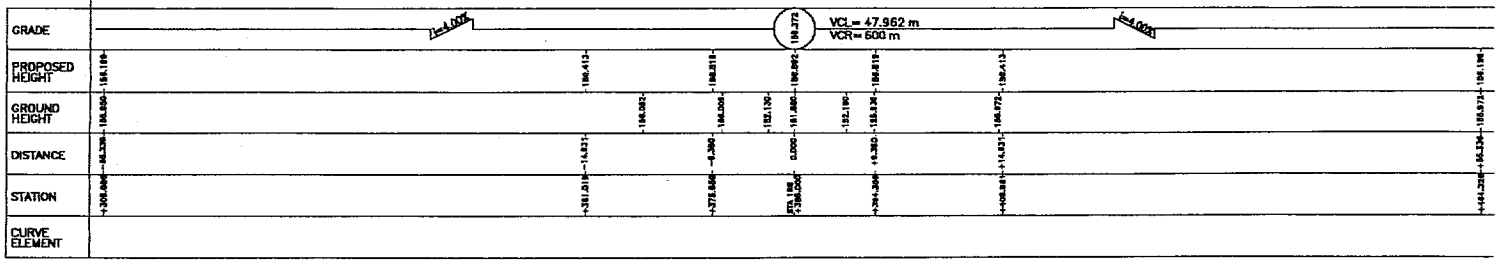


LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE 2			
Drawing Title	GENERAL VIEW (TX No. 4)		
Scale	1 : 300	Drawing No.	4
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(TX No. 5)

SIDE ELEVATION S = 1 / 300





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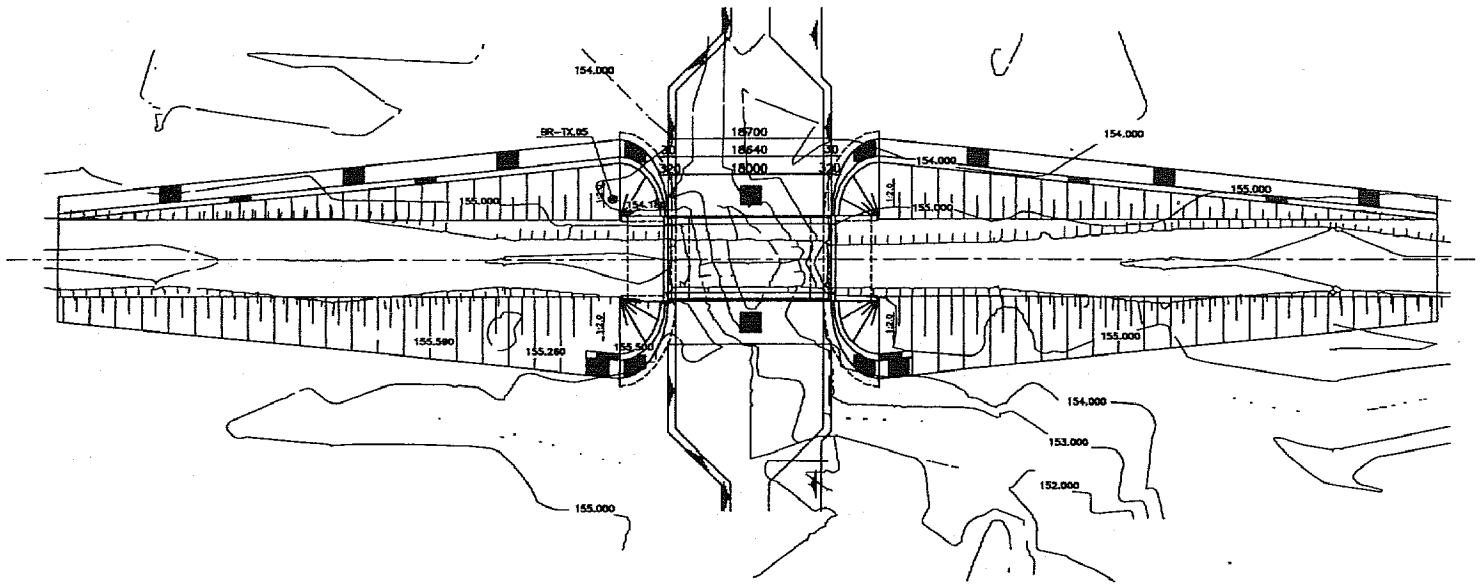
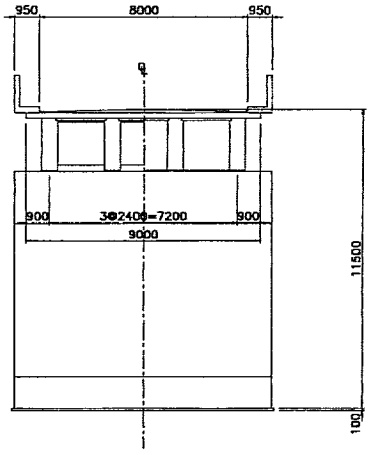


DESIGN CONDITION

TYPE	RC 1 span I-girder bridge
BRIDGE LENGTH	18.700
GIRDER LENGTH	18.640
SPAN	18.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE II			
Drawing Title	GENERAL VIEW (TXNo. 5)		
Scale	1 : 300	Drawing No.	5
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(TX No. 6)

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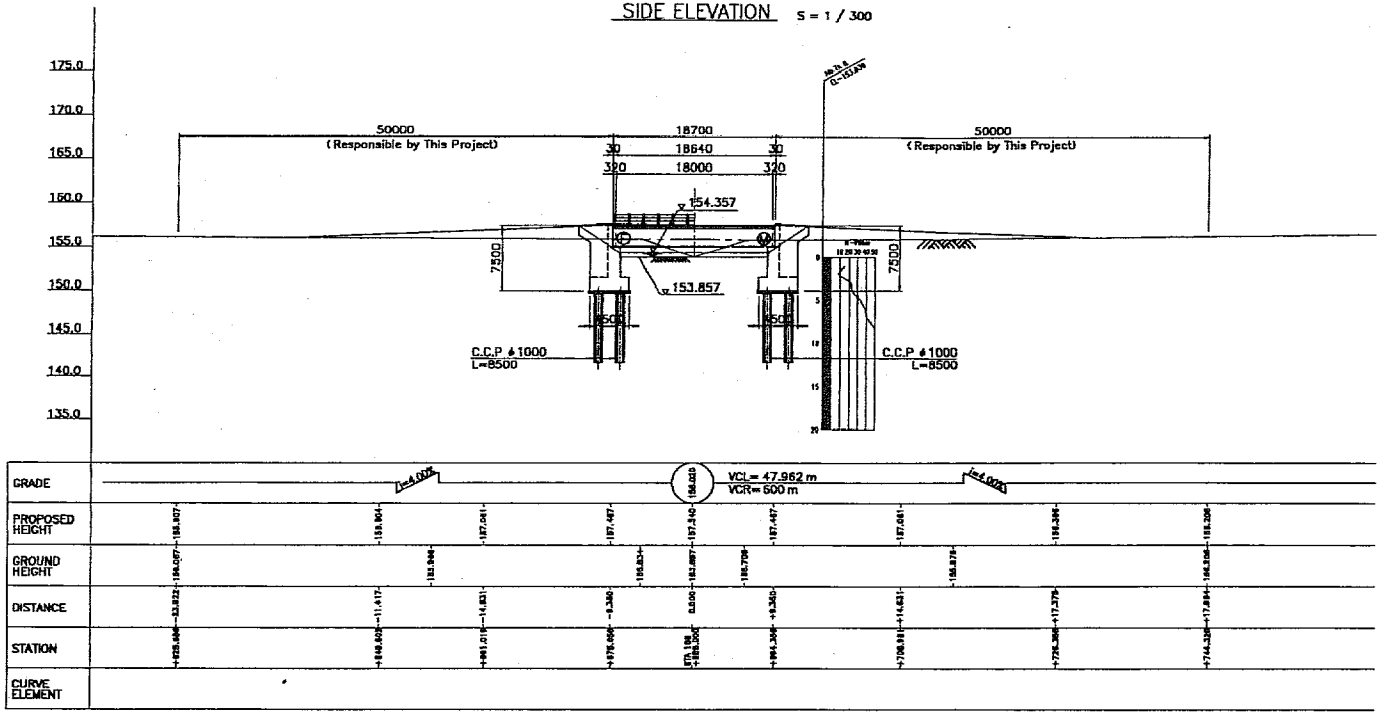
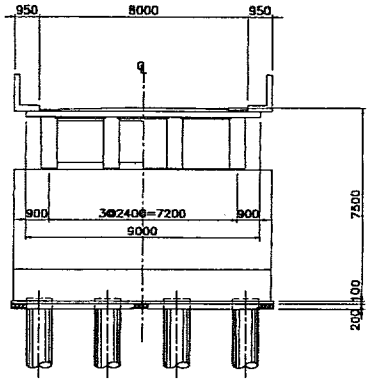


DESIGN CONDITION

TYPE	RC 1 span I-girder bridge
BRIDGE LENGTH	18.700
GIRDER LENGTH	18.640
SPAN	18.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



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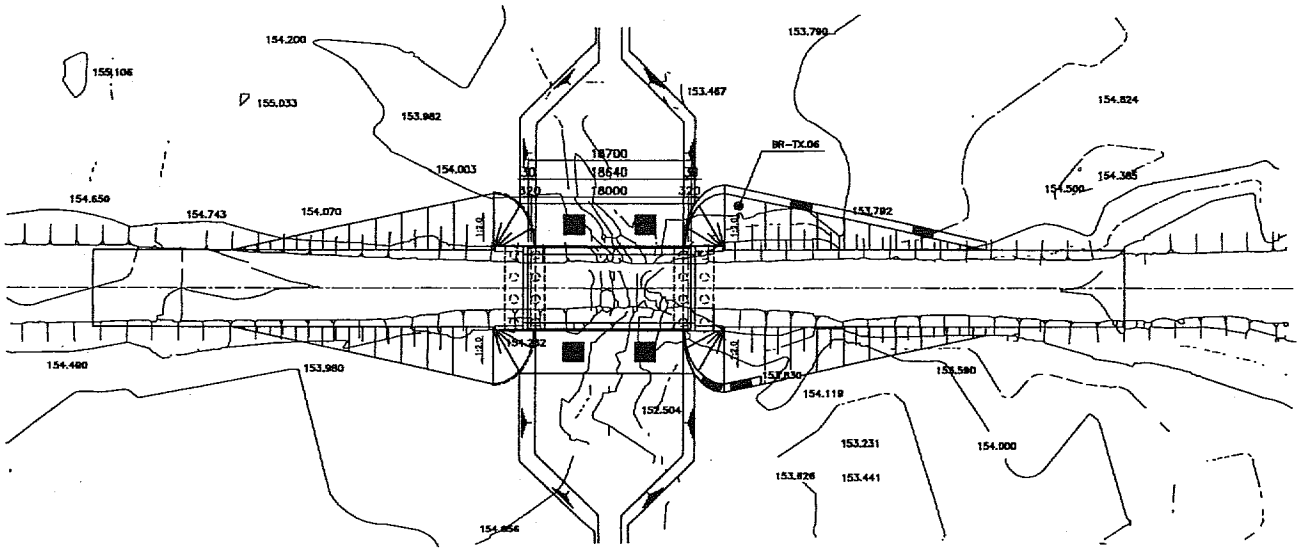
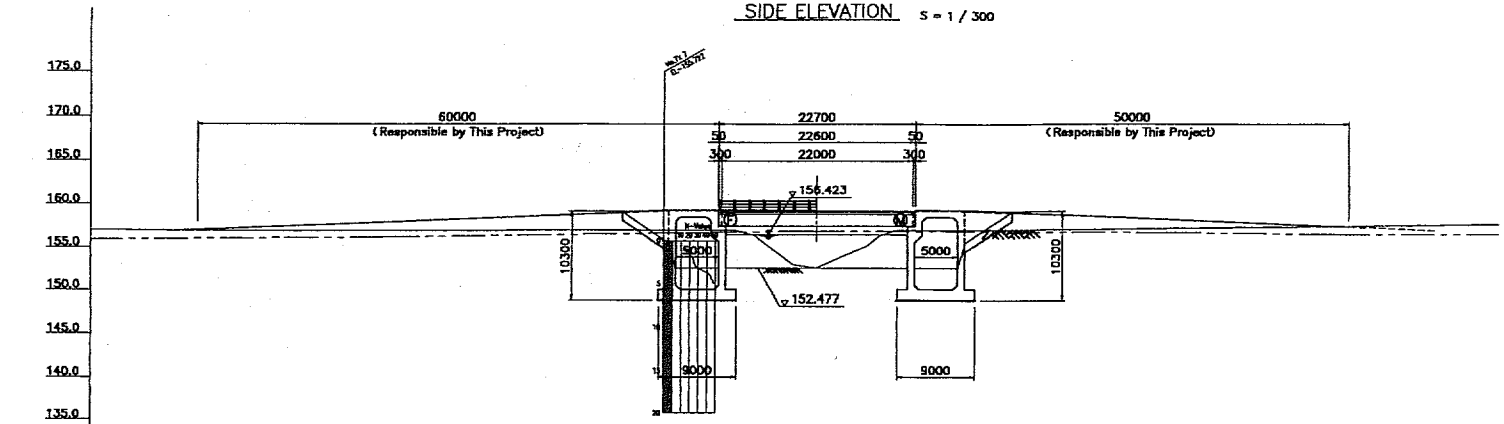
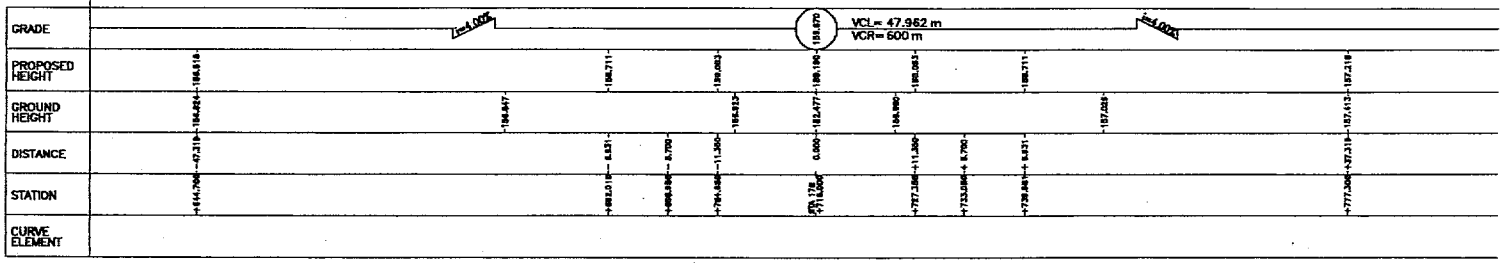


LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE II			
Drawing Title	GENERAL VIEW (TXNo. 6)		
Scale	1 : 300	Drawing No.	6
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(TX No. 7)

SIDE ELEVATION S = 1 / 300

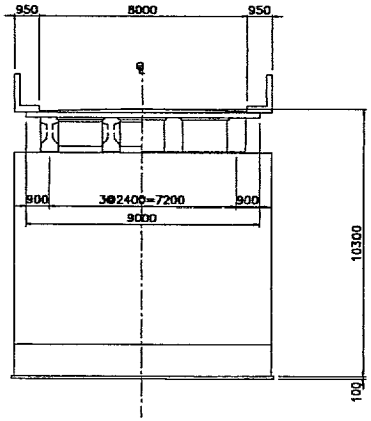




DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	22.700
GIRDER LENGTH	22.600
SPAN	22.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



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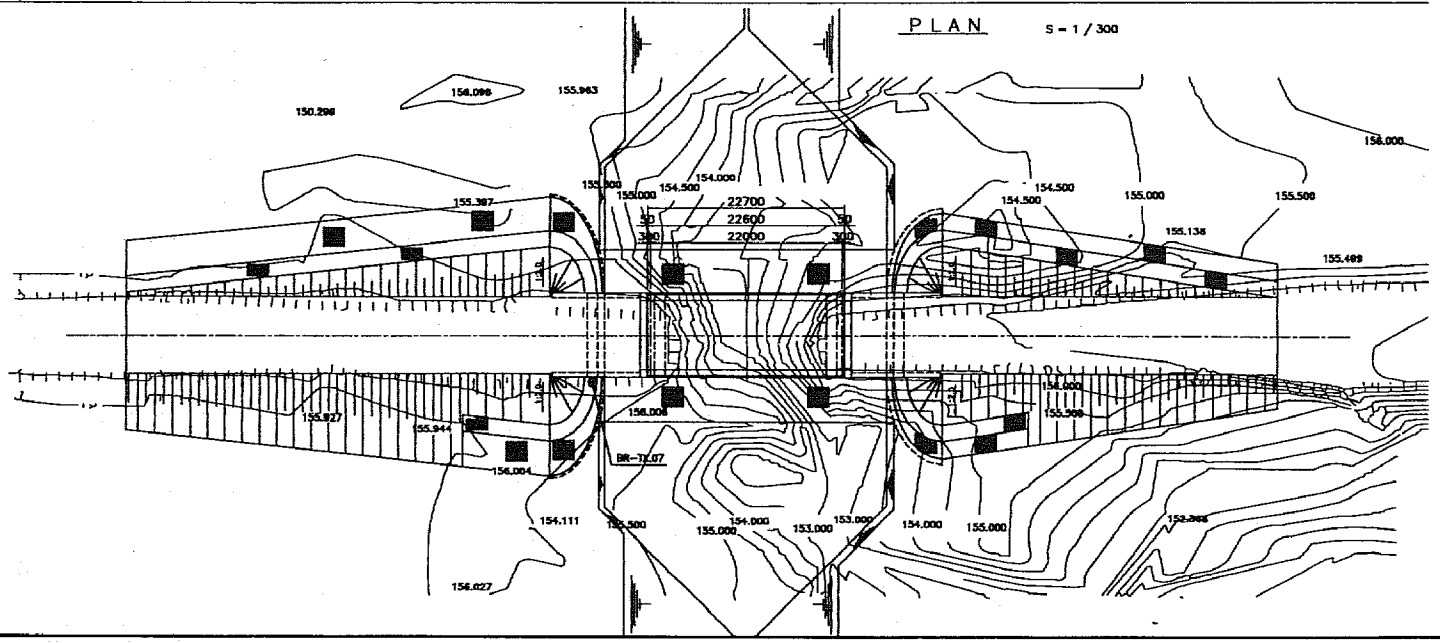

LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE I			
Drawing Title	GENERAL VIEW (TXNo. 7)		
Scale	1 : 300	Drawing No.	7
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(TX No. 8)

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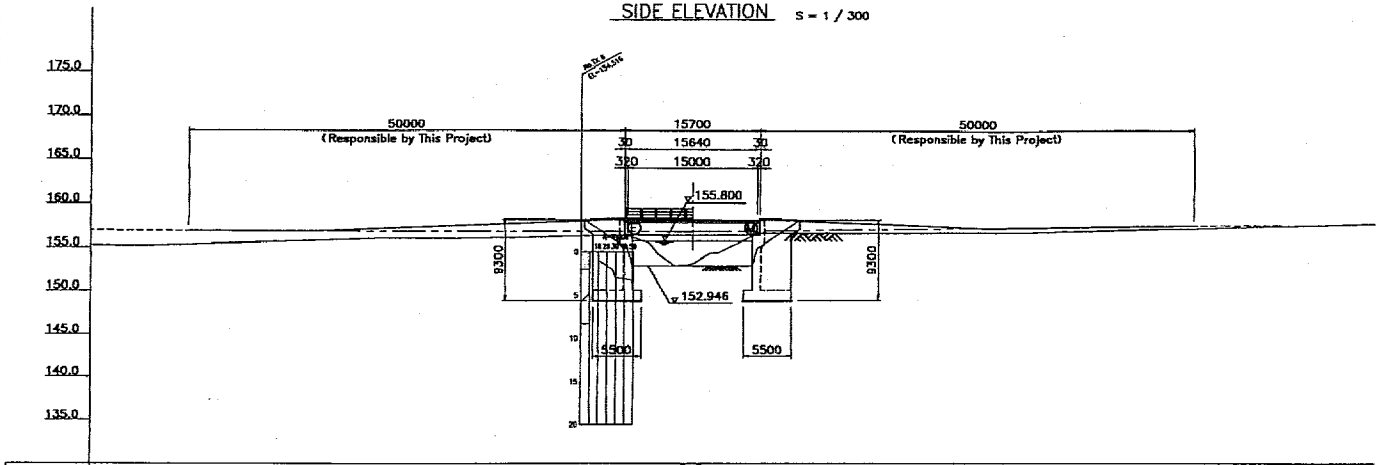

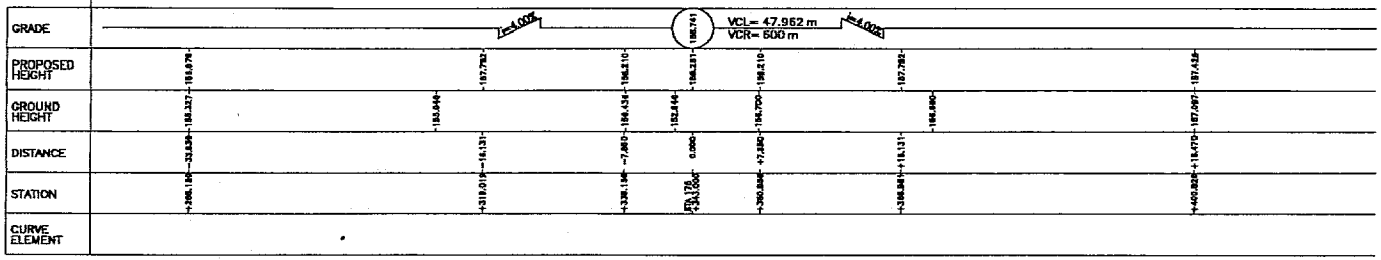

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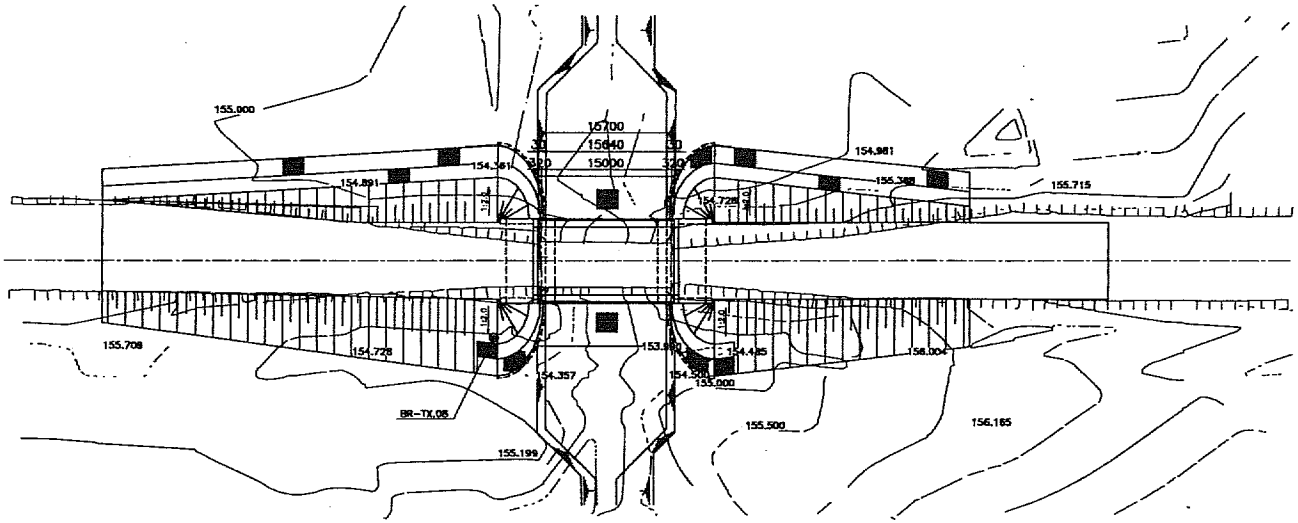
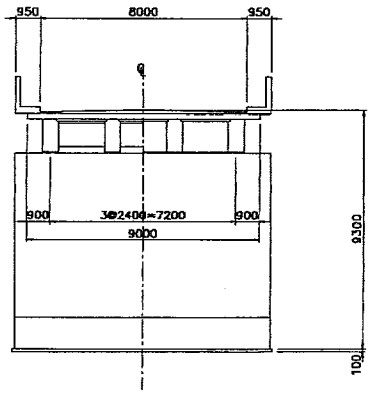


DESIGN CONDITION

TYPE	RC 1 span I-girder bridge
BRIDGE LENGTH	15.700
GIRDER LENGTH	15.640
SPAN	15.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

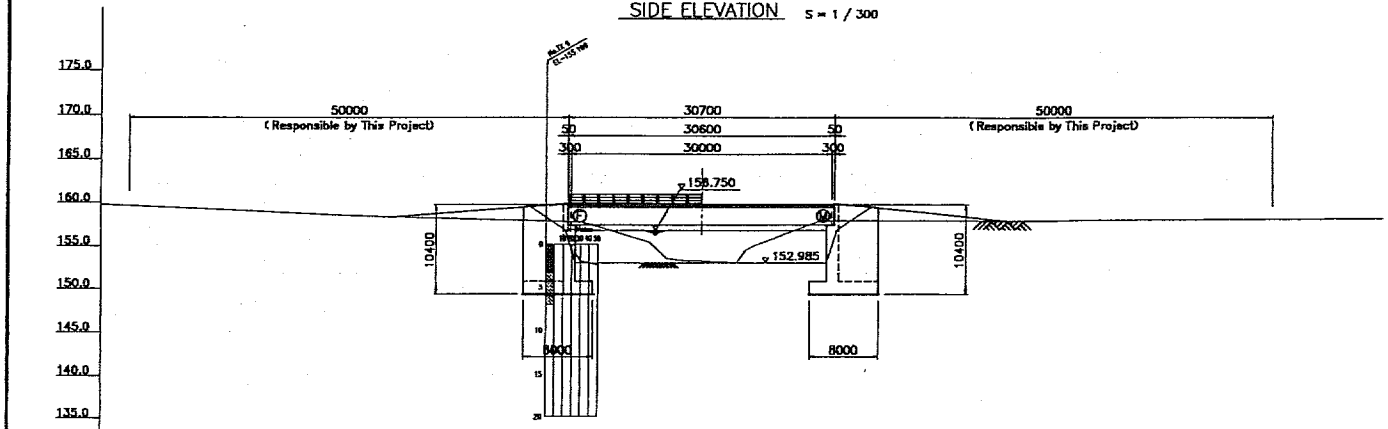
CROSS SECTION S = 1 / 100

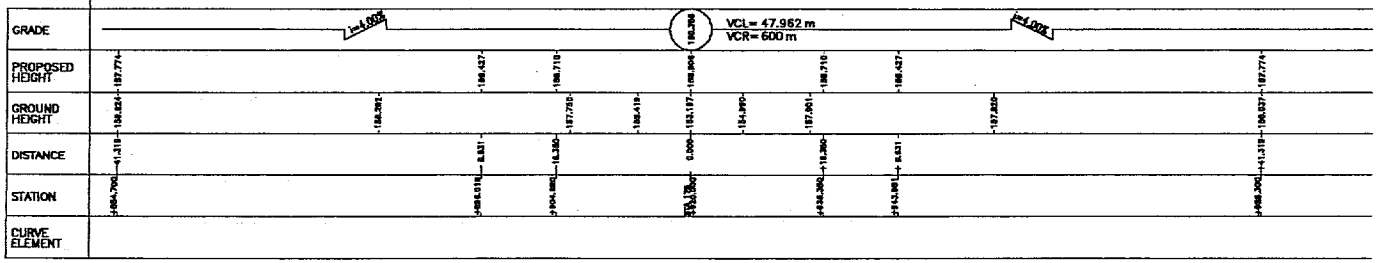


LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE I			
Drawing Title	GENERAL VIEW (TX No. 8)		
Scale	1 : 300	Drawing No.	8
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(TX No. 9)

SIDE ELEVATION S = 1 / 300

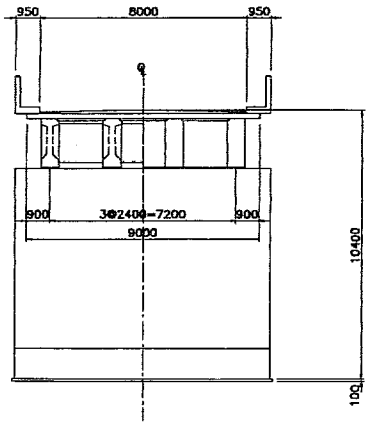




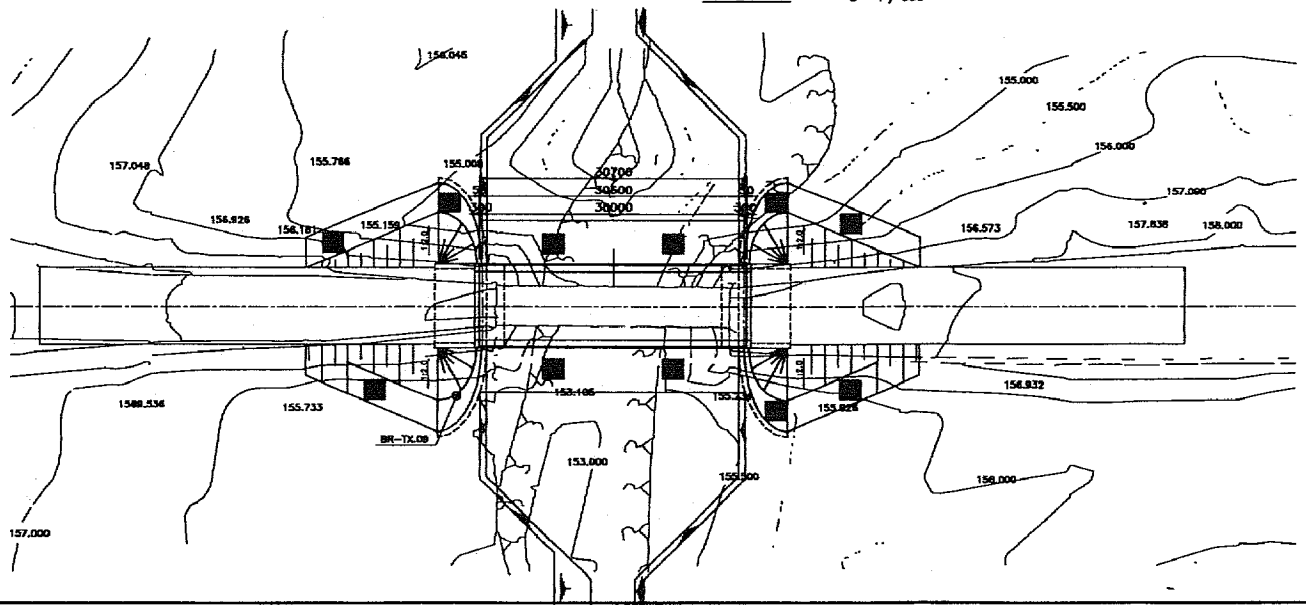
DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	30.700
GIRDER LENGTH	30.600
SPAN	30.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



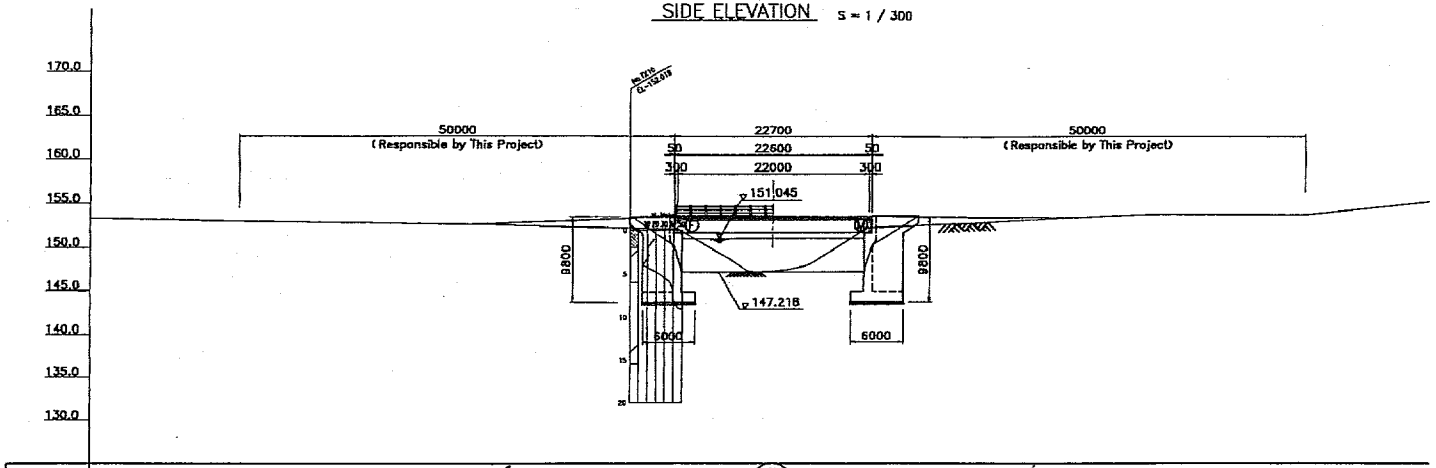
PLAN S = 1 / 300

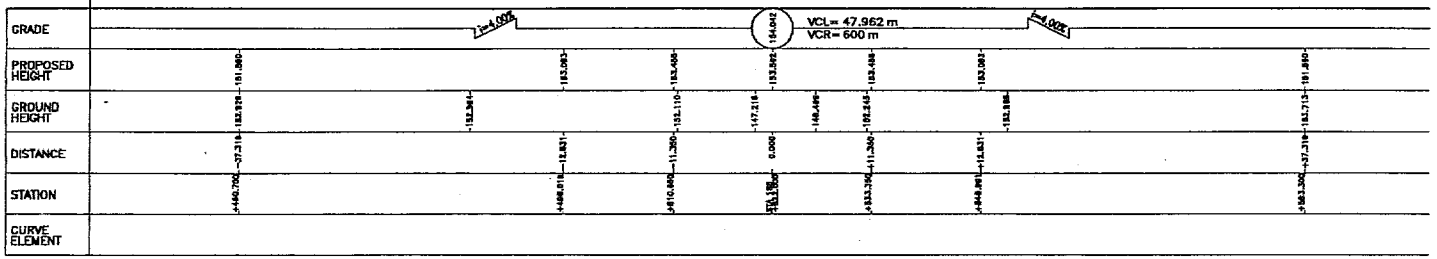


LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE I			
Drawing Title	GENERAL VIEW (TX No. 9)		
Scale	1 : 200	Drawing No.	9
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(TX No. 10)

SIDE ELEVATION S = 1 / 300

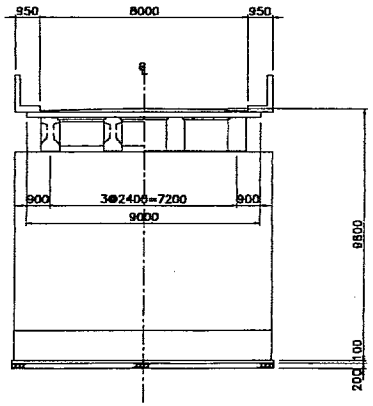




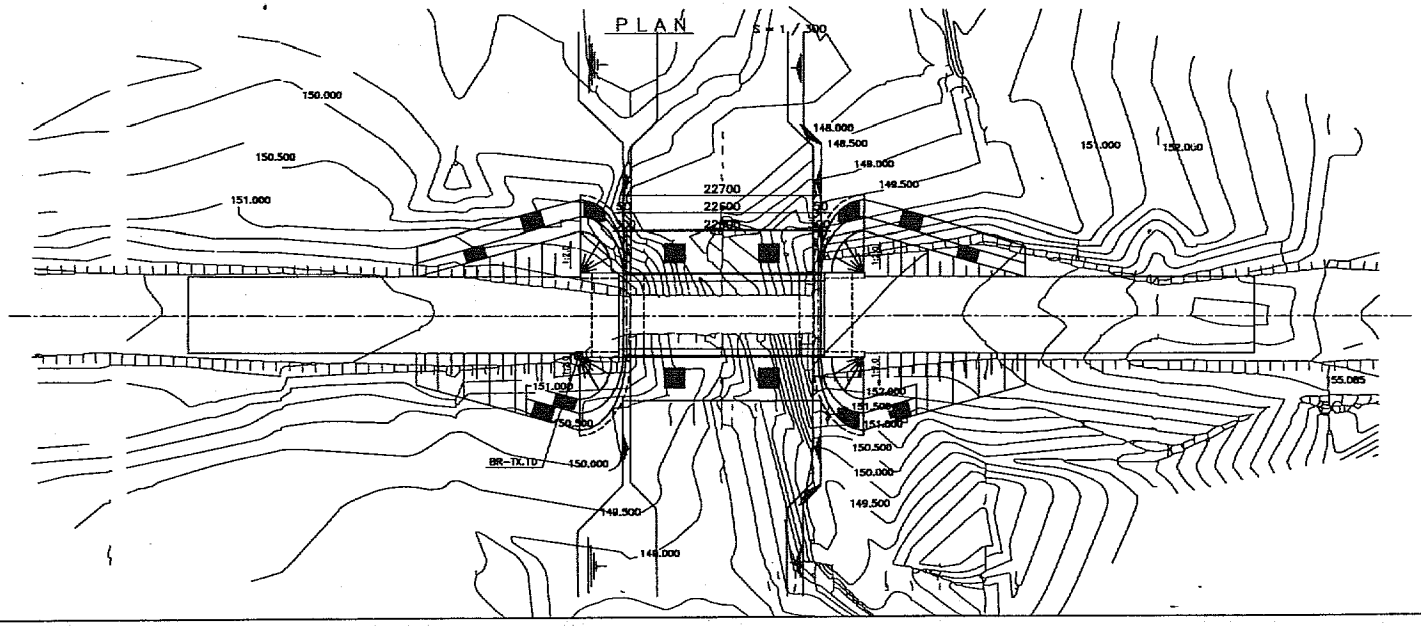
DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	22.700
GIRDER LENGTH	22.600
SPAN	22.000
WIDTH	8.000
LIVE LOAD	Type B five load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



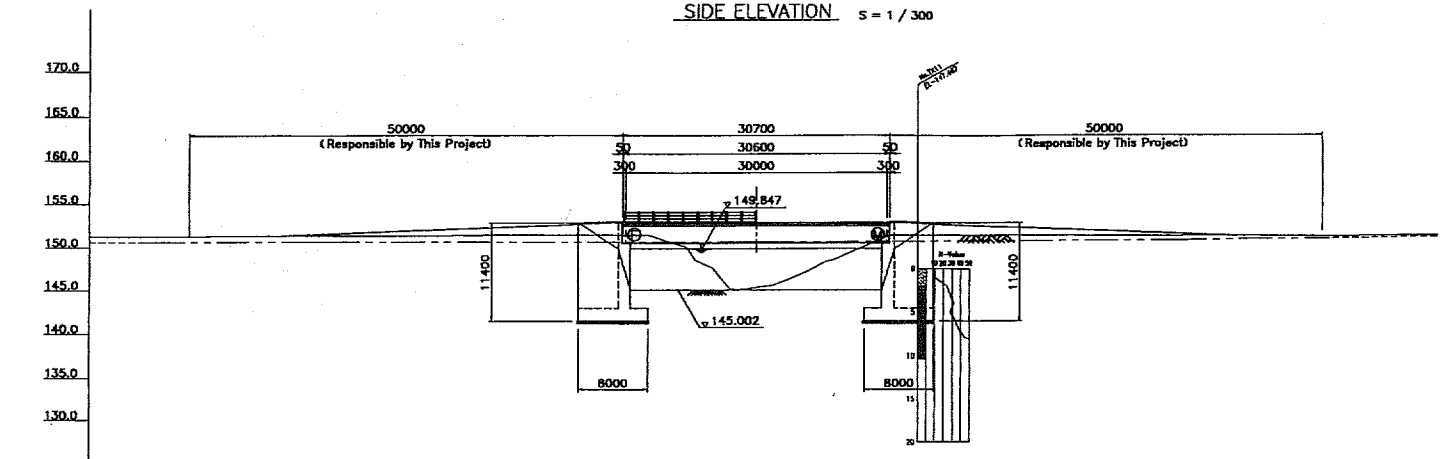
PLAN S = 1 / 300

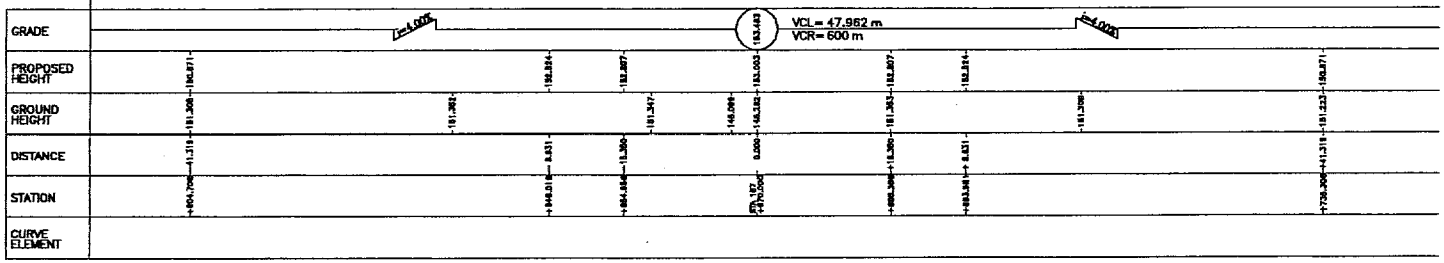


LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE II			
Drawing Title	GENERAL VIEW (TXNo. 10)		
Scale	1 : 300	Drawing No.	10
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(TX No. 11)

SIDE ELEVATION S = 1 / 300

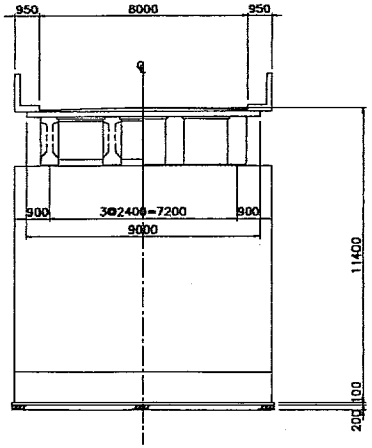




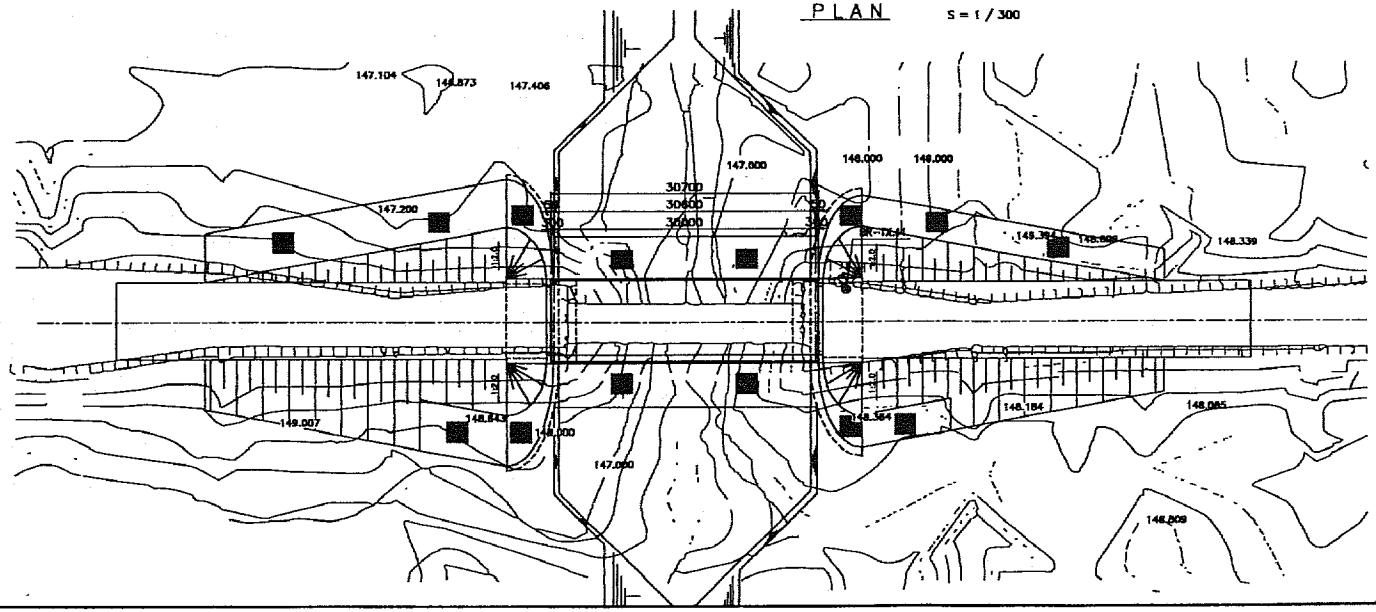
DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	30.700
GIRDER LENGTH	30.600
SPAN	30.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



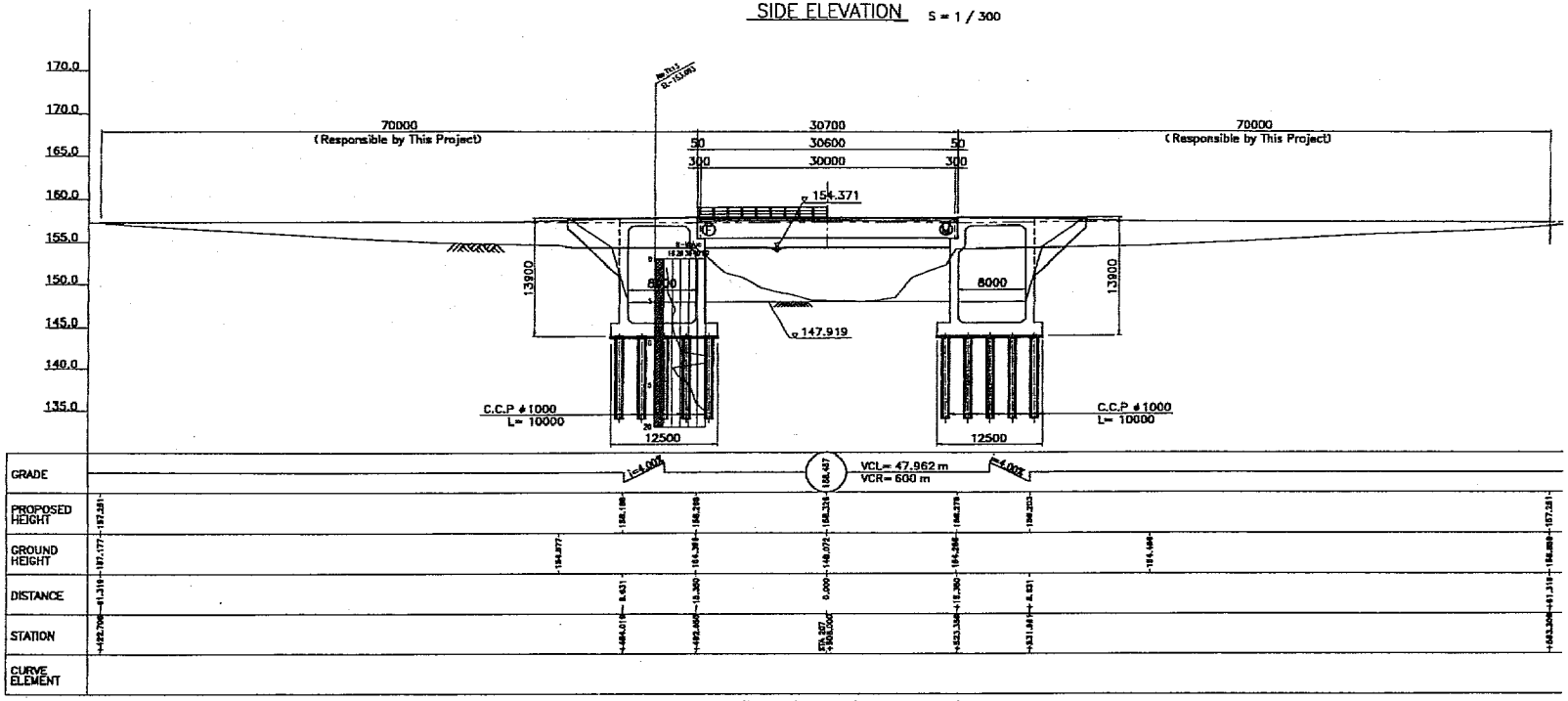
PLAN S = 1 / 300



LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE II			
Drawing Title	GENERAL VIEW (TX No. 11)		
Scale	1 : 300	Drawing No.	11
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(TX No. 13)

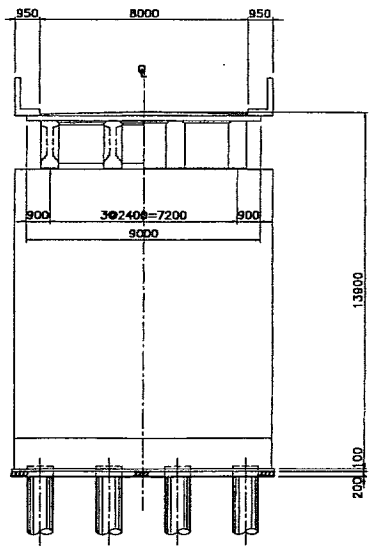
SIDE ELEVATION S = 1 / 300



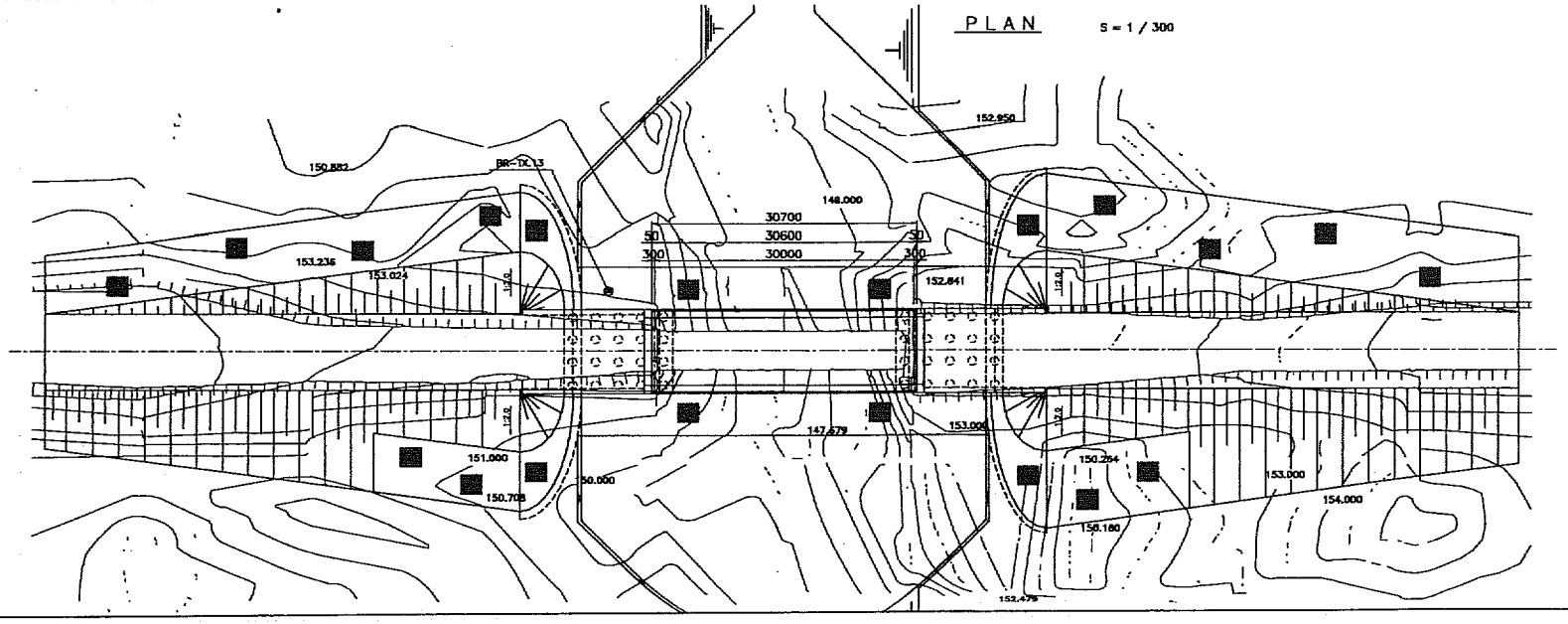
DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	30.700
GIRDER LENGTH	30.600
SPAN	30.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



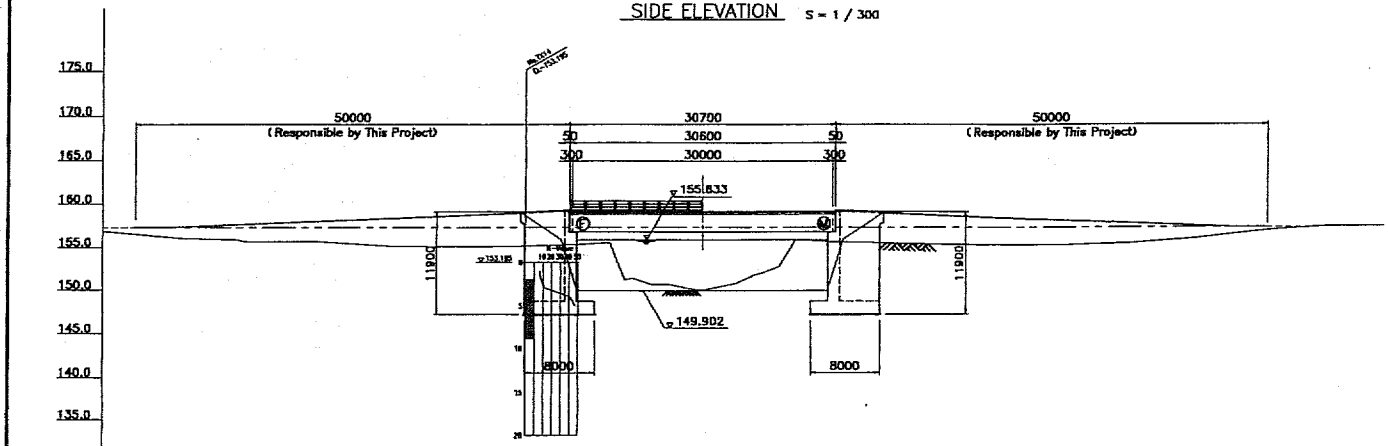
PLAN S = 1 / 300

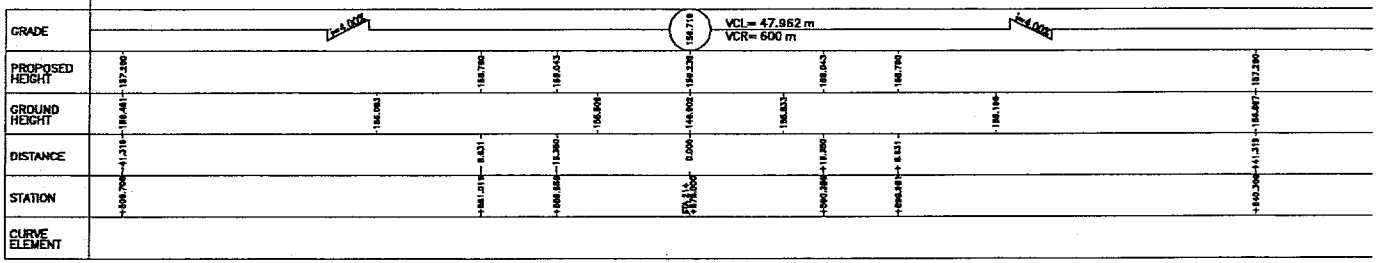


LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE I			
Drawing Title	GENERAL VIEW (TX No. 13)		
Scale	1 : 300	Drawing No.	12
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

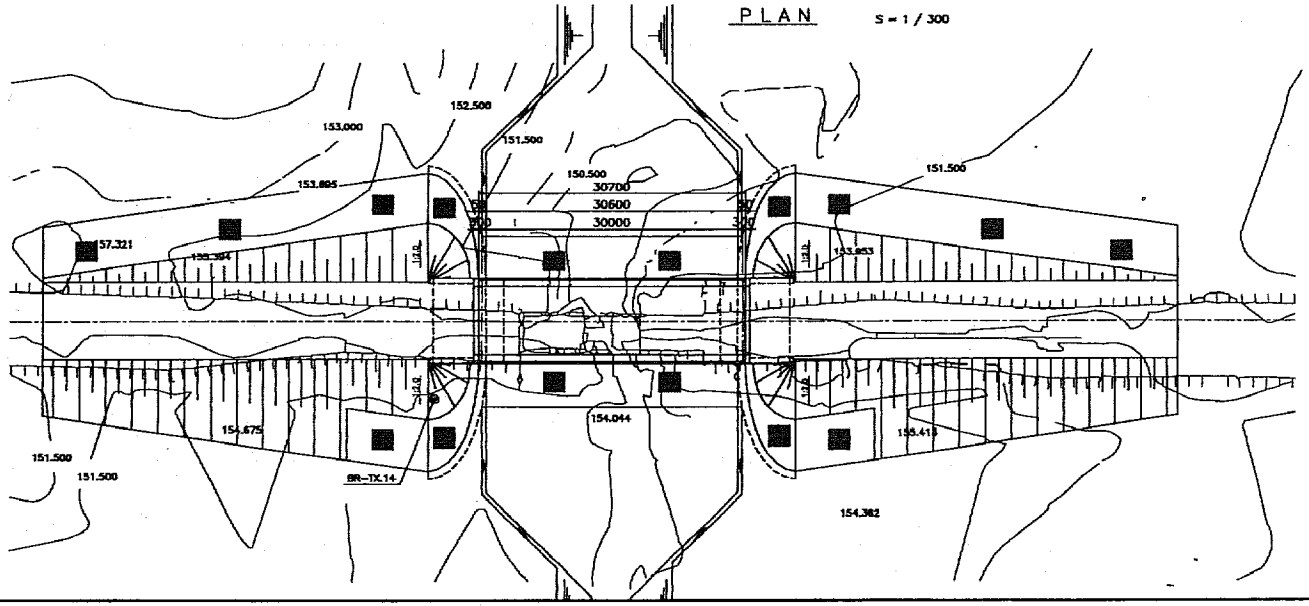
GENERAL VIEW
(TX No. 14)

SIDE ELEVATION S = 1 / 300





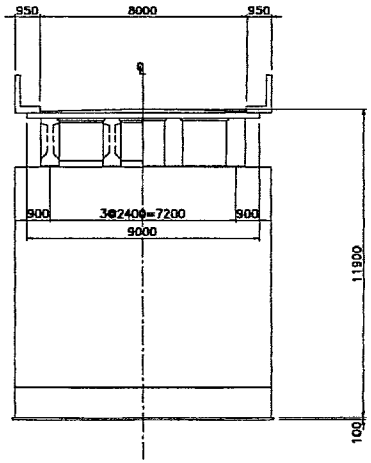
PLAN S = 1 / 300



DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	30.700
GIRDER LENGTH	30.600
SPAN	30.000
WIDTH	8.000
LIVE LOAD	Type B five load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

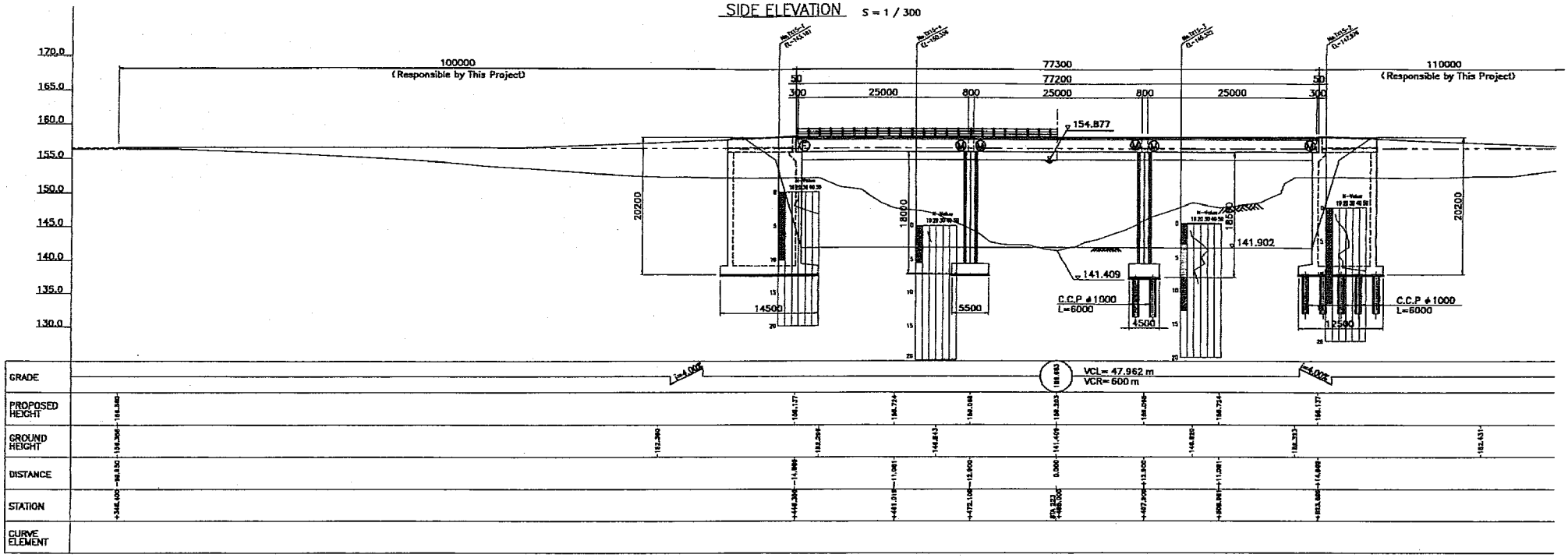
CROSS SECTION S = 1 / 100



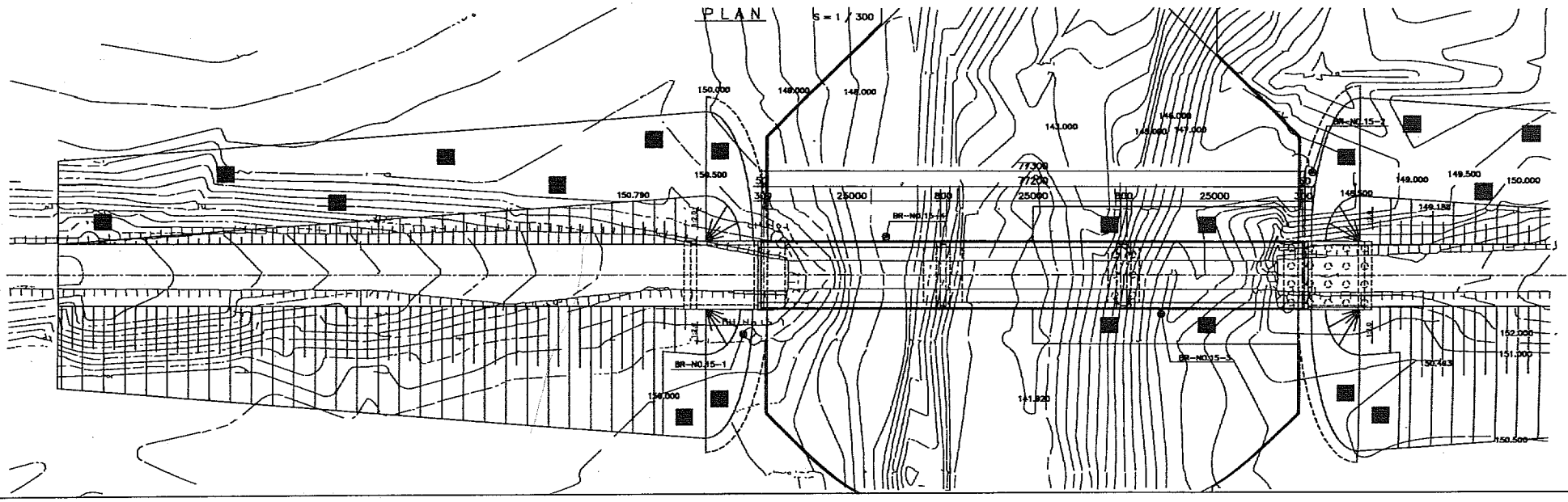
LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE II			
Drawing Title	GENERAL VIEW (TXNo. 14)		
Scale	1 : 300	Drawing No.	13
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(TX No. 15 (1))

SIDE ELEVATION S = 1 / 300

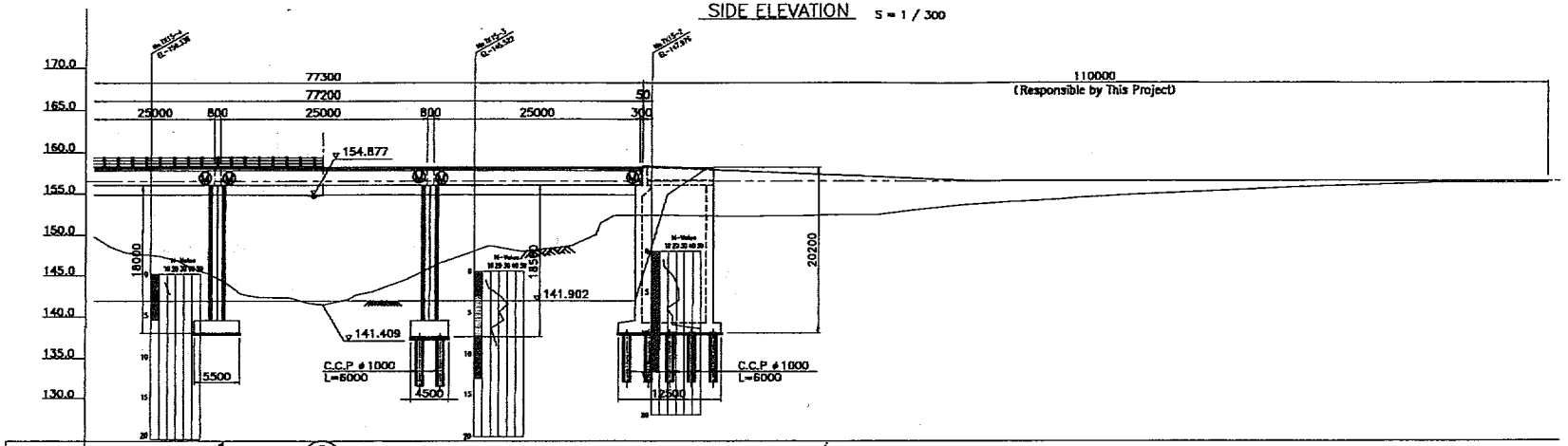


PLAN S = 1 / 300



GENERAL VIEW
(TX No. 15(2))

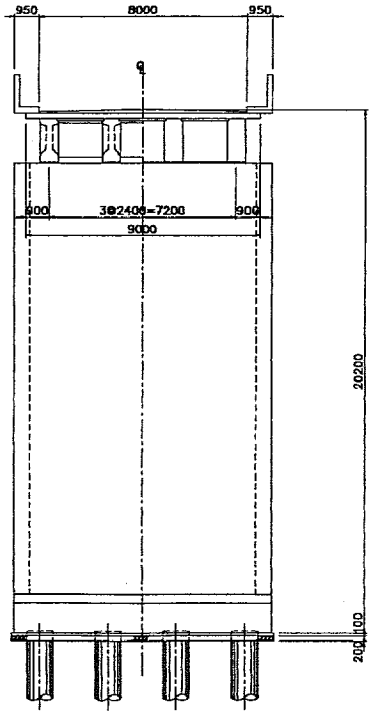
SIDE ELEVATION S = 1 / 300



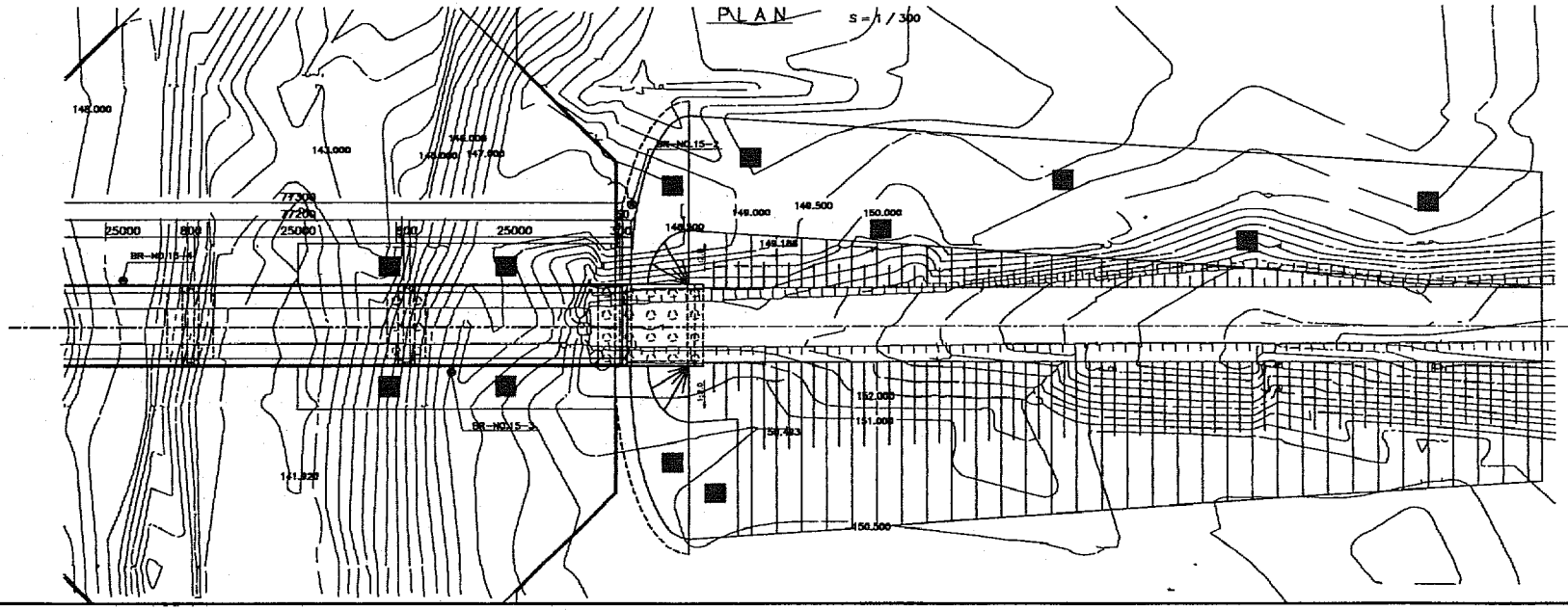
DESIGN CONDITION

TYPE	PC 3 span articulated I-girder bridge
BRIDGE LENGTH	77.300
GIRDER LENGTH	77.200
SPAN	25.000 + 25.000 + 25.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



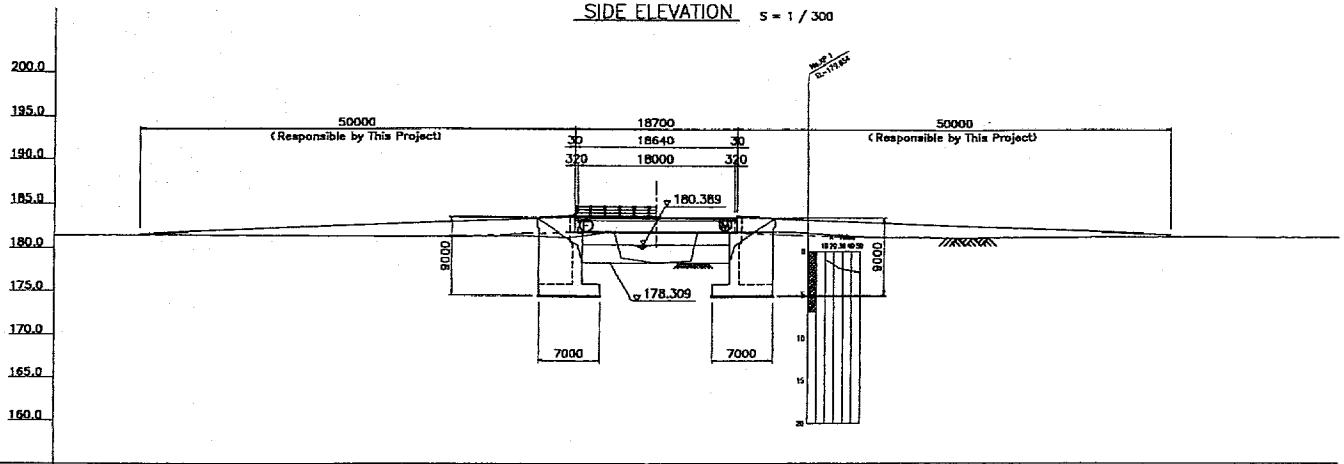
PLAN S = 1 / 300

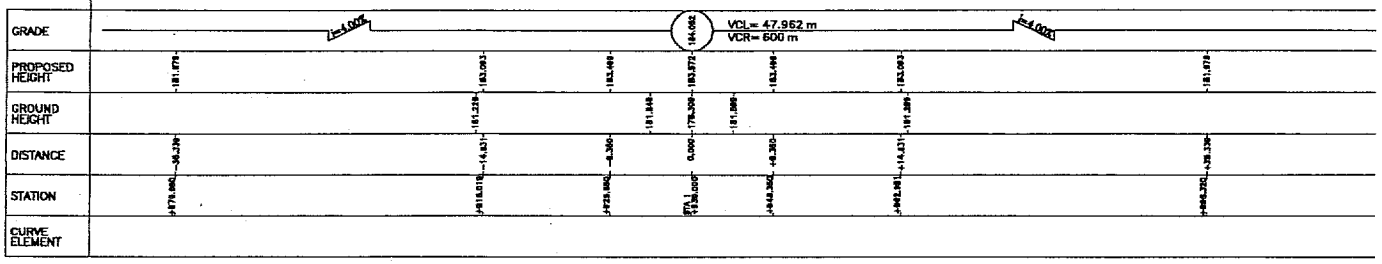


LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE II			
Drawing Title	GENERAL VIEW (TX No. 15)		
Scale	1 : 300	Drawing No.	14
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

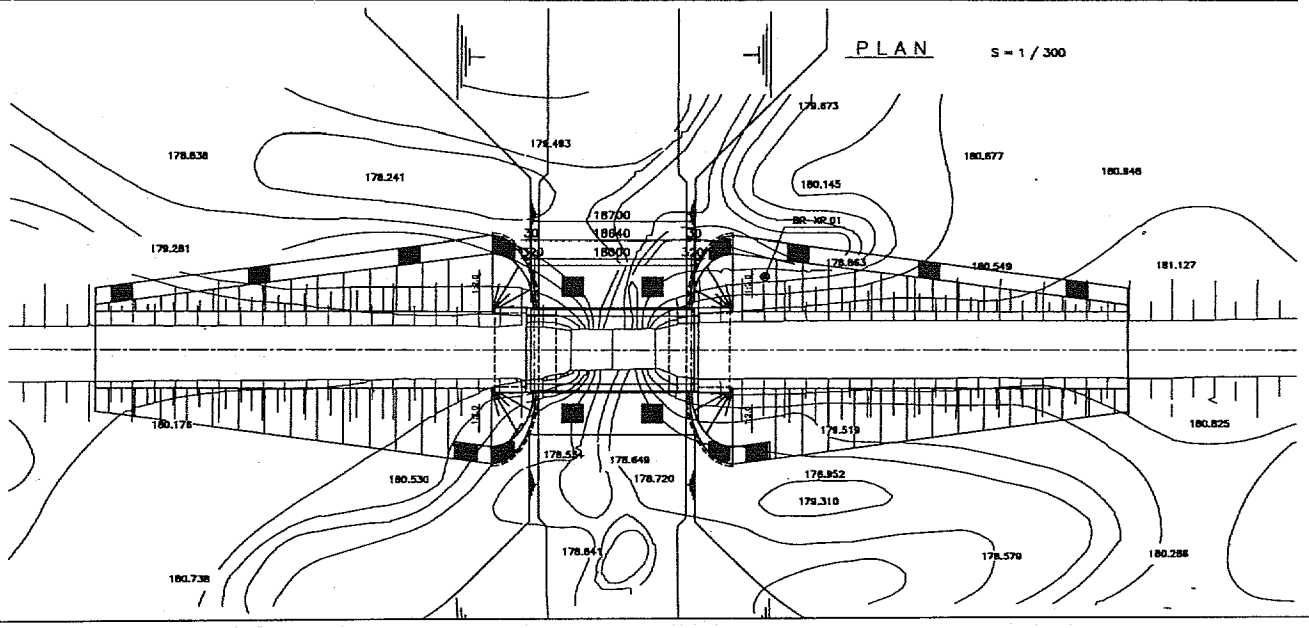
GENERAL VIEW
(XPNo. 1)

SIDE ELEVATION S = 1 / 300





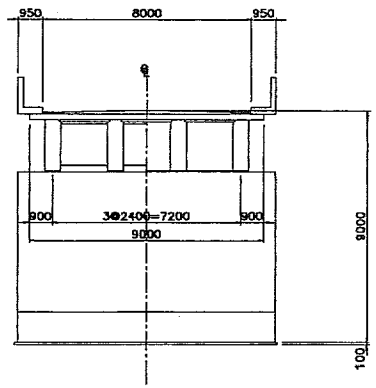
PLAN S = 1 / 300



DESIGN CONDITION

TYPE	RC 1 span I-girder bridge
BRIDGE LENGTH	18.700
GIRDER LENGTH	18.640
SPAN	18.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

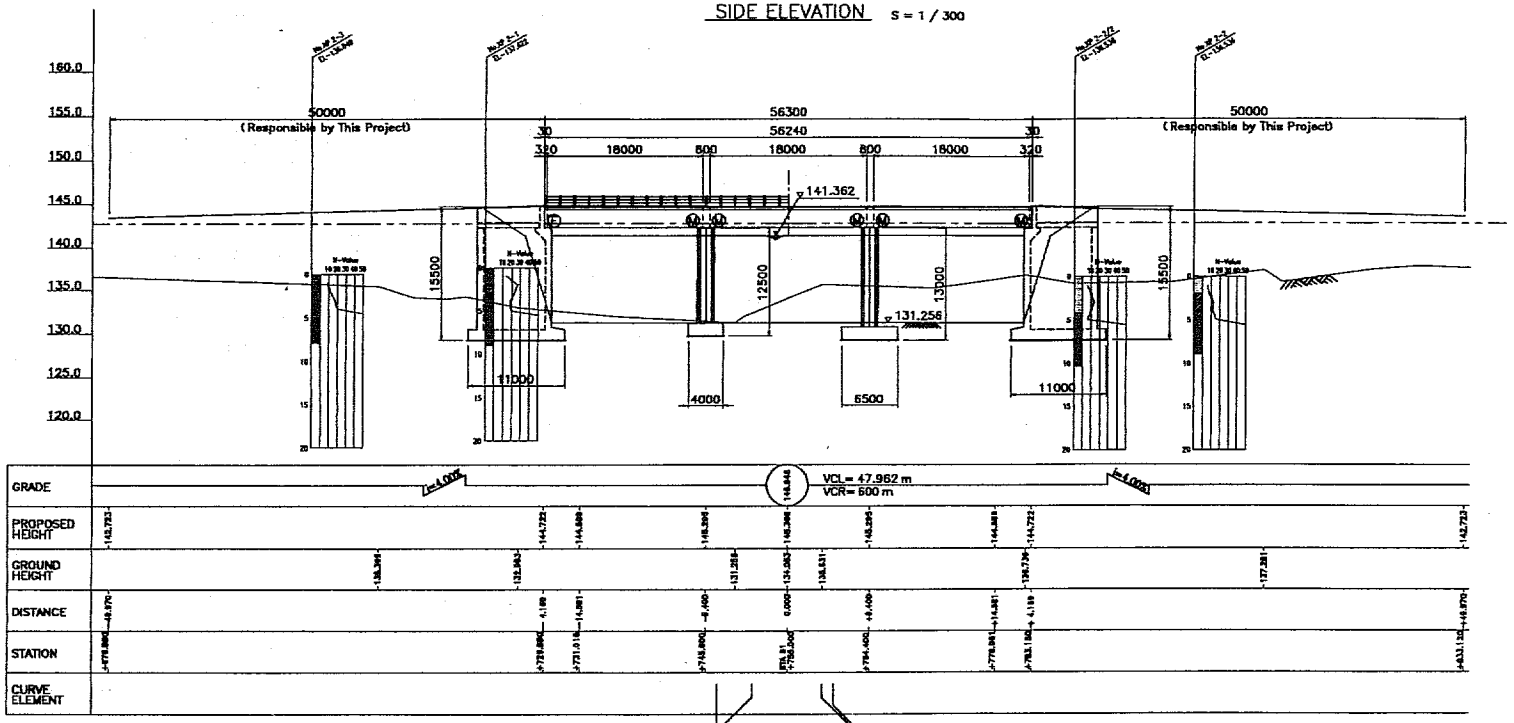
CROSS SECTION S = 1 / 100



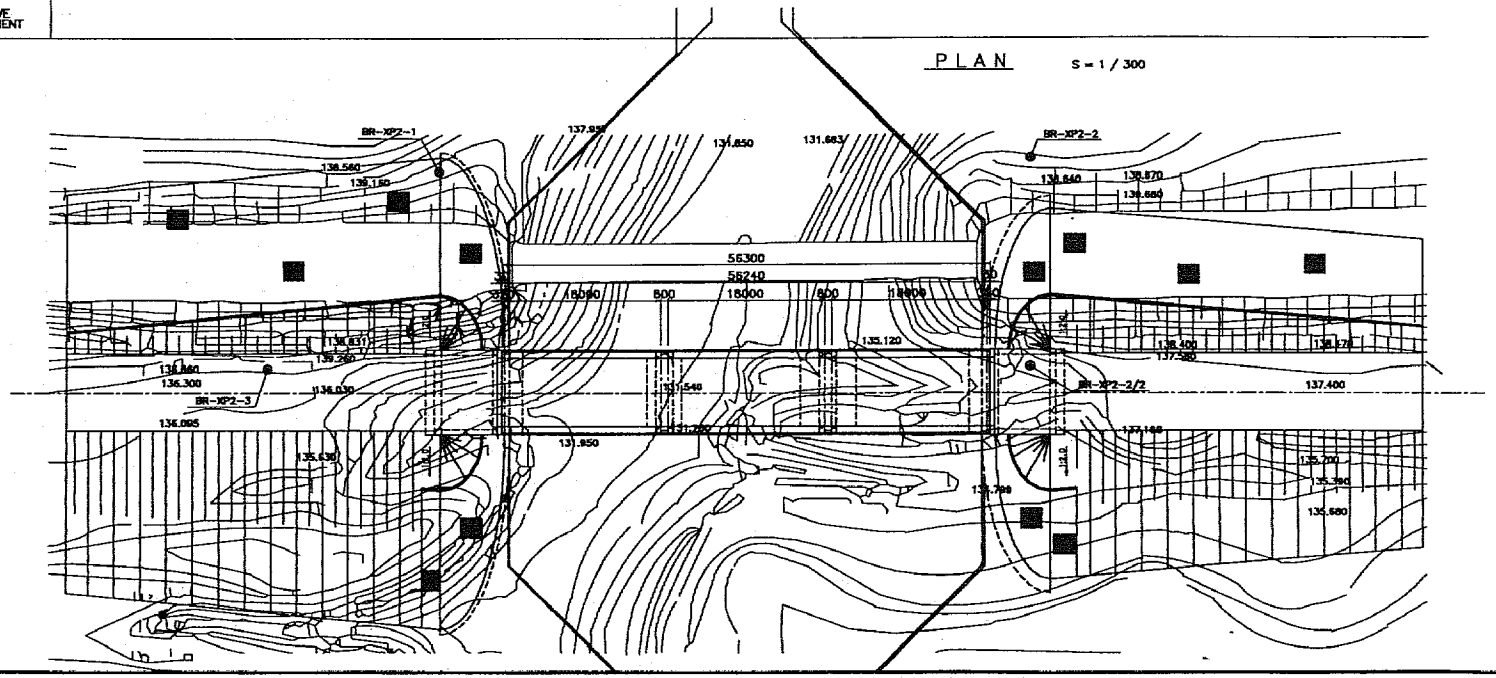
LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE I			
Drawing Title	GENERAL VIEW (XPNo. 1)		
Scale	1 : 300	Drawing No.	15
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(XPNo. 2)

SIDE ELEVATION S = 1 / 300



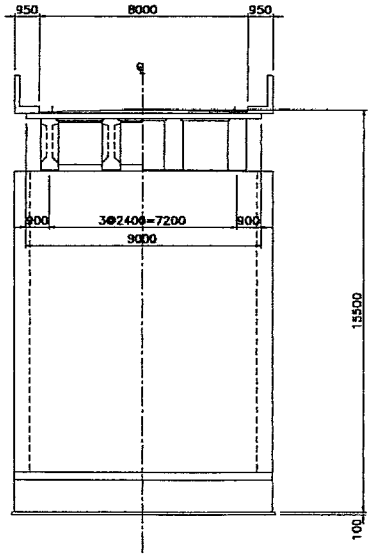
PLAN S = 1 / 300



DESIGN CONDITION

TYPE	RC 3 span articulated I-girder bridge
BRIDGE LENGTH	58.300
GIRDER LENGTH	56.240
SPAN	18.000 + 18.000 + 18.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

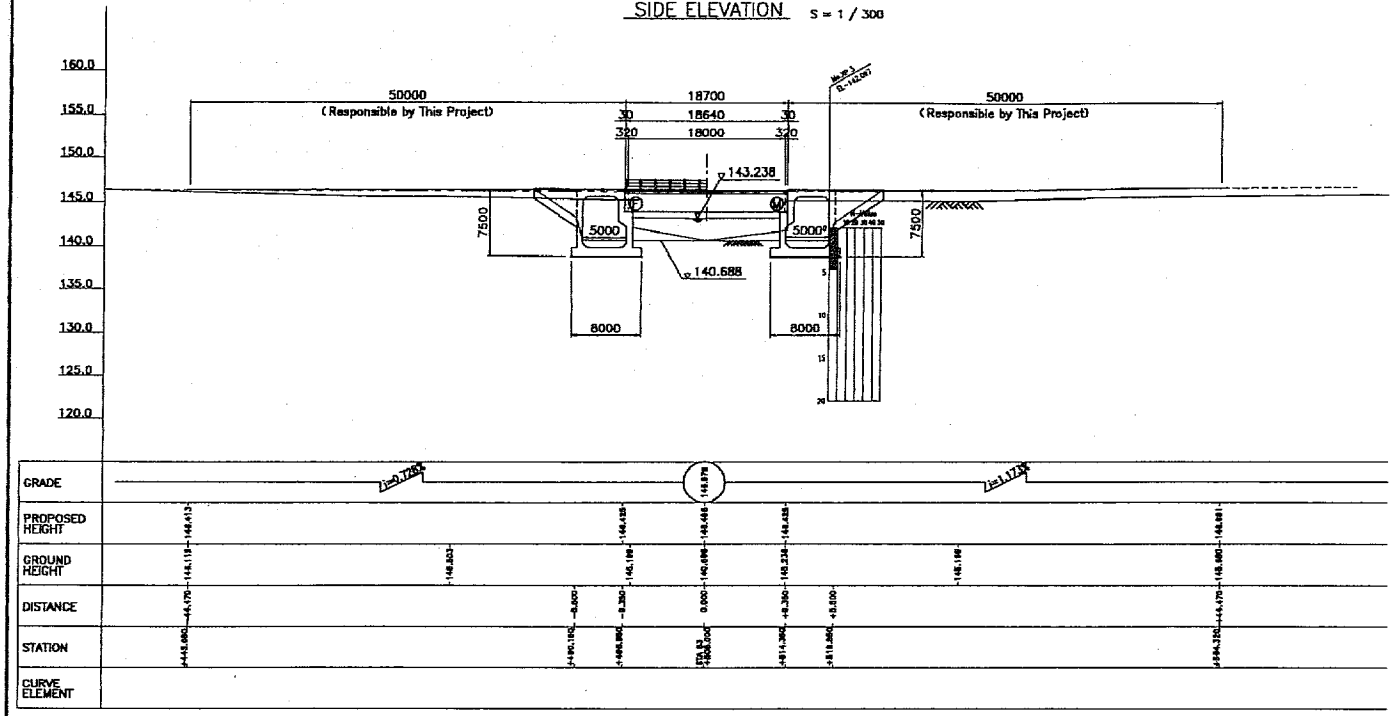
CROSS SECTION S = 1 / 100



LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE I			
Drawing Title	GENERAL VIEW (XPNo. 2)		
Scale	1 : 300	Drawing No.	16
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(XPNo. 3)

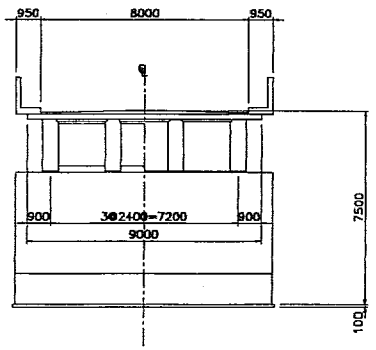
SIDE ELEVATION S = 1 / 300



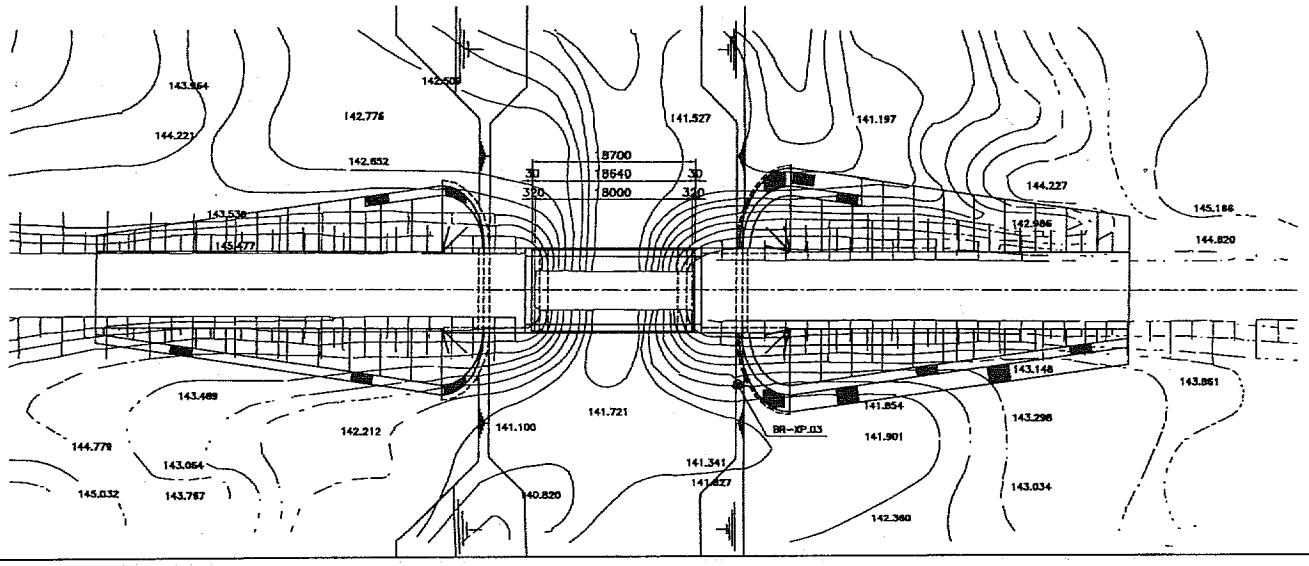
DESIGN CONDITION

TYPE	RC 1 span I-girder bridge
BRIDGE LENGTH	18.700
GIRDER LENGTH	18.640
SPAN	18.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



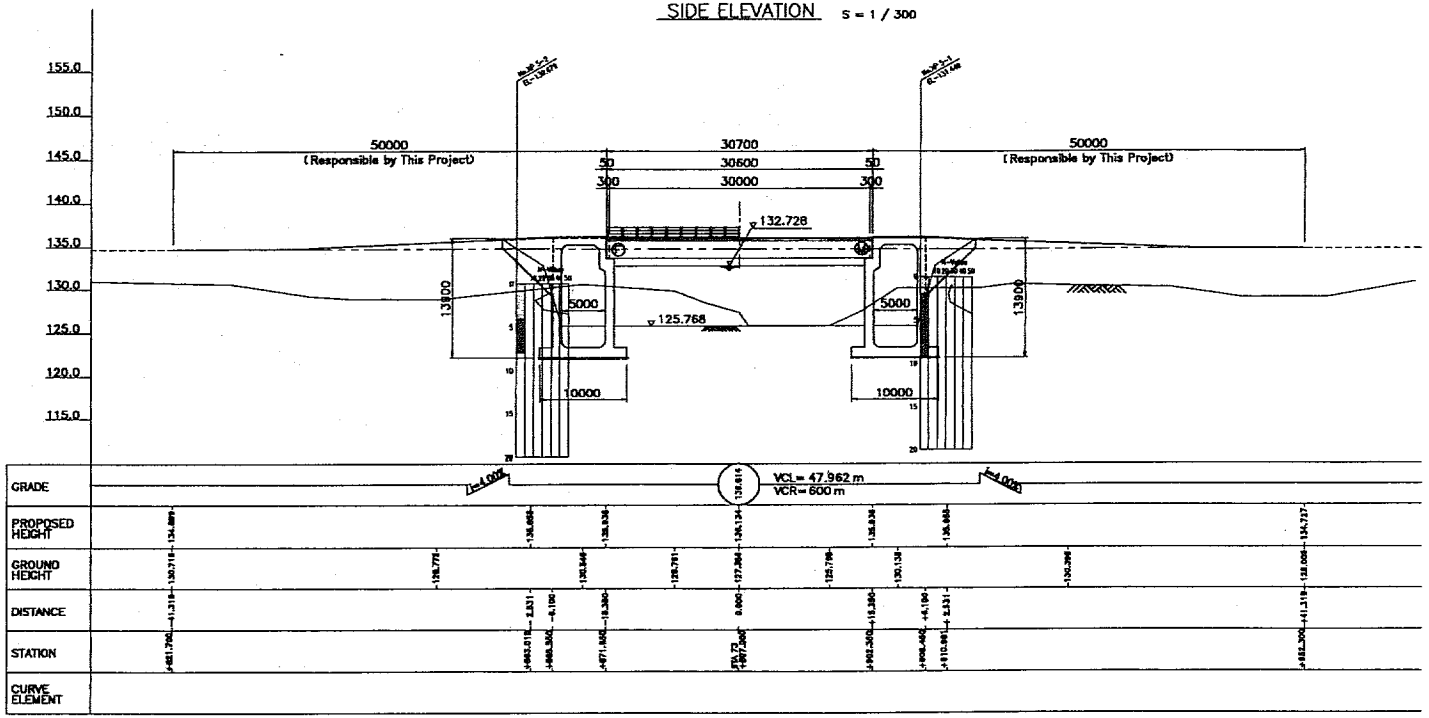
PLAN S = 1 / 300



LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE V			
Drawing Title	GENERAL VIEW (XPNo. 3)		
Scale	1 : 300	Drawing No.	17
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(XPNo. 5)

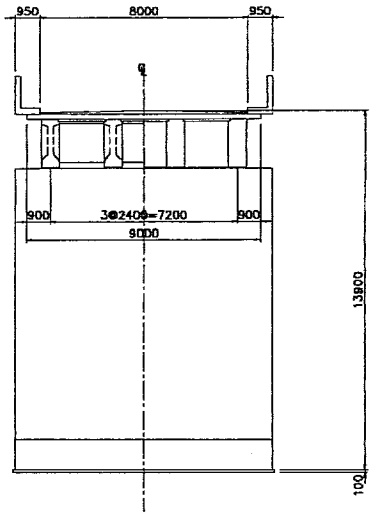
SIDE ELEVATION S = 1 / 300



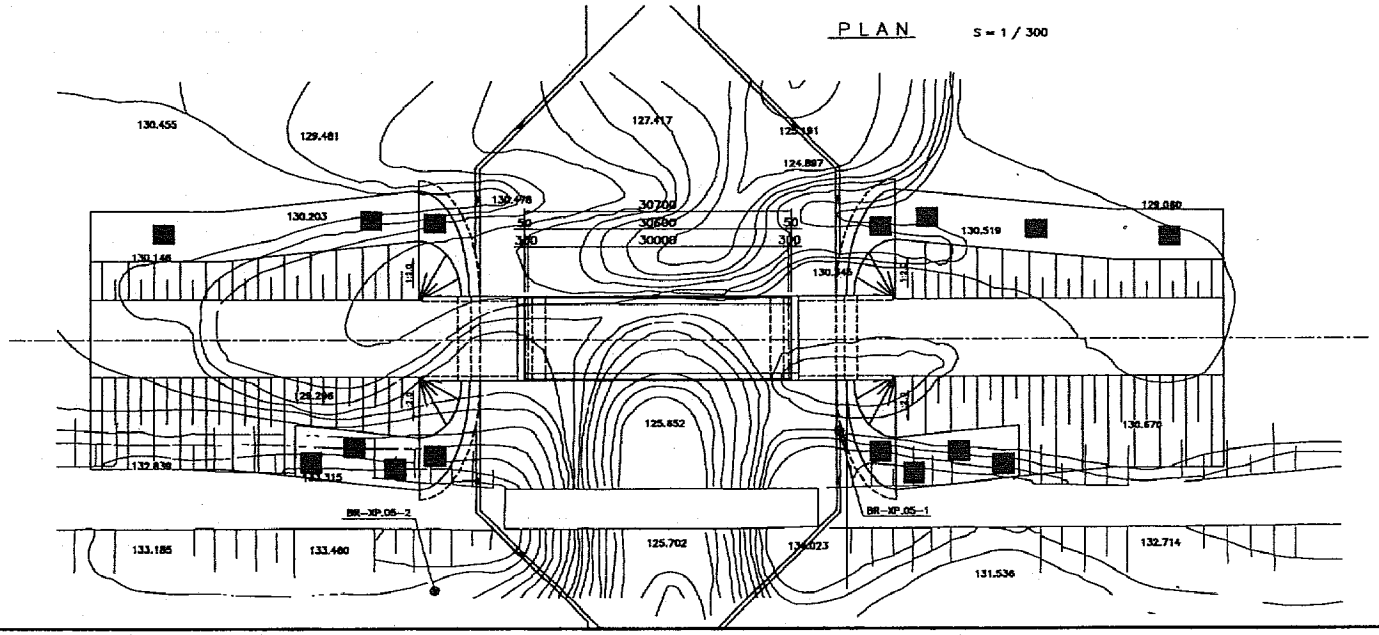
DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	30.700
GIRDER LENGTH	30.600
SPAN	30.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



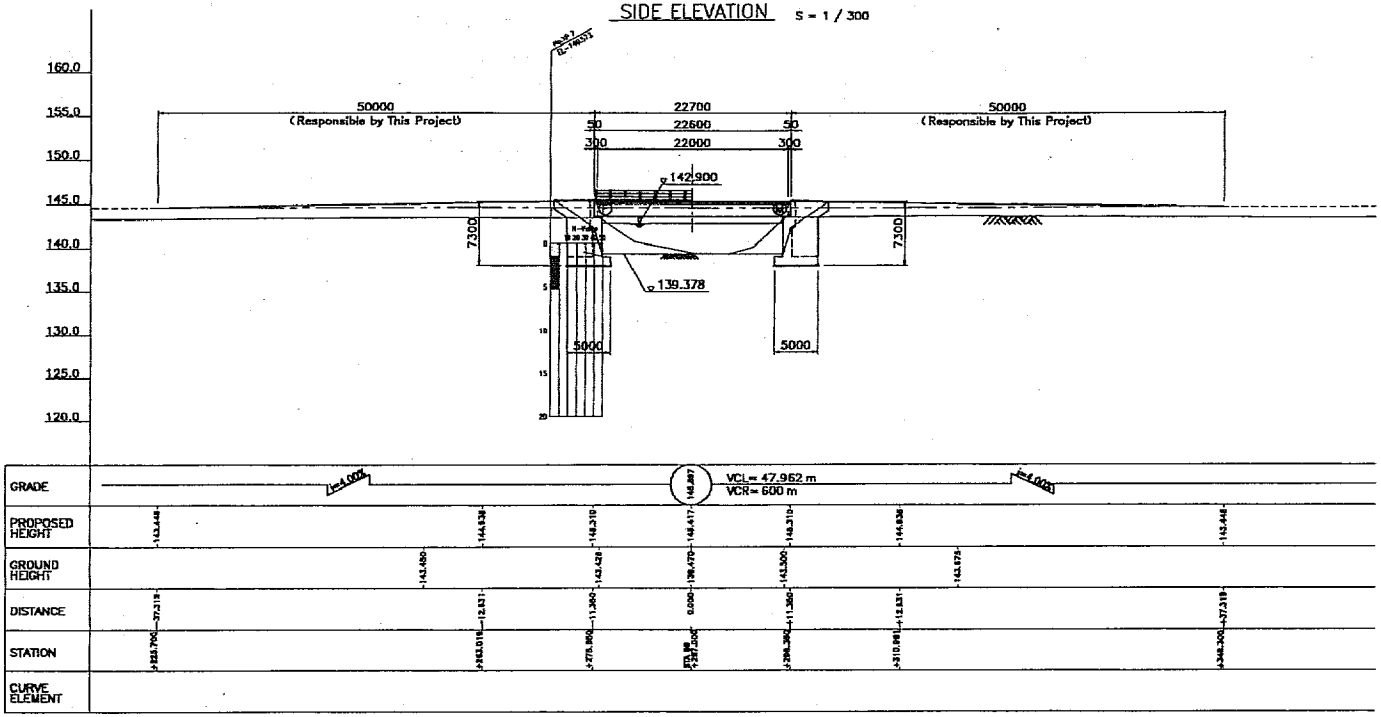
PLAN S = 1 / 300



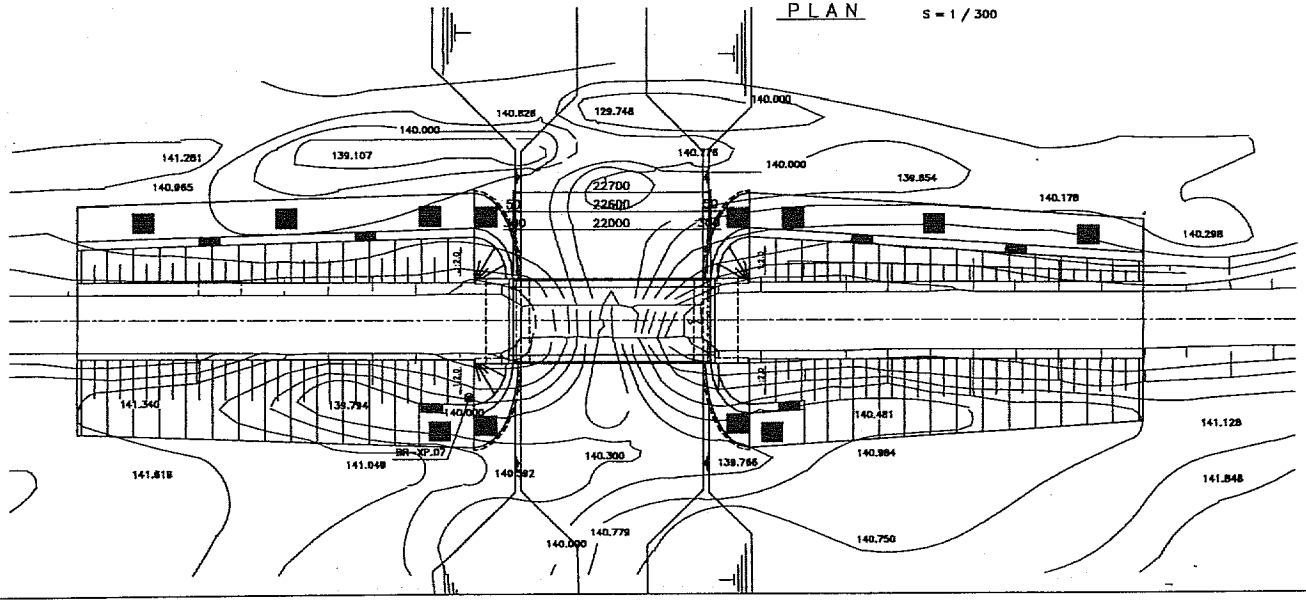
LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE X			
Drawing Title	GENERAL VIEW (XPNo. 5)		
Scale	1 : 300	Drawing No.	18
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(XPNo. 7)

SIDE ELEVATION S = 1 / 300



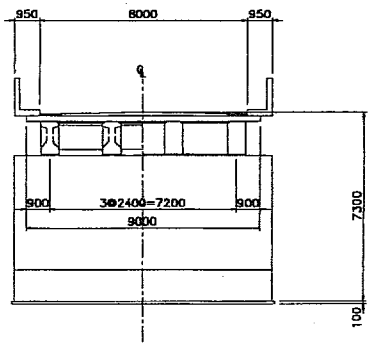
PLAN S = 1 / 300



DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	22.700
GIRDER LENGTH	22.600
SPAN	22.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

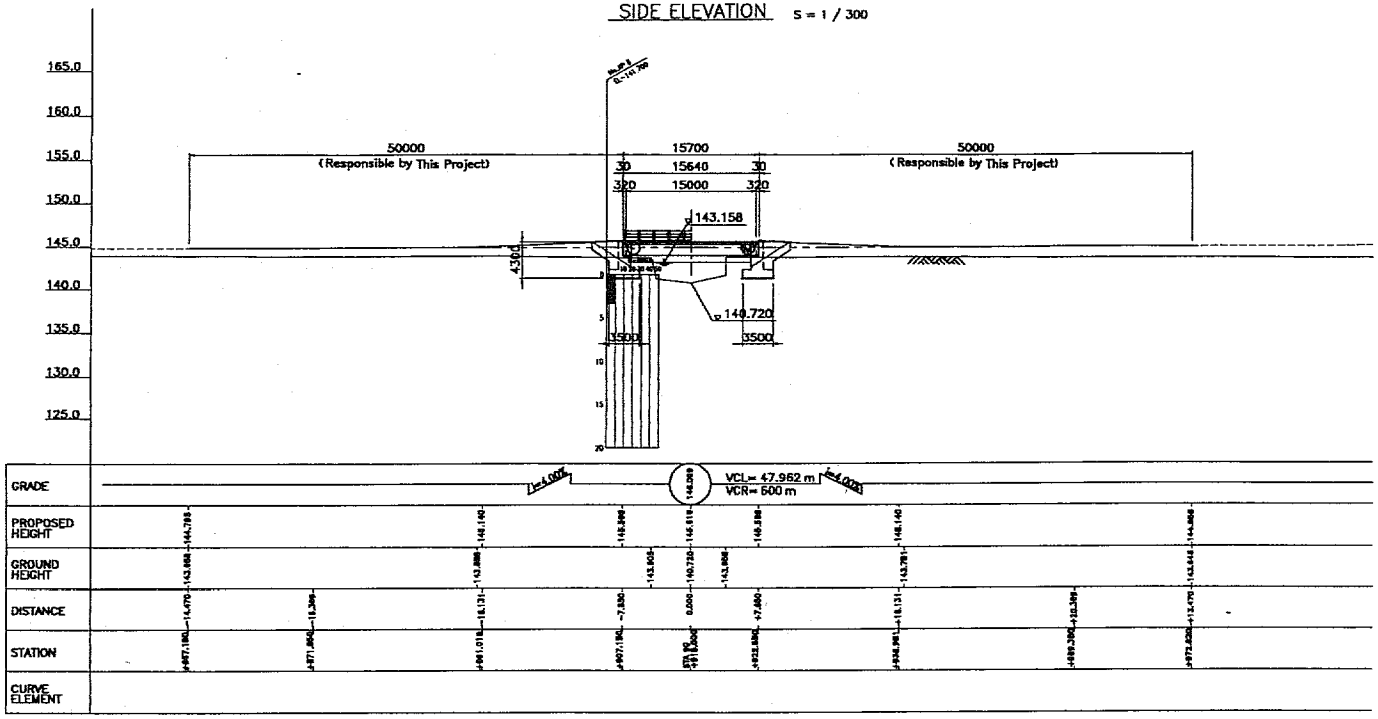
CROSS SECTION S = 1 / 100



LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE X			
Drawing Title	GENERAL VIEW (XPNo. 7)		
Scale	1 : 300	Drawing No.	19
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(XPNo. 8)

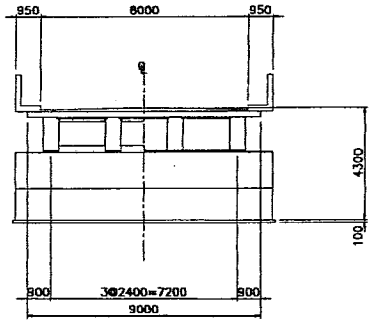
SIDE ELEVATION S = 1 / 300



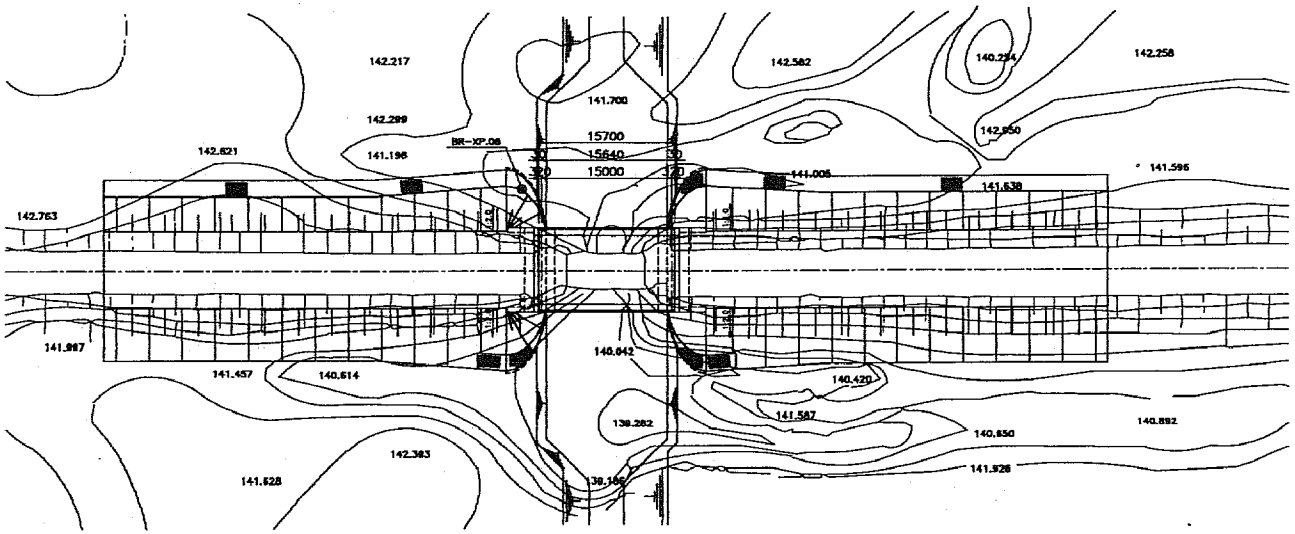
DESIGN CONDITION

TYPE	RC 1 span I-girder bridge
BRIDGE LENGTH	15.700
GIRDER LENGTH	15.640
SPAN	15.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



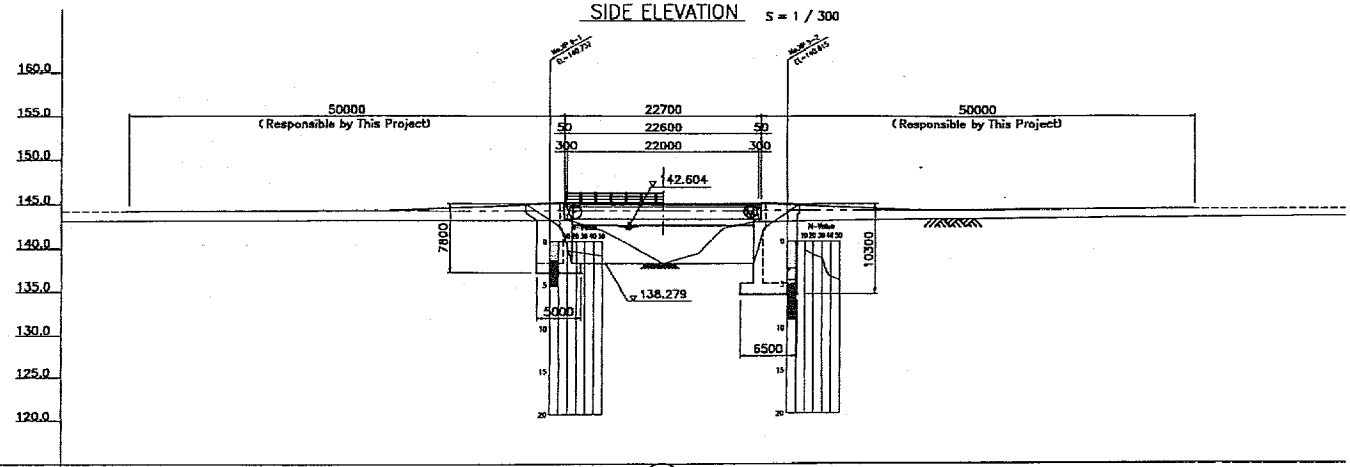
PLAN S = 1 / 300

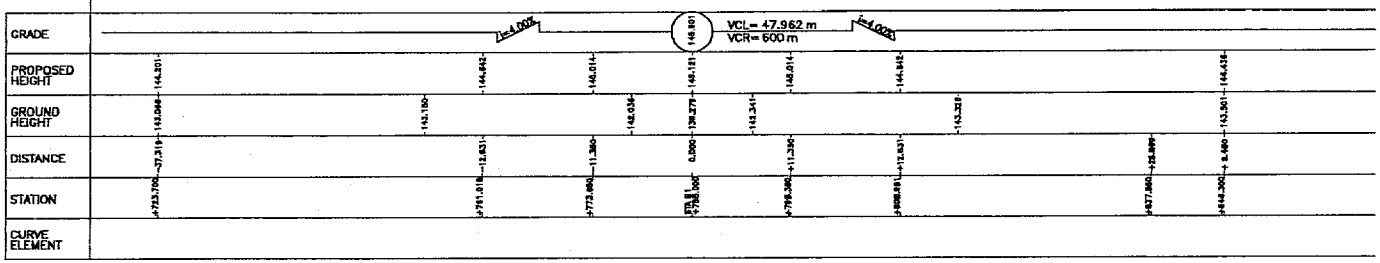


LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE I			
Drawing Title	GENERAL VIEW (XPNo. 8)		
Scale	1 : 300	Drawing No.	20
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(XPNo. 9)

SIDE ELEVATION S = 1 / 300

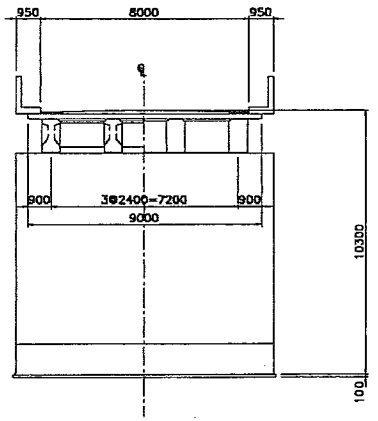




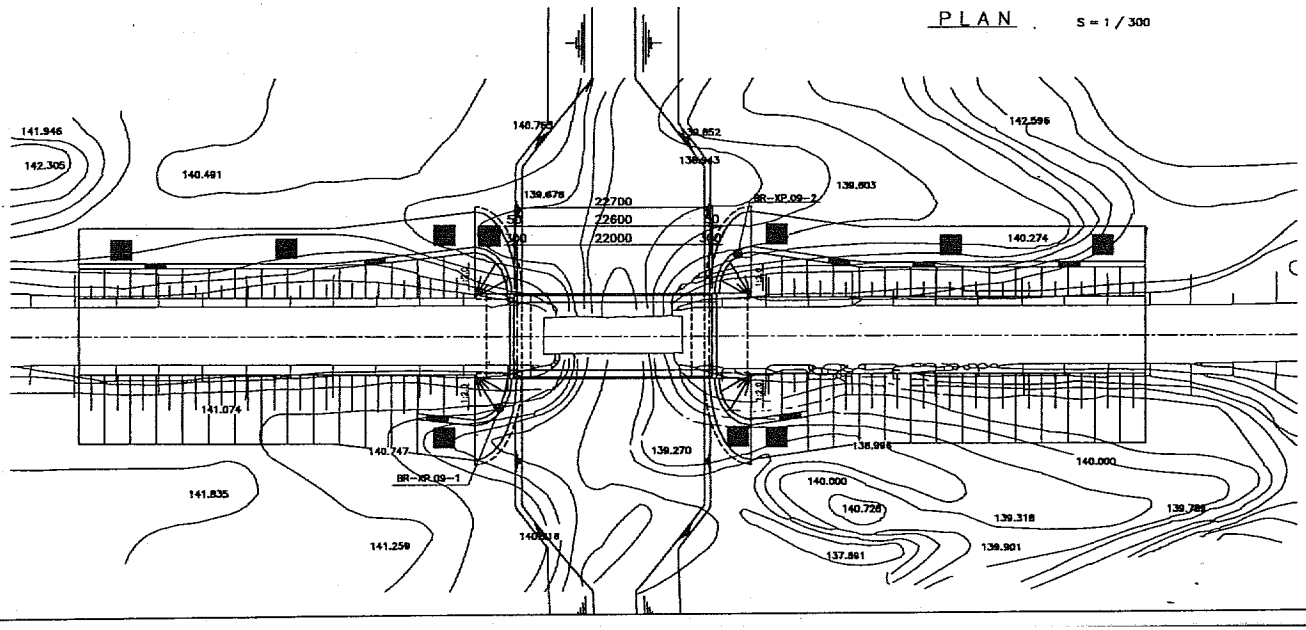
DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	22.700
GIRDER LENGTH	22.600
SPAN	22.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



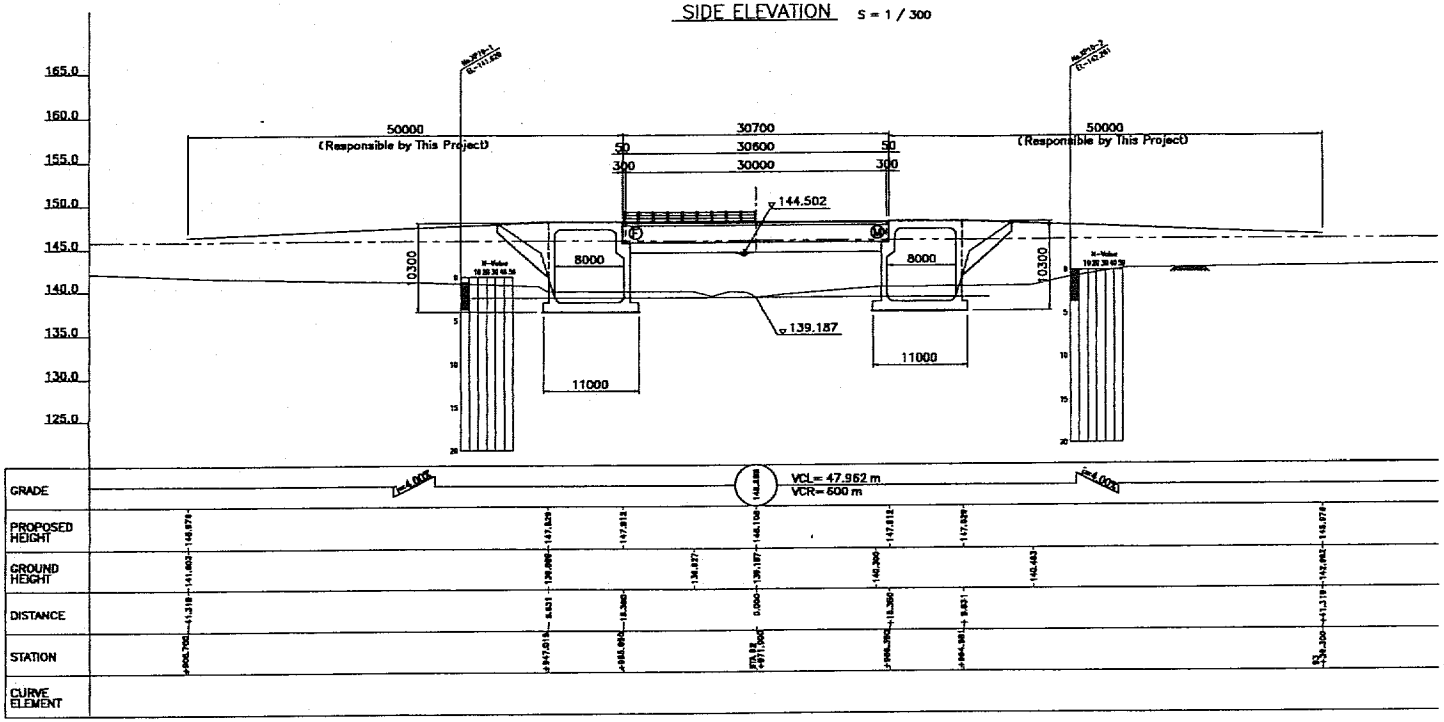
PLAN S = 1 / 300



LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE II			
Drawing Title	GENERAL VIEW (XPNo. 9)		
Scale	1 : 300	Drawing No.	21
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(XPNo. 10)

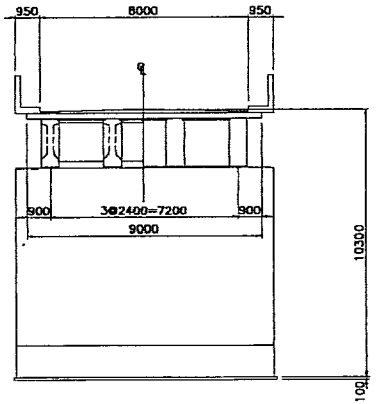
SIDE ELEVATION S = 1 / 300



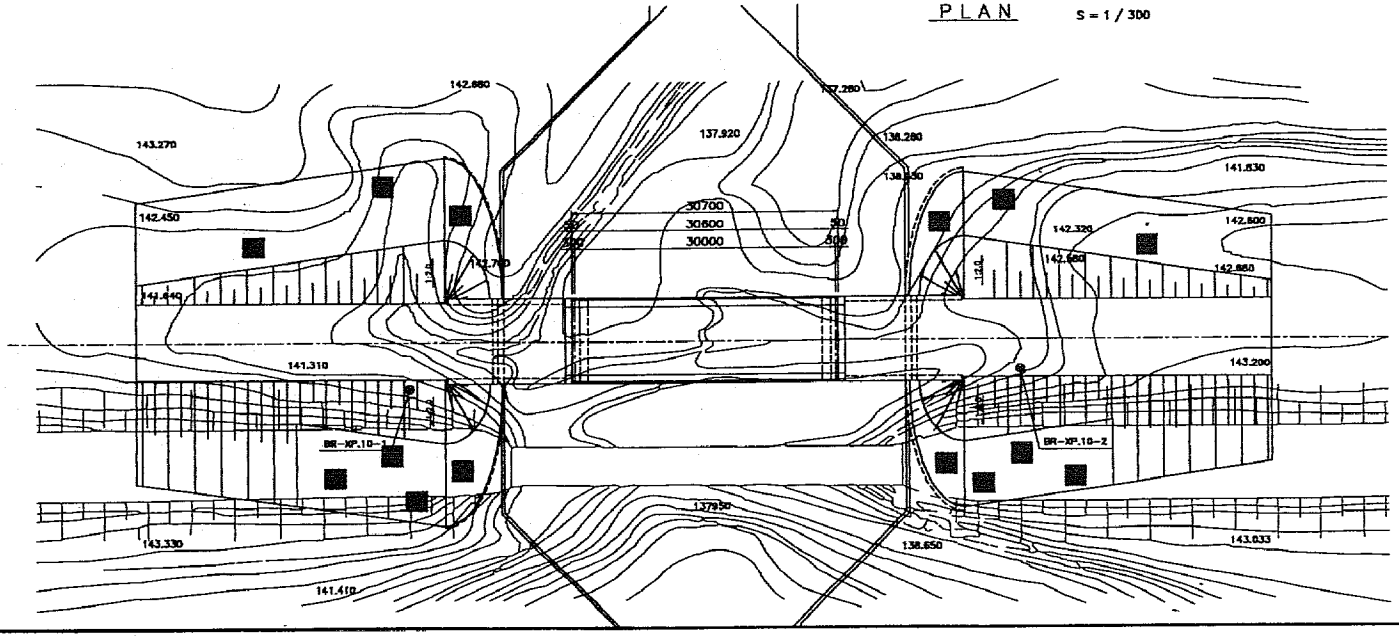
DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	30.700
GIRDER LENGTH	30.600
SPAN	30.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



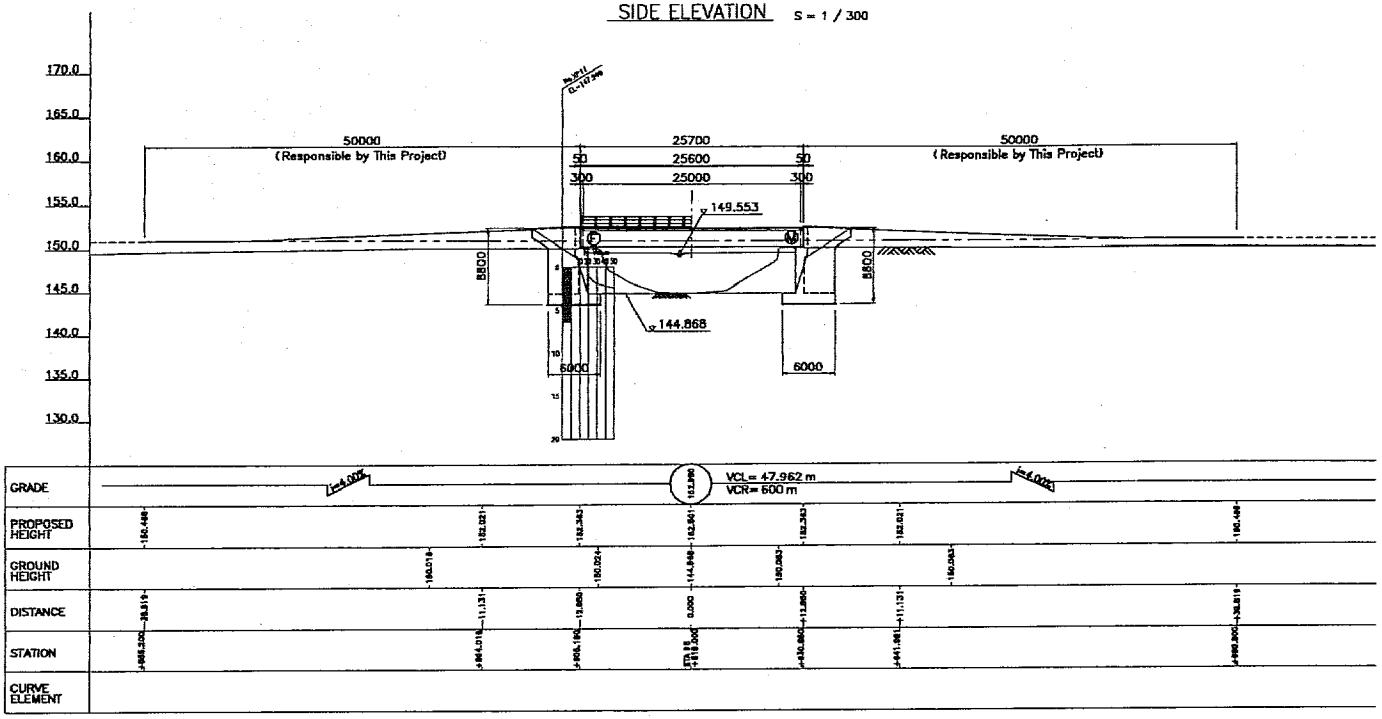
PLAN S = 1 / 300



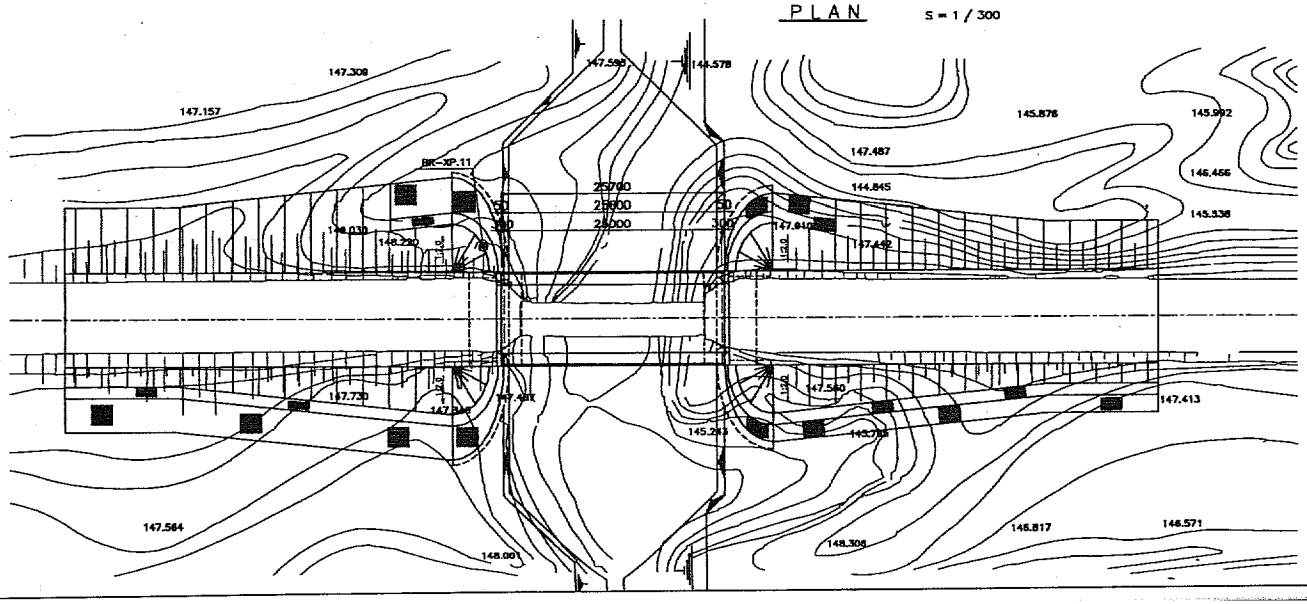
LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE II			
Drawing Title	GENERAL VIEW (XPNo. 10)		
Scale	1 : 300	Drawing No.	22
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(XPNo. 11)

SIDE ELEVATION S = 1 / 300



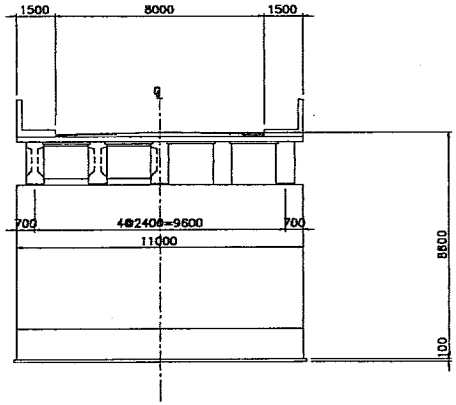
PLAN S = 1 / 300



DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	25.700
GIRDER LENGTH	25.600
SPAN	25.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

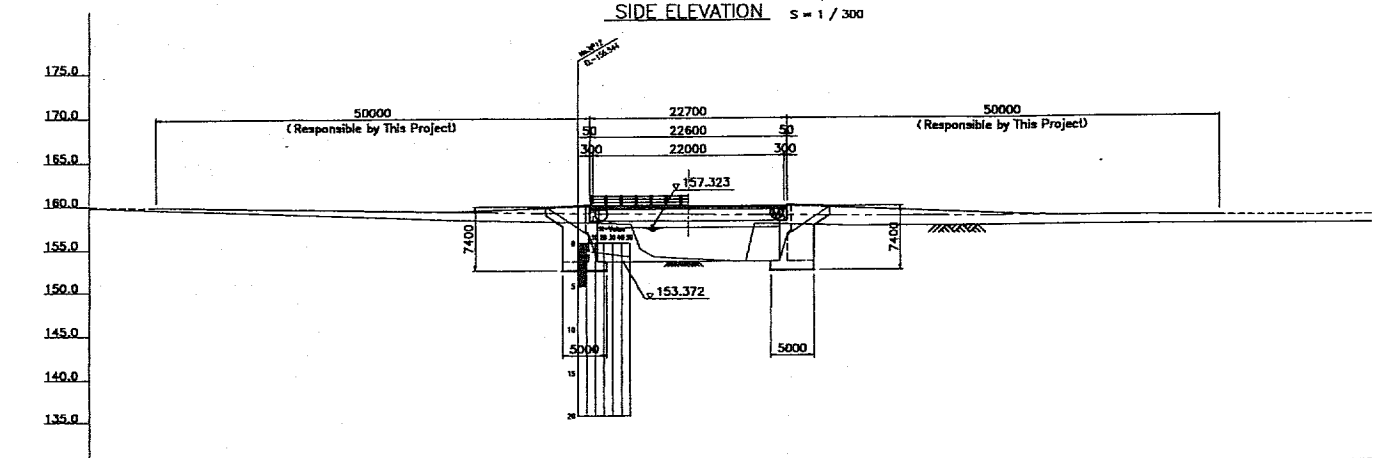
CROSS SECTION S = 1 / 100

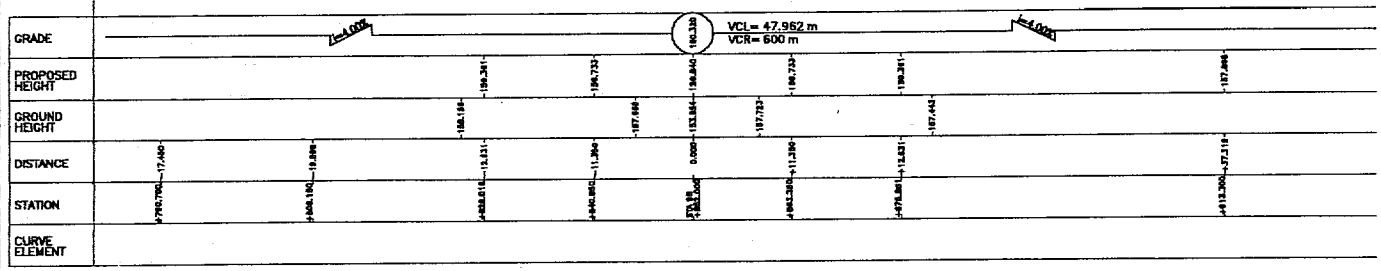


LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE I			
Drawing Title	GENERAL VIEW (XPNo. 11)		
Scale	1 : 300	Drawing No.	23
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

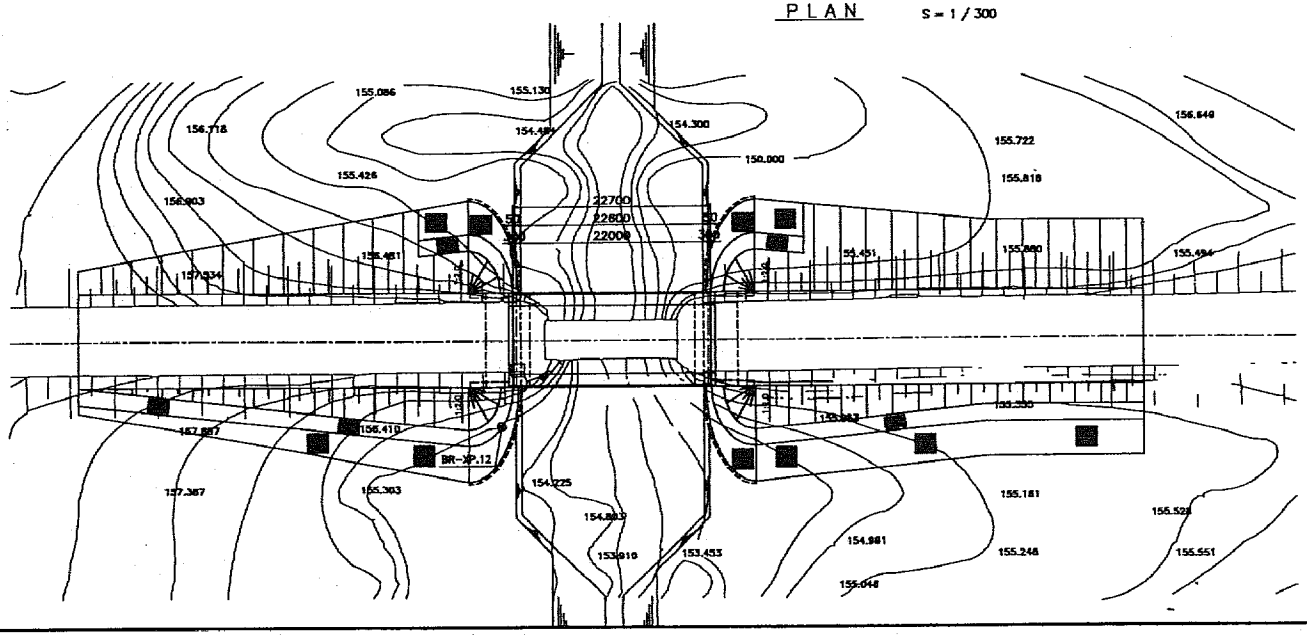
GENERAL VIEW
(XPNo. 12)

SIDE ELEVATION S = 1 / 300





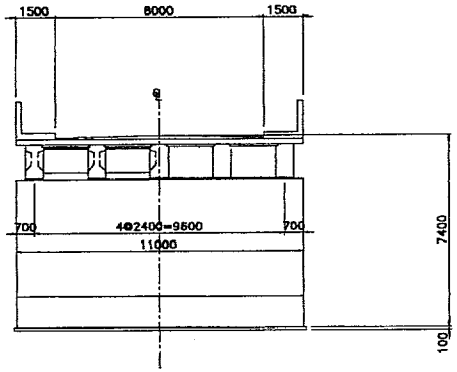
PLAN S = 1 / 300



DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	22.700
GIRDER LENGTH	22.600
SPAN	22.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

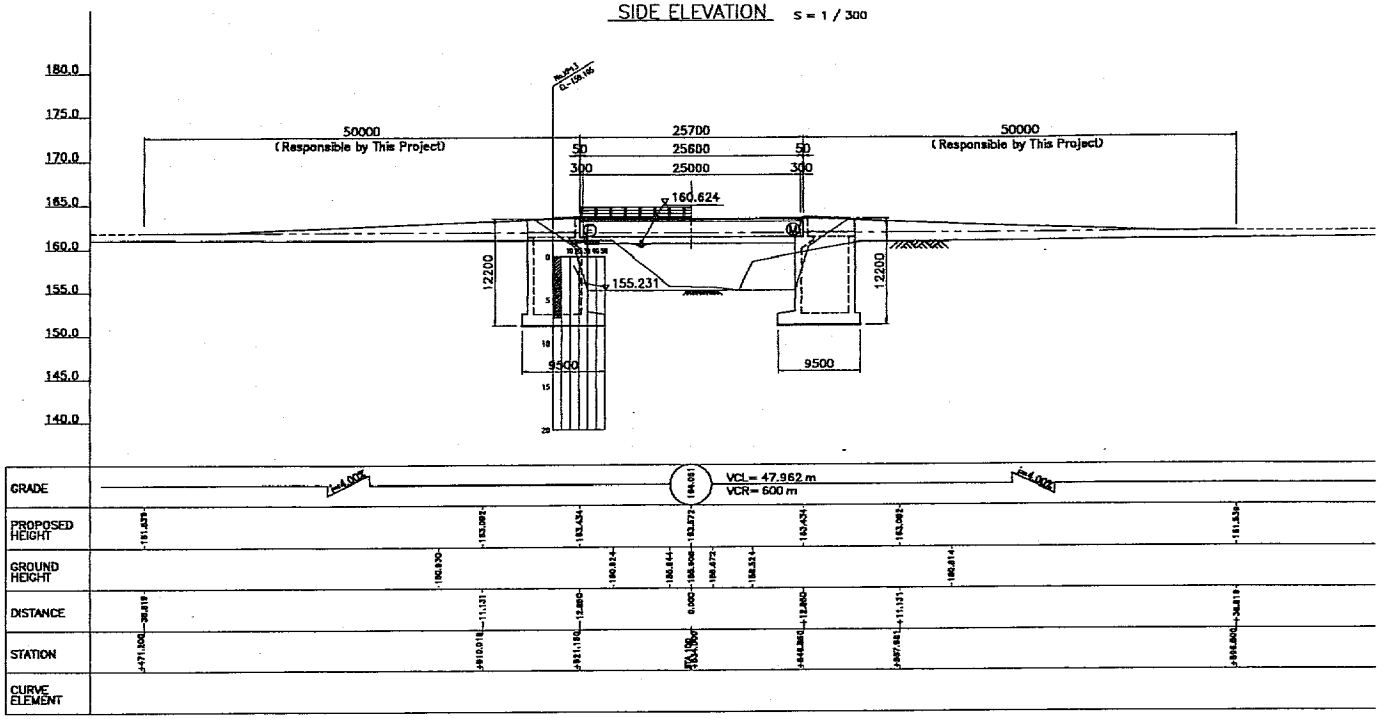
CROSS SECTION S = 1 / 100



LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE II			
Drawing Title	GENERAL VIEW (XPNo. 12)		
Scale	1 : 300	Drawing No.	24
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			

GENERAL VIEW
(XPNo. 13)

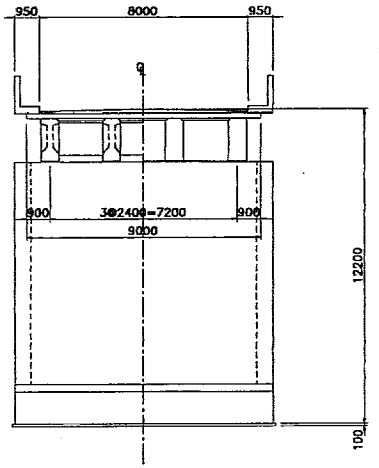
SIDE ELEVATION S = 1 / 300



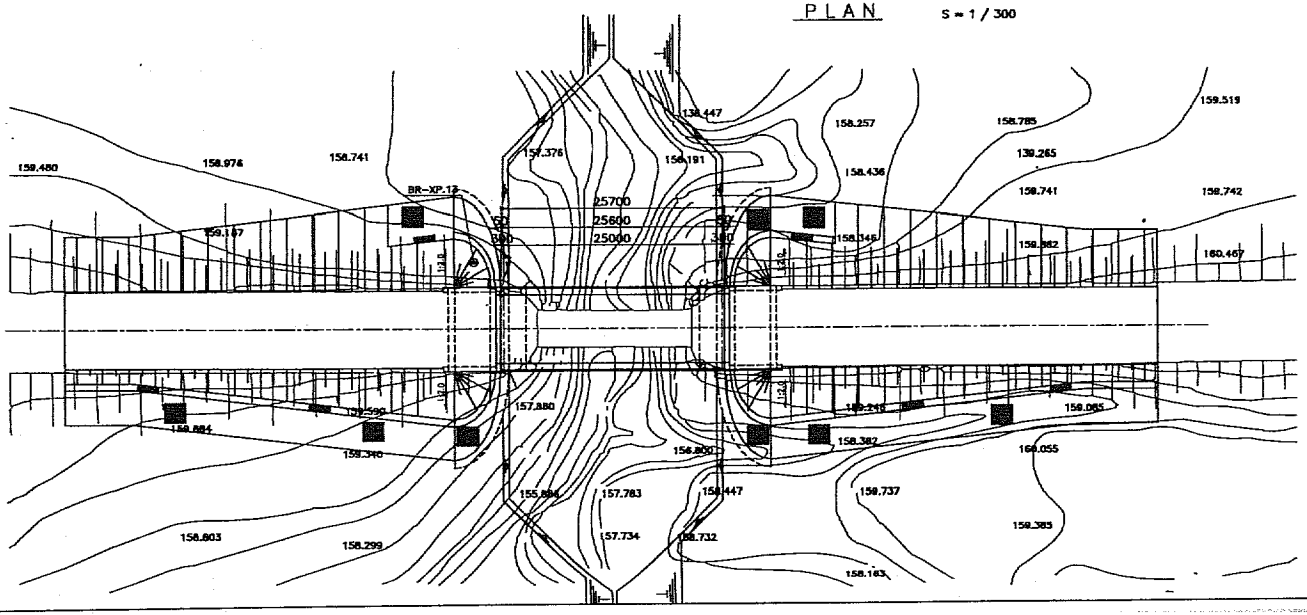
DESIGN CONDITION

TYPE	PC 1 span I-girder bridge
BRIDGE LENGTH	25.700
GIRDER LENGTH	25.600
SPAN	25.000
WIDTH	8.000
LIVE LOAD	Type B live load
SEISMIC COEFICIENT	KH = 0.06
ANGLE OF SKEW	90°

CROSS SECTION S = 1 / 100



PLAN S = 1 / 300



LAO PEOPLE'S DEMOCRATIC REPUBLIC			
THE PROJECT FOR THE RECONSTRUCTION OF BRIDGES ON THE NATIONAL ROAD ROUTE 13, PHASE I			
Drawing Title	GENERAL VIEW (XPNo. 13)		
Scale	1 : 300	Drawing No.	25
JAPAN INTERNATIONAL COOPERATION AGENCY ORIENTAL CONSULTANTS CO., LTD. JAPAN OVERSEAS CONSULTANT CO., LTD.			