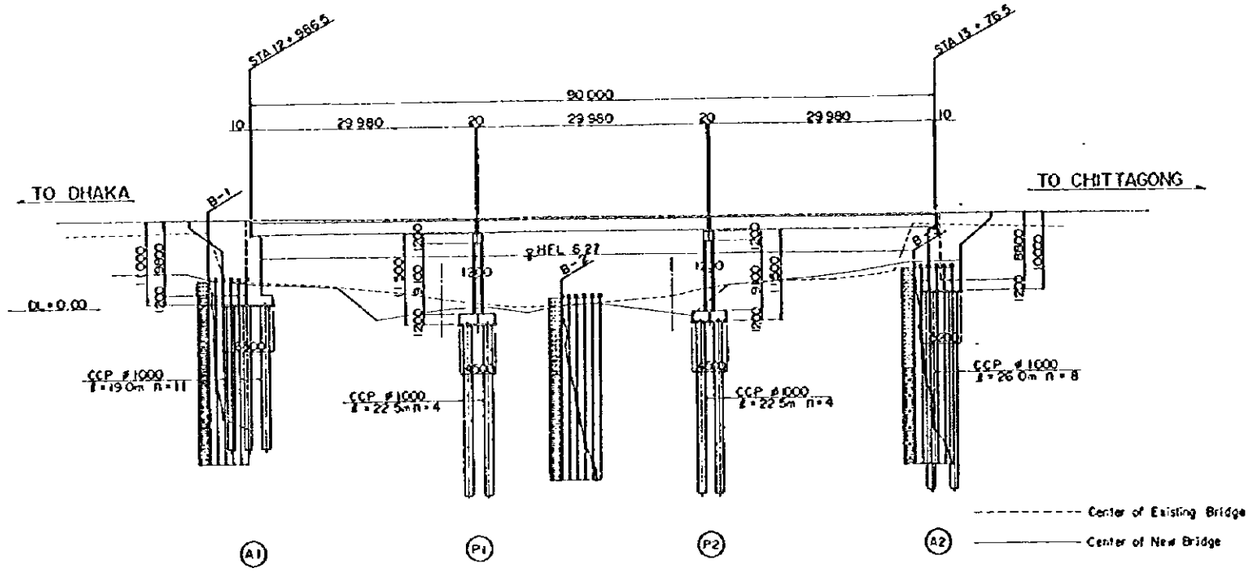
8. 基本設計図

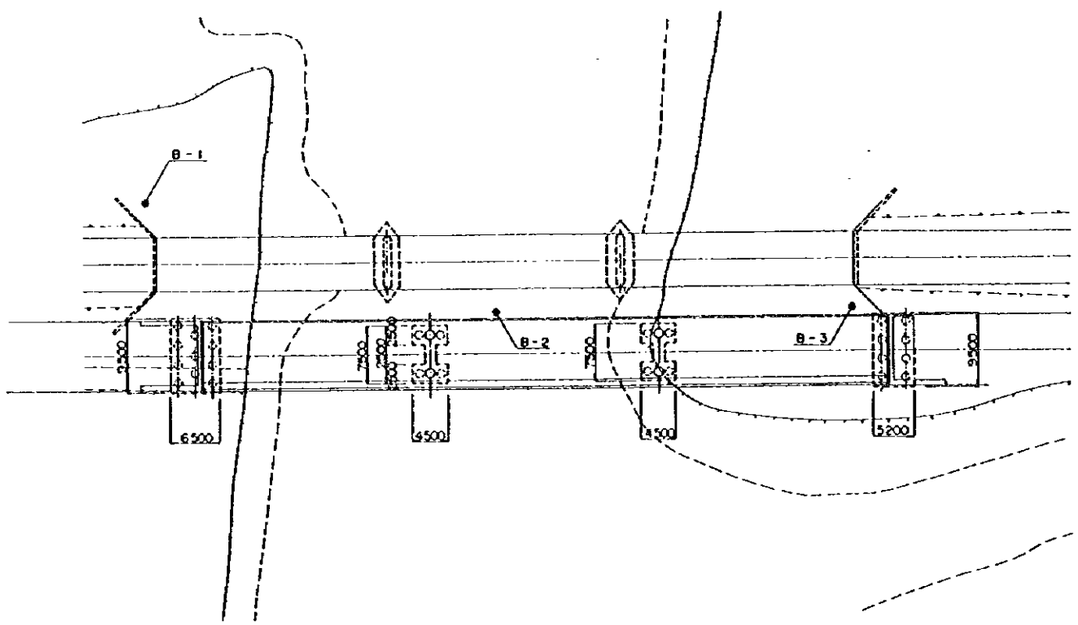
橋梁一般図

No. 1　マリカリ橋

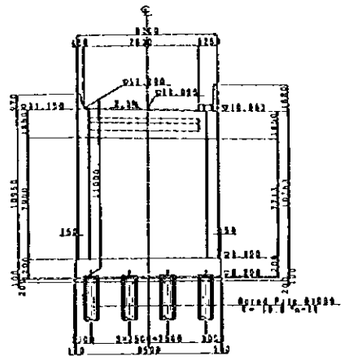


SLOPE	▽ 11.200　LEVEL　▽ 11.200
PROPOSED HEIGHT	11.200　11.200　11.200　11.200　11.200　11.200　11.200　11.200　11.200
ORIGINAL GROUND LEVEL	
ACCUMULATIVE DISTANCE	
STATION No.	STA.12 +960.0　A1　+986.5　STA.13 +0.0　P1　+15.5　+21.0　+40.0　+46.5　P2　+60.0　A2　+76.5　+80.0

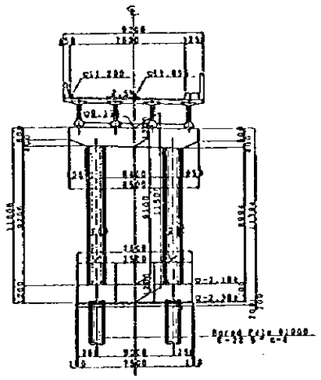
PLAN



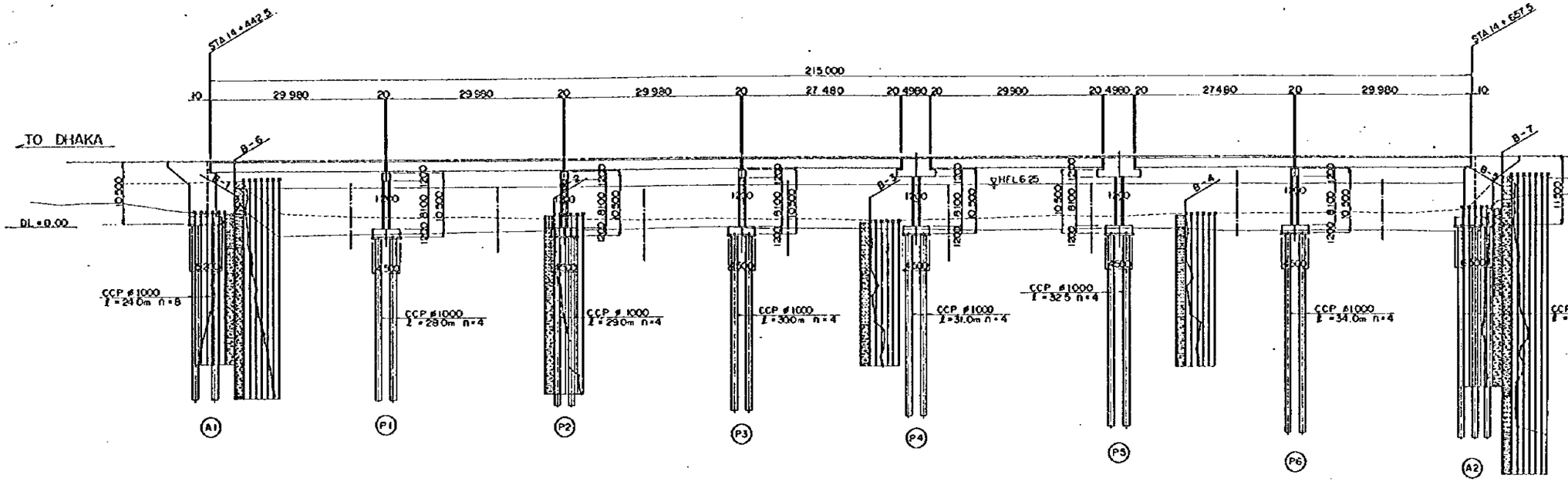
A1 ABUTMENT



P1 PIER

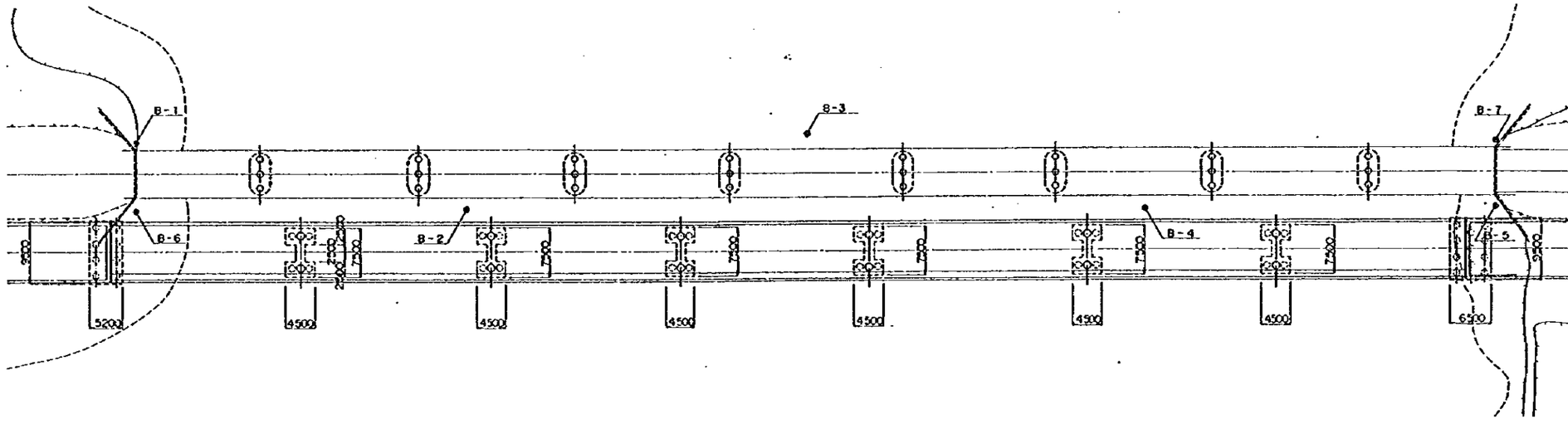


No. 2　アシャルチャー　1橋

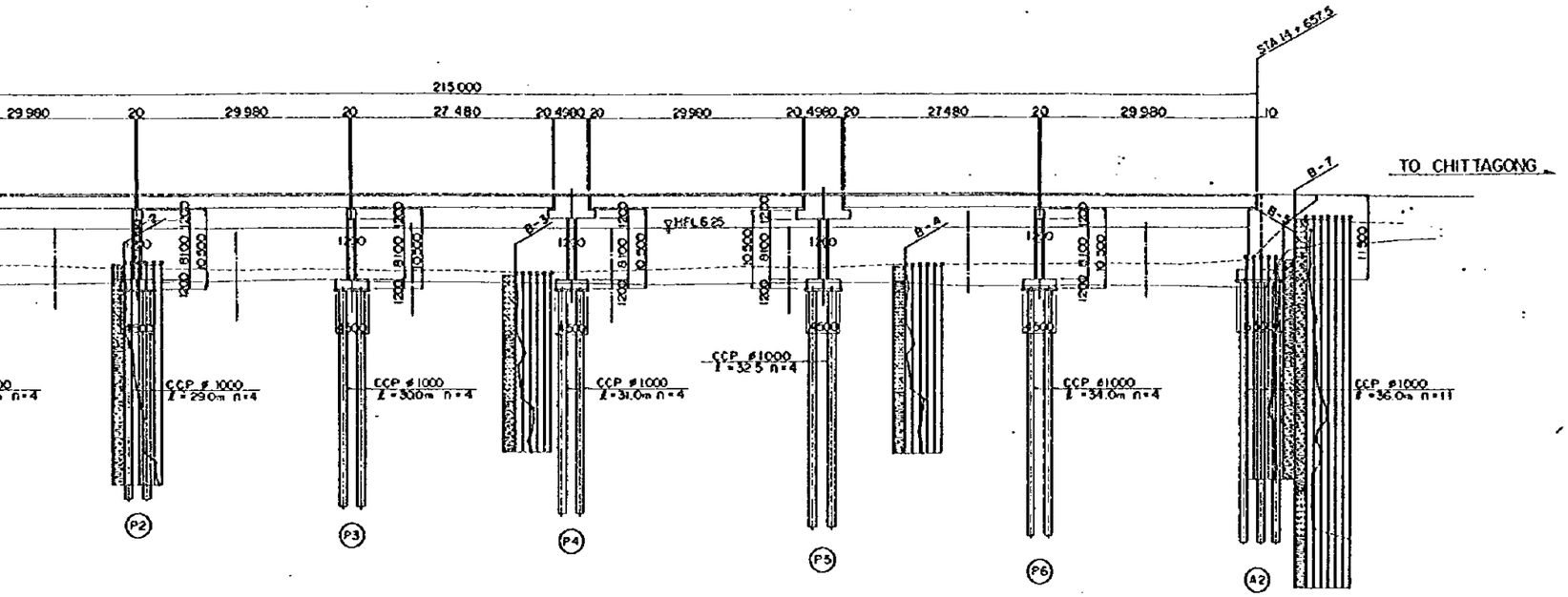


SLOPE	
PROPOSED HEIGHT	+10.8 +10.8
ORIGINAL GROUND LEVEL	
ACCUMULATIVE DISTANCE	
STATION No.	STA 14 +440.0 +442.5 (A1) +460.0 +472.5 (P1) +480.0 +500.0 +502.5 (P2) +520.0 +532.5 (P3) +540.0 +560.0 +562.5 (P4) +580.0 +597.5 +600.0 (P5) +620.0 +627.5 (P6) +640.0 +657.5 (A2) +660.0

PLAN

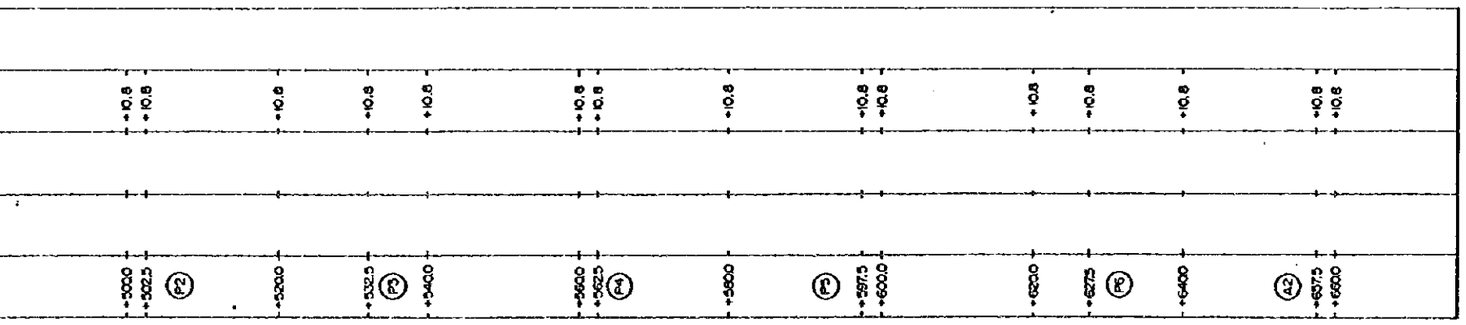


No. 2　アシャルチャー　1橋

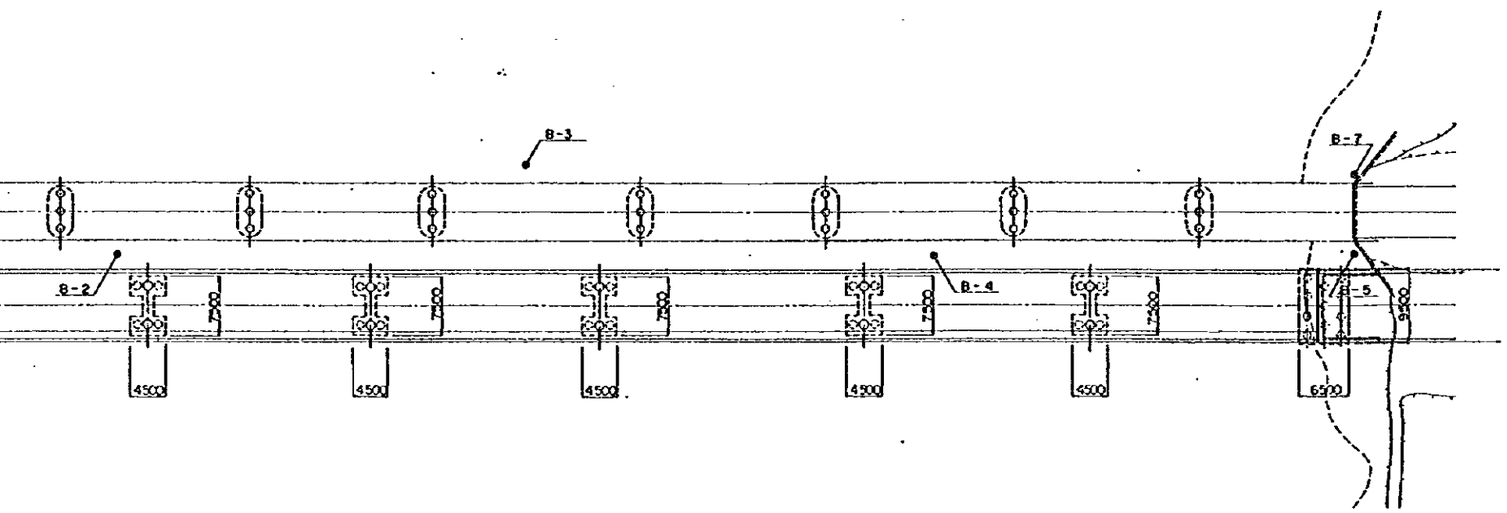


Center of Existing Bridge

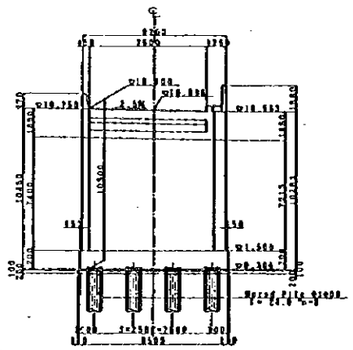
Center of New Bridge



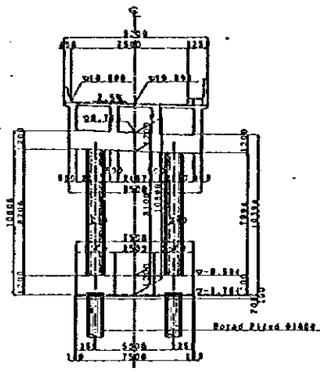
PLAN



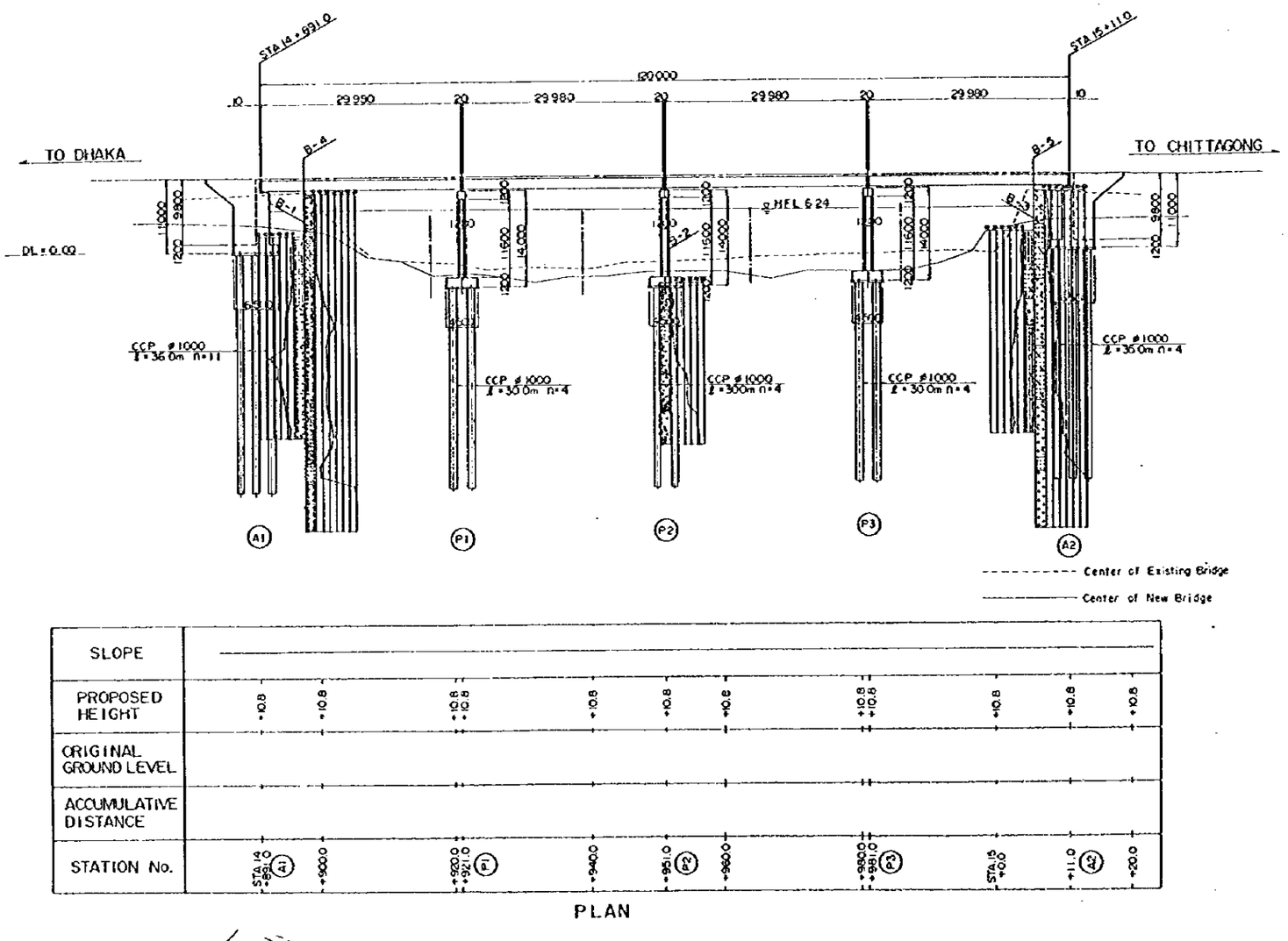
A1 ABUTMENT



P4 PIER

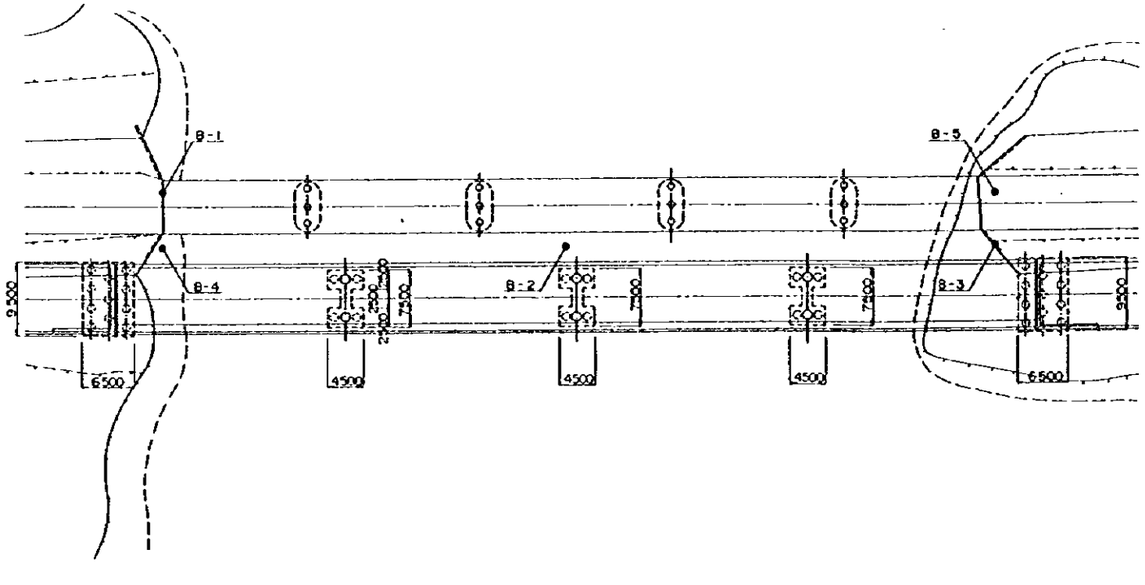


NO.3　アシャルチャー　2橋

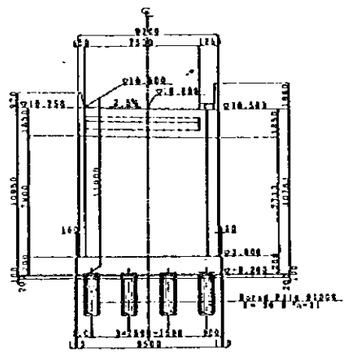


SLOPE	
PROPOSED HEIGHT	+10.8 +10.8 +10.8 +10.8 +10.8 +10.8 +10.8 +10.8 +10.8 +10.8 +10.8
ORIGINAL GROUND LEVEL	
ACCUMULATIVE DISTANCE	
STATION No.	STA 14 +691.0 (A1) +9000 +9200 +9210.0 (P1) +9400 +9510.0 (P2) +9800 +9810.0 (P3) STA 15 +0.0 +11.0 (A2) +20.0

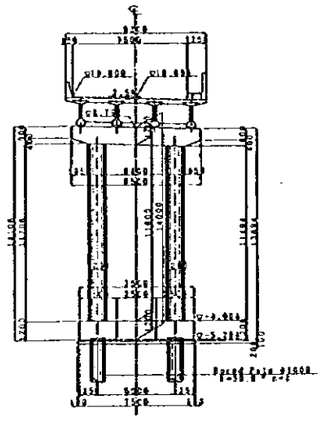
PLAN



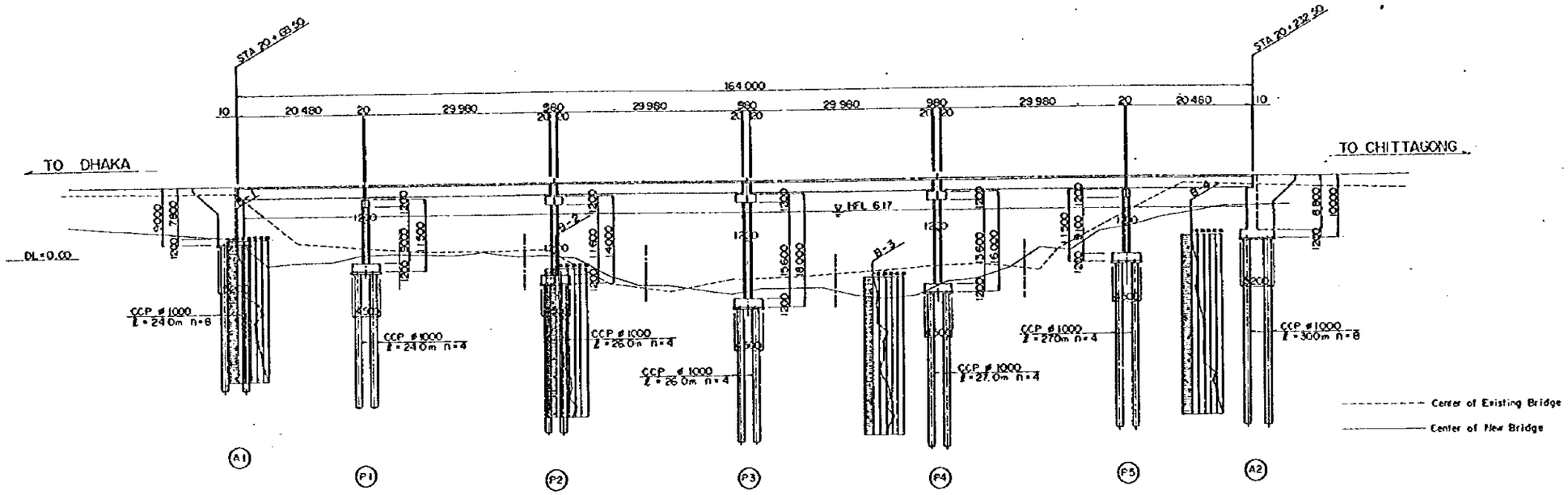
A1 ABUTMENT



P1 PIER

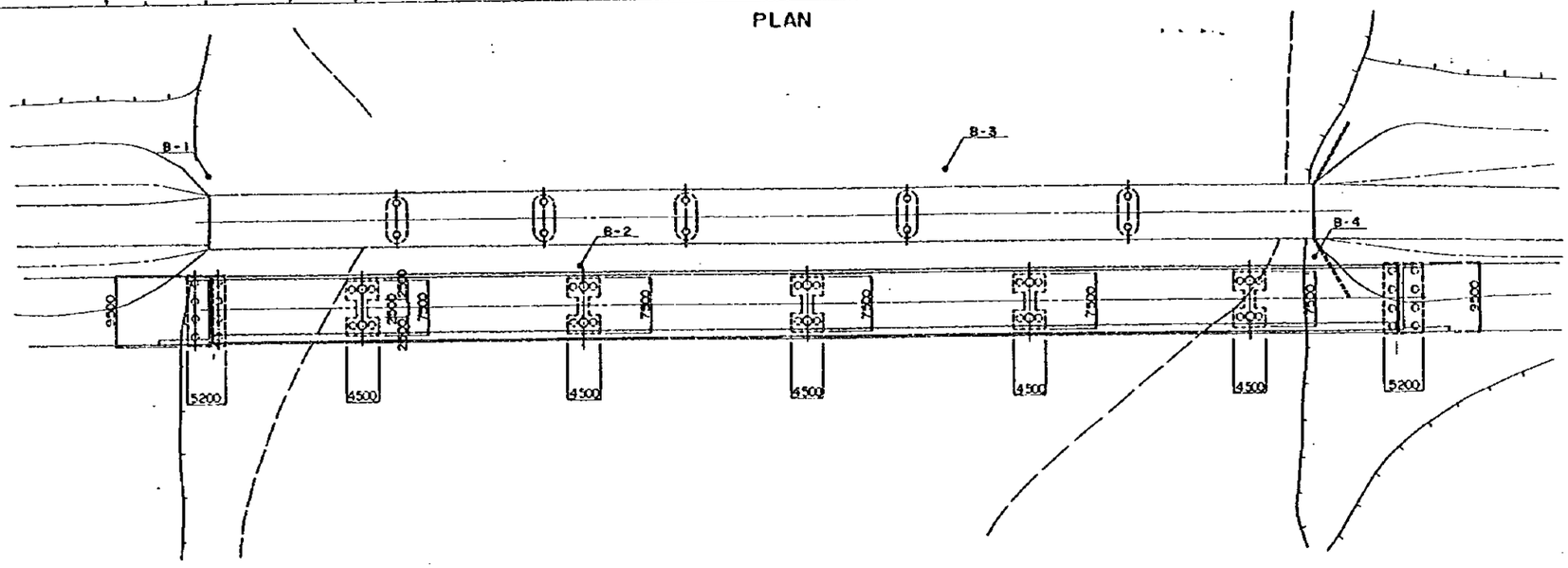


No. 4　バティヤチャー橋

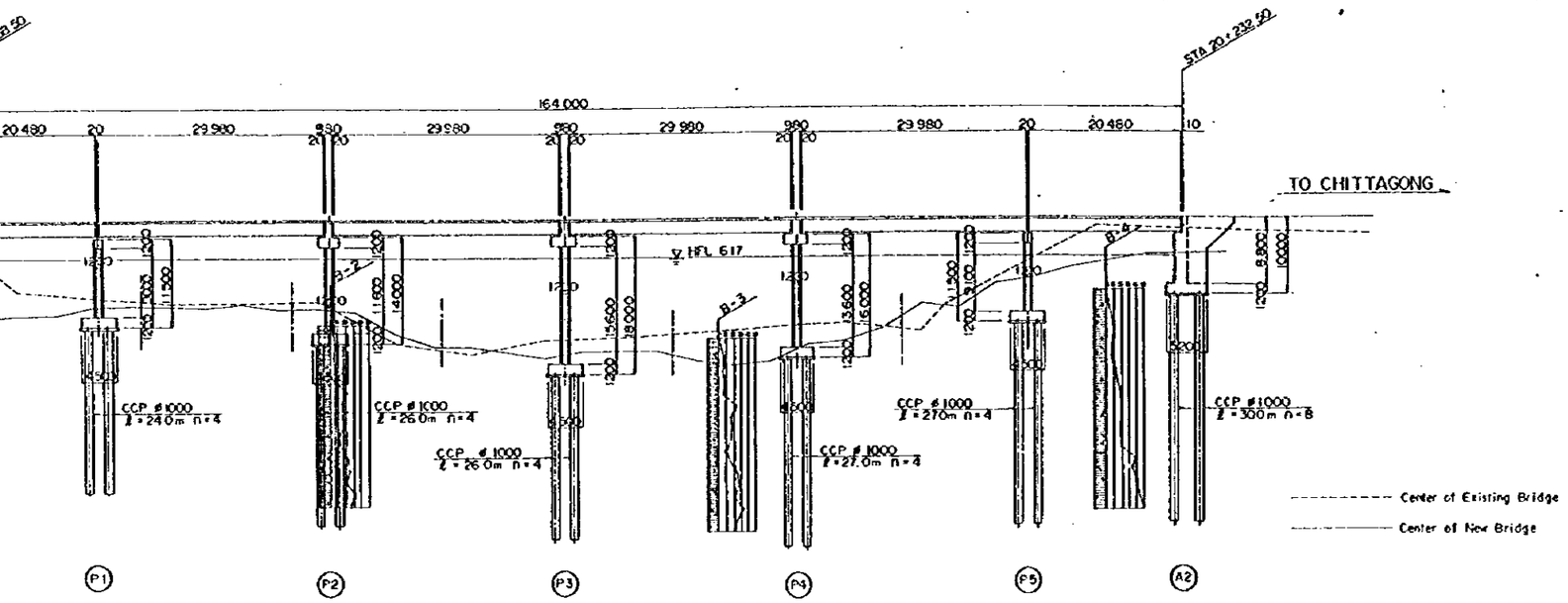


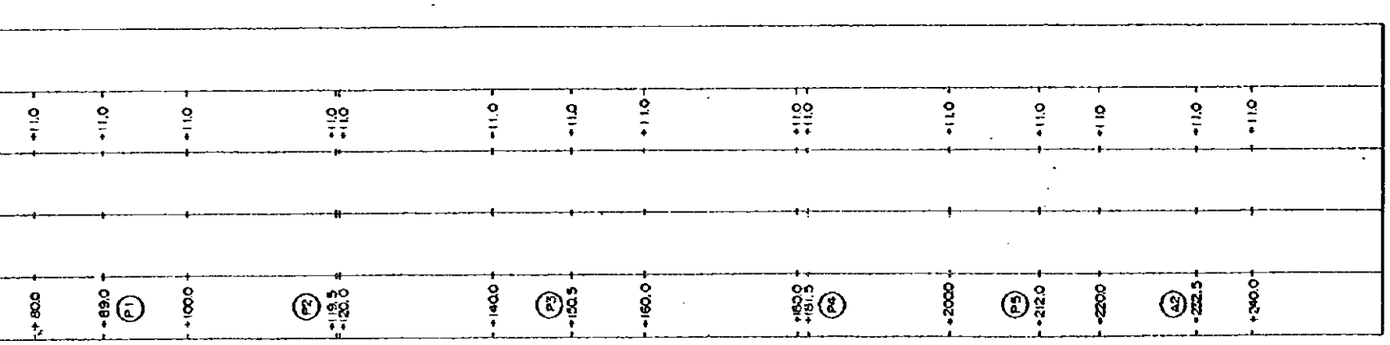
SLOPE	
PROPOSED HEIGHT	+11.0 +11.0 +11.0 +11.0 +11.0 +11.0 +11.0 +11.0 +11.0 +11.0 +11.0 +11.0 +11.0 +11.0
ORIGINAL GROUND LEVEL	
ACCUMULATIVE DISTANCE	
STATION No.	STA.20 +60.50 +68.5 A1 +80.0 +89.0 P1 +100.0 P2 +131.5 +140.0 P3 +150.5 +160.0 +180.0 +191.5 P4 +200.0 P5 +212.0 +220.0 A2 +232.5 +240.0

PLAN

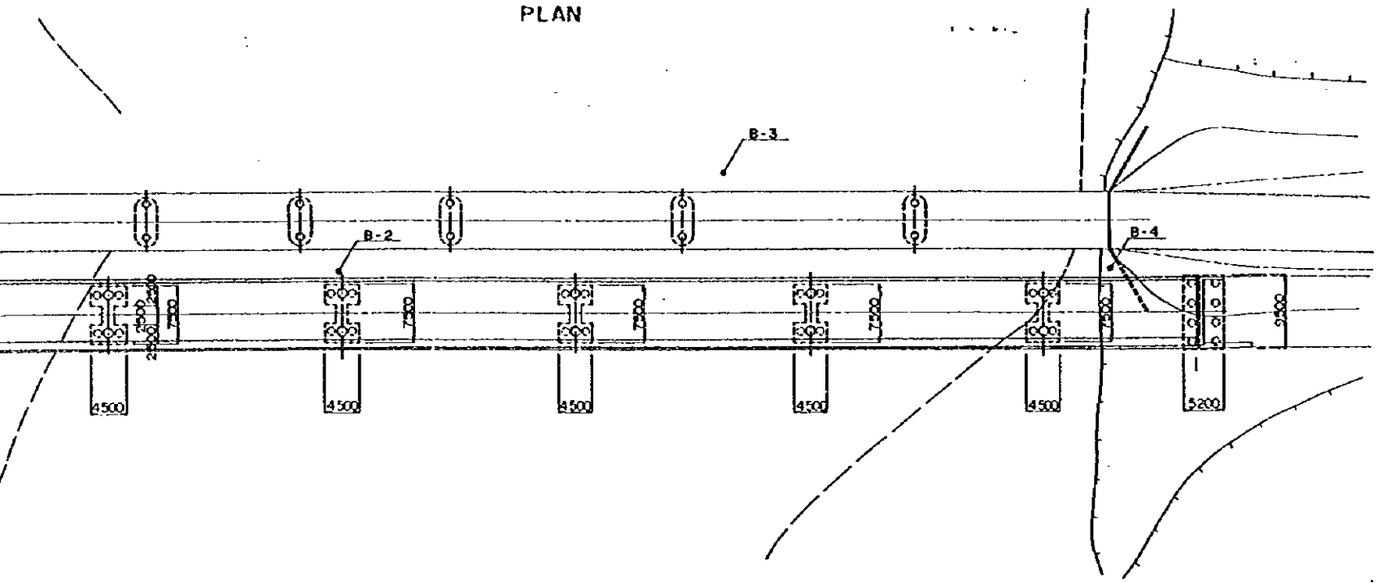


No. 4　バティヤチャー橋

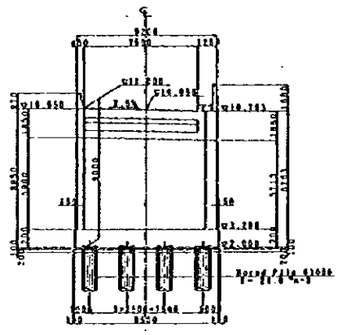




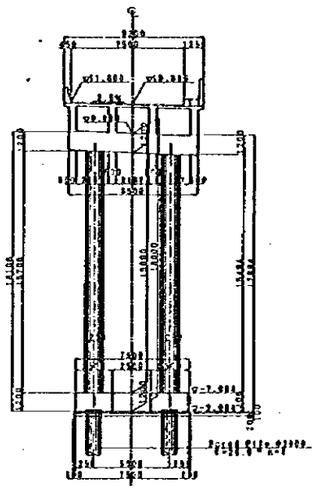
PLAN



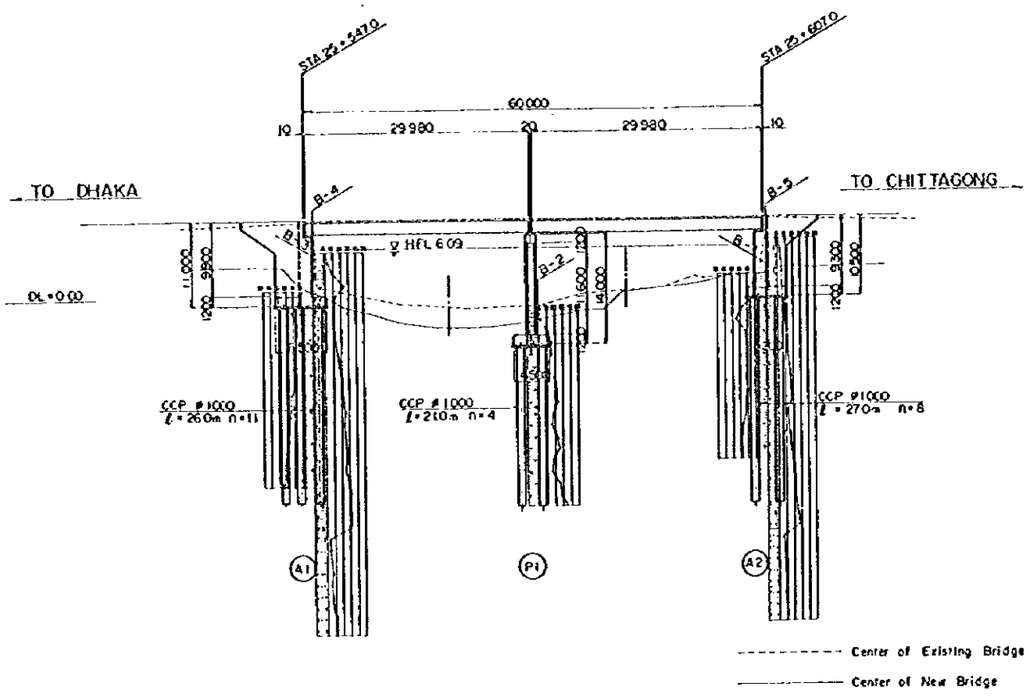
A1 ABUTMENT



P1 PIER

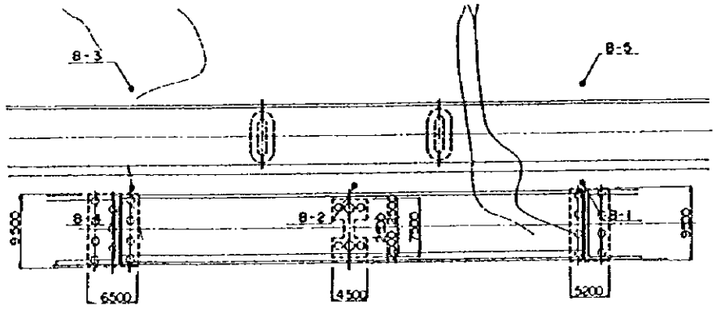


No. 5　マディヤバウシア橋

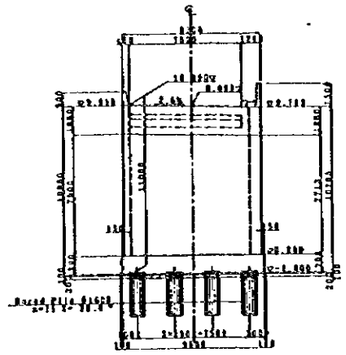


SLOPE	
PROPOSED HEIGHT	10.0 / 10.0 / 10.0 / 10.0 / 10.0 / 10.0 / 10.0 / 10.0
ORIGINAL GROUND LEVEL	
ACCUMULATIVE DISTANCE	
STATION No.	STA.P2 +5400 / +5470 / A1 / +5600 / P1 / +5770 / +5900 / +6000 / +6070 / A2 / +6200

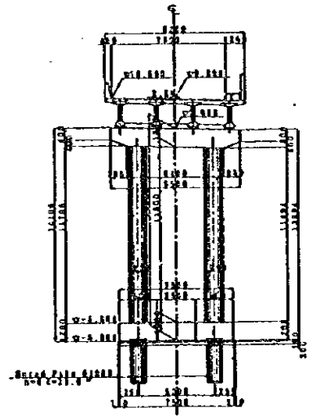
PLAN



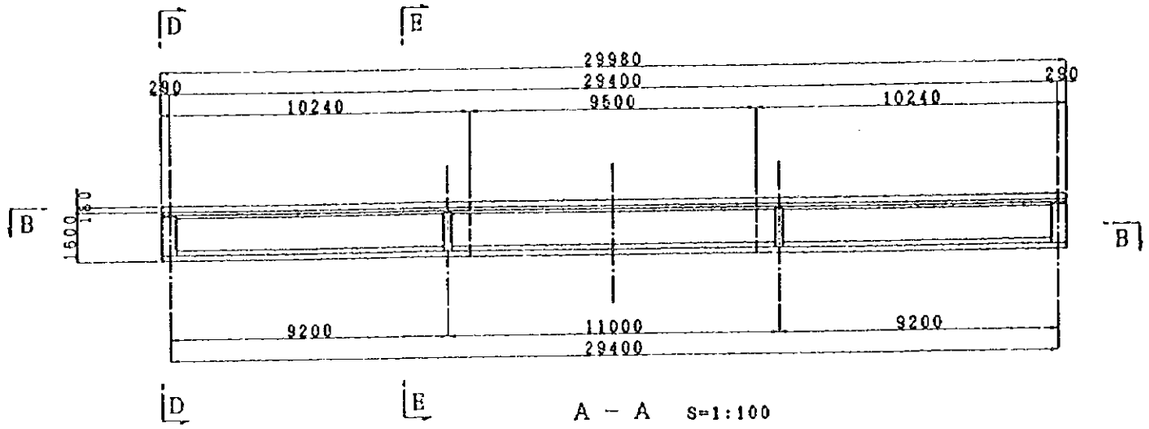
A1 ABUTMENT



P1 PIER



主桁構造図　L=30.0m



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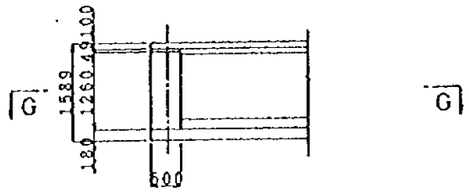
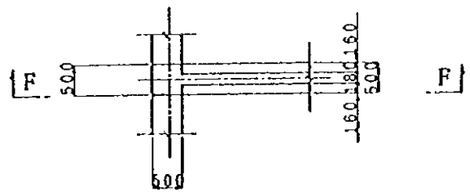
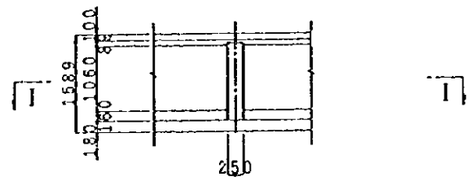


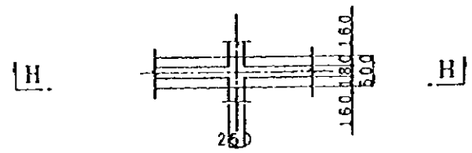
F － F　S=1:50



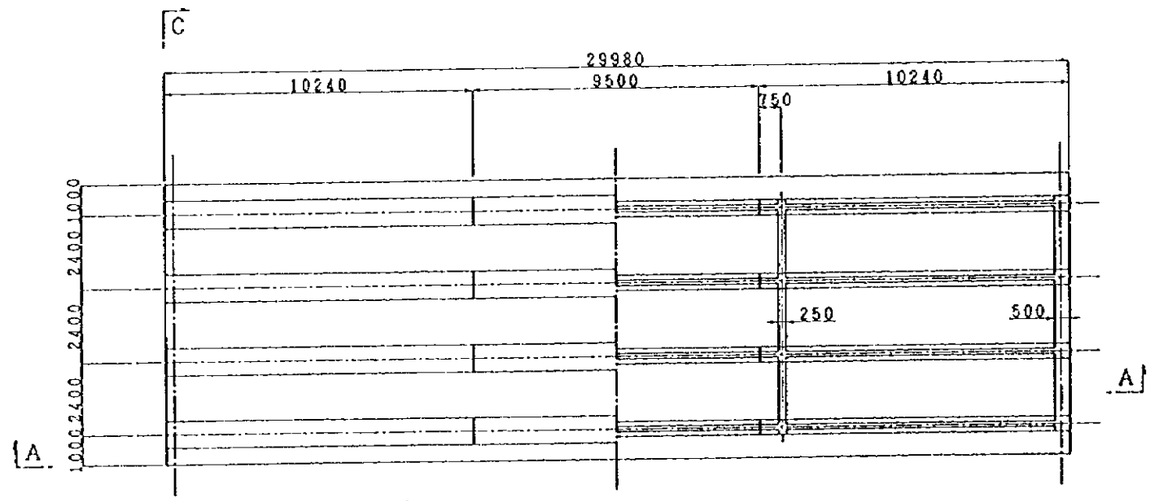
G － G　S=1:50



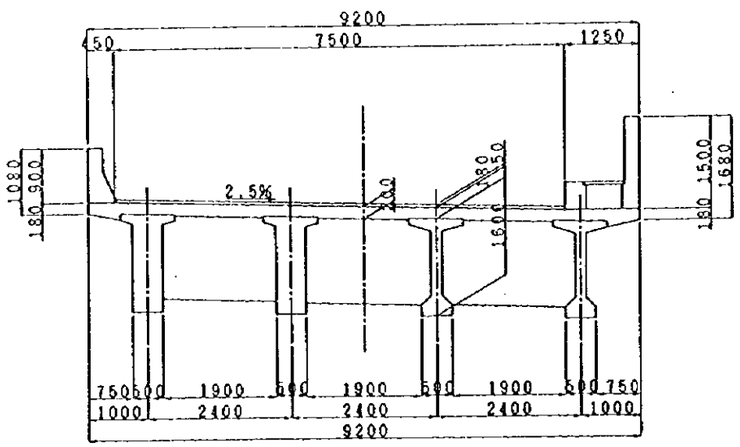
H － H　S=1:50



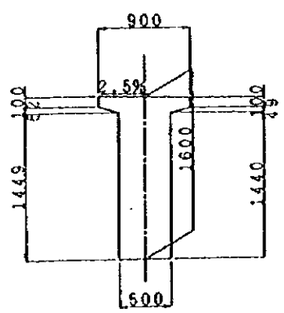
I － I　S=1:50



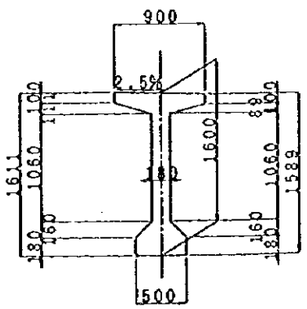
B － B　S=1:100



C － C　S=1:50



D － D　S=1:30



E － E　S=1:30

NO.	DATE	DESCRIPTION	BY

REVISIONS

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF COMMUNICATIONS
ROADS AND HIGHWAYS DEPARTMENT

JAPANESE GRANT AID PROJECT
THE PROJECT FOR THE RECONSTRUCTION OF
FIVE BRIDGES ON DHAKA-CHITTAGONG HIGHWAY

ROAD NAME: DHAKA-CHITTAGONG

CONTRACT NO.

DRAWING TITLE)

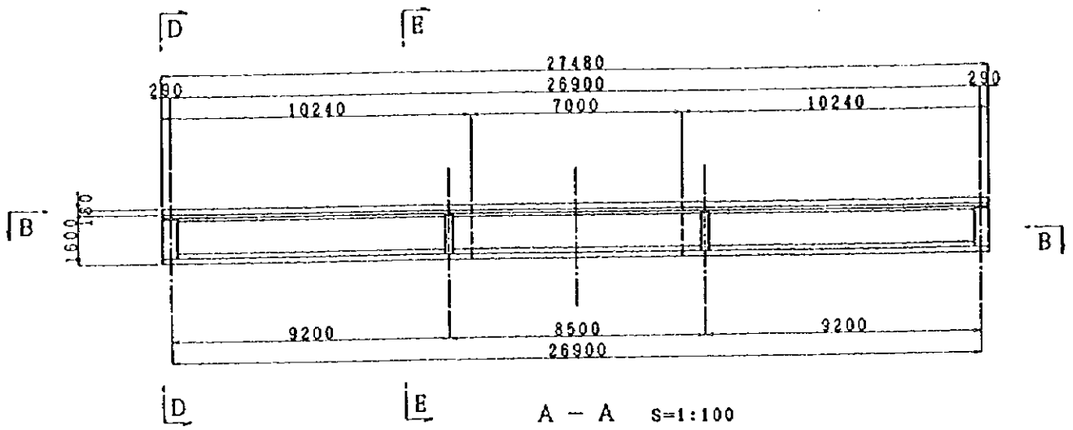
DESIGNED BY:　CHECKED BY:　DATE:

JAPAN BRIDGE & STRUCTURE INSTITUTE, INC.

SCALE:

DWG NO.

主桁構造図　L=27.5m



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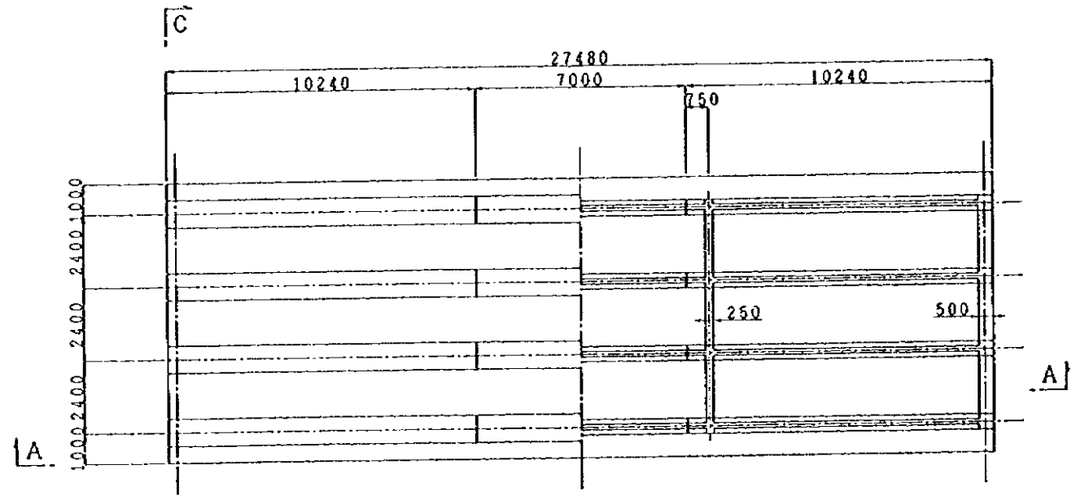
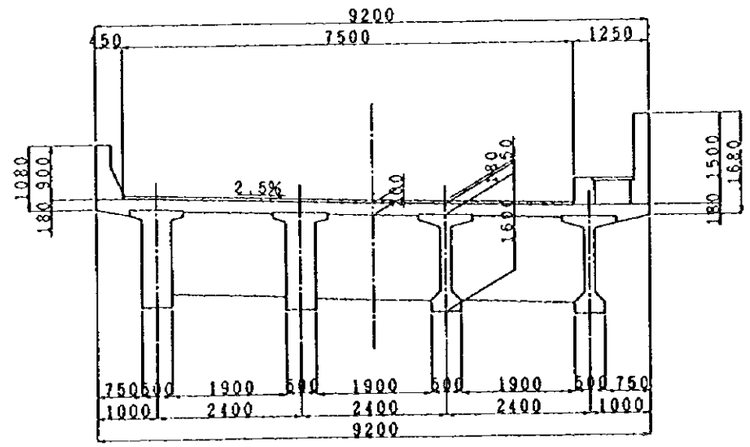
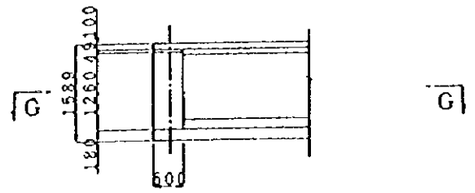


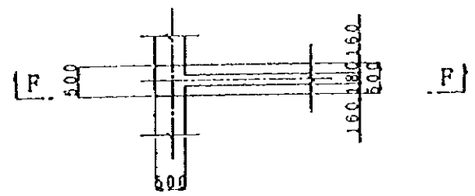
B － B　S=1:100



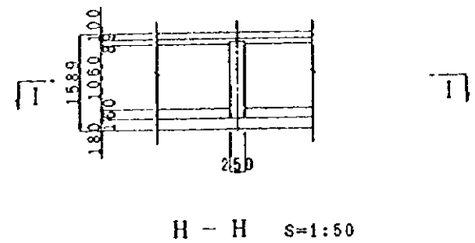
C － C　S=1:50



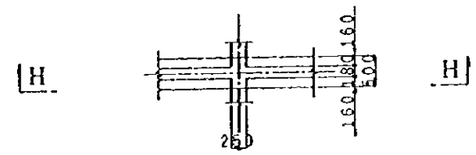
F － F　S=1:50



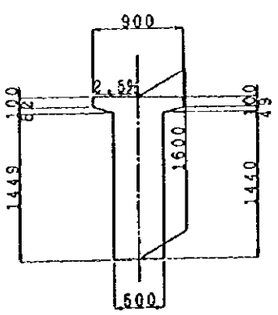
G － G　S=1:50



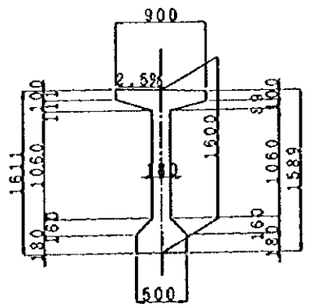
H － H　S=1:50



I － I　S=1:50



D － D　S=1:30



E － E　S=1:30

MK'D	DATE	DESCRIPTION	BY

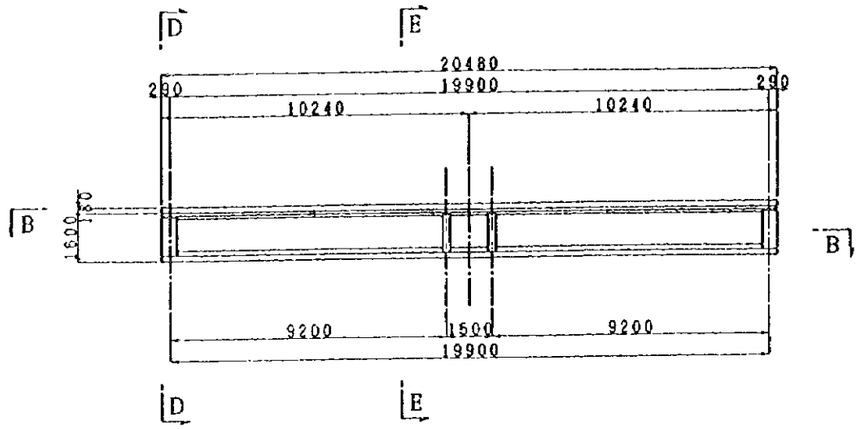
REVISIONS

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF COMMUNICATIONS
ROADS AND HIGHWAYS DEPARTMENT

JAPANESE GRANT AID PROJECT
THE PROJECT FOR THE RECONSTRUCTION OF
FIVE BRIDGES ON DHAKA-CHATTAGONG HIGHWAY

ROAD NAME: DHAKA-BAUCHANGI	CONTRACT NO.
DRAWING TITLE)	APPROVED BY.
DES. AND D BY. CHECKED BY.	DATE)
JAPAN BRIDGE & STRUCTURE INSTITUTE, INC.	SCALE)

主桁構造図　L=20.5m



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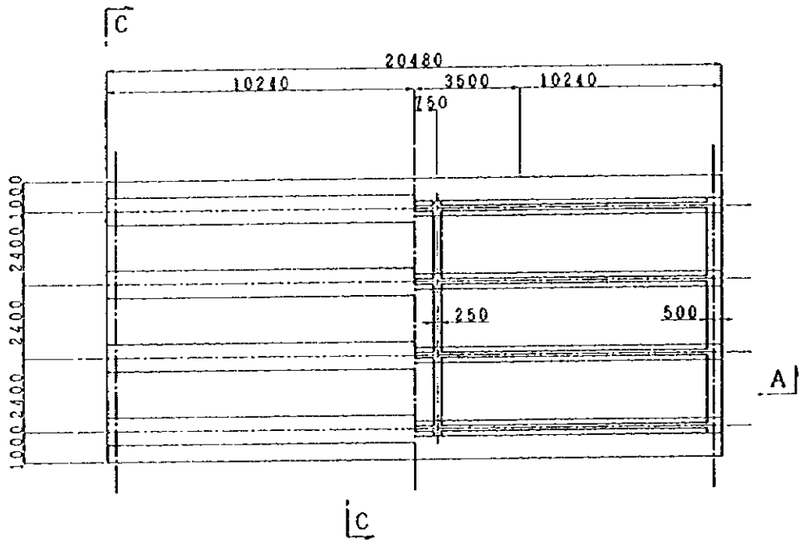
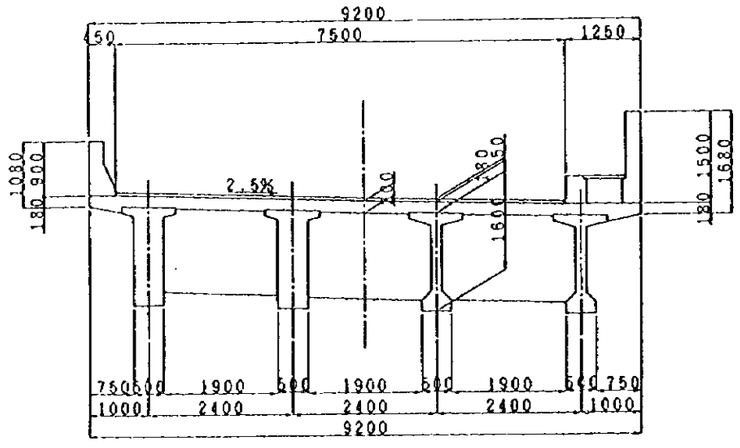
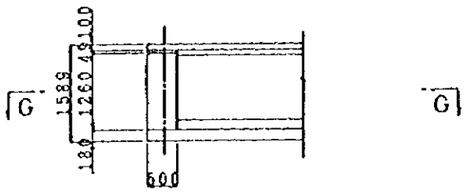


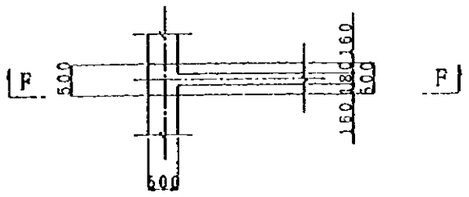
B － B　S=1:100



C － C　S=1:50



F － F　S=1:50



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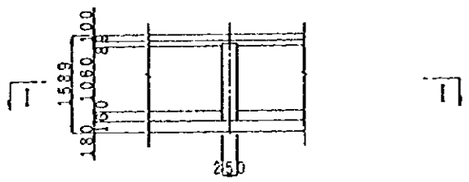

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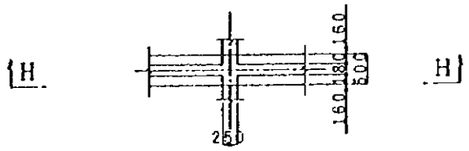

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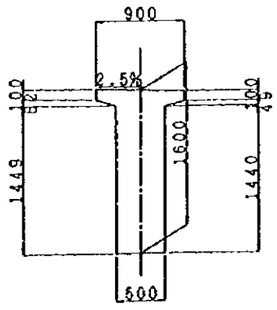

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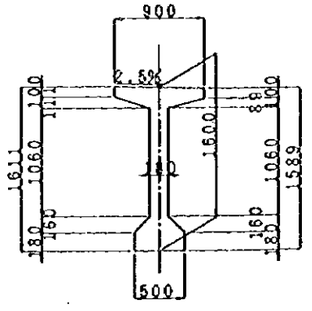

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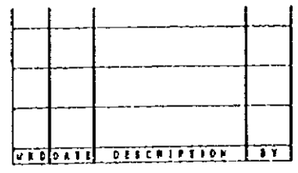

REVISIONS

GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
MINISTRY OF COMMUNICATIONS
ROADS AND HIGHWAYS DEPARTMENT

JAPANESE GRANT AID PROJECT
THE PROJECT FOR 2ND RECONSTRUCTION OF
FIVE BRIDGES ON DHAKA-CHITTAGONG HIGHWAY

ROAD NAME: DHAKA-BAUCKANDI

DRAWING TITLE:

DESIGNED BY:　CHECKED BY:　CONTROLLED BY:　APPROVED BY:　DATE:　SCALE:

JAPAN BRIDGE & STRUCTURE INSTITUTE, INC.

DRG NO.

SUMMARY

of

JAMUNA BRIDGE ACCESS ROADS
PROJECT' S MAIN REPORT

JUNE 1996

1. GENERAL

* Bangladesh
  - Area: 144000 Sq. Km
  - Population: 120 Million
    85% Rural areas - Agriculture
  - Per capita income: US$ 120
* Project implementation agency
  Roads and Highways Department (RHD) under the control of Road & Road Transport Division of the Ministry of Communication responsible for construction and maintenance of major road networks:
  - National H/ways
  - Regional H/ways
  - Feeder type 'A' Roads
* One (1) bridge for 3 Km of roads - reinforced concrete
* Four (4) ferry crossings linking National Highways:
  - Aricha-Nagarbari
  - Bhuapur-Sirajganj
  - Aricha-Daulatdia
  - Mawa-Bhanga
* Detailed pavement assessment undertaken by Road Master Plan Project (RMPP)
* Various measures to improve existing important road network:
  - Rehabilitation and maintenance
  - Bridging the major river gaps
  - Streamlining ferry system where bridges are not available
  - Constructing thana connecting feeder roads
* Various Projects:
  - Road Rehabilitation and Maintenance Project (RRMP) - IDA
  - Road Improvement Project (RIP) - ADB
  - Feeder Road Improvement Project (FRIP) - ADB
  - Road Overlay & Improvement Project (ROIP) - ADB
* Dhaka-Daudkandi Road Section:
  Four (4) lane carriageway - new bridges adjacent to old bridges
  Economic review was conducted to evaluate the feasibility of constructing this section to 4-lane standard
  4-lane road provides more attractive returns and a more robust performance
* Dhaka-Meghna Bridge subsection of Dhaka-Daudkandi road:
  Considerable traffic volume is expected in future
* Vertical profile:
  The design road level has been calculated taking the subgrade level at 30 cm above the design HFL.
* Minimum vertical clearance:
  One (1) meter above highest flood level (HFL) with a return period of 50 years
* Sub-soil investigation for bridges:
  Piled or well foundation required to transmit load from superstructure and substructure to the ground

2. SOILS AND MATERIALS

2.1 Compaction properties of subgrade soils
(Tables 3.1.3 ~ 3.1.6)

Maximum dry density (MDD)	= 1.71 - 1.92	t/cu.m	(range)
	1.84	t/cu.m	(mean)
Optimum moisture content (OMC)	= 11.6 ~ 17.8%		(range)
	15.1 %		(mean)
Field dry density (FDD)	= 1.46 - 1.70	t/cu.m	(range)
	1.59	t/cu.m	(mean)
Field moisture content (FMC)	= 16.0 ~ 28.0%		(range)
	22.0 %		(mean)
Relative subgrade compaction (RSC)	= 78.0 ~ 92.0%		(range)
	87.0 %		(mean)
CBR of subgrade soils at MDD & OMC	= 2.0 ~ 19.0%		(range)
	9.0%		(mean)
CBR of subgrade soils at FDD & FMC	=		(range)
	2.0%		(mean)

2.2 Suitability criteria & design parameters for soils & materials
(see Table 3.1.9)

2.3 Sub-soil investigation

Geotechnical investigation at sites of bridges for Dhaka-Daudkandi Road Section
(see Table 3.2.1.3)

The bridge sites (in chainage) on different road sections of the project along with the total number of bore holes (BH) drilled at a bridge site, range of borehole depths and probable foundation depths at the site are listed in Table 3.2.1.3.

Standard penetration tests (SPT)

Conducted at 1.5 m interval down the depth

SPT-N values used to estimate: Angle of shearing resistance for cohesionless soil, ϕ
Undrained shear strength for cohesive soil, Cu

Engineering parameters; ϕ and Cu, are required for the design of shallow & deep foundations

2.3.1 Bridge sites on Dhaka-Daudkandi Road Section

Foundation soil strata (12 bridge sites) belongs to geologically recent alluvial deposits of young & older Meghna upper strata composed of mainly;

Soft to medium stiff
Low to medium plastic silt
Clayey silt/ silty clay
Very loose to loose to lower medium dense (N < 20)
Nonplastic fine sandy silt/ silty fine sand to considerable depth
= 10 to 25 m (often up to 30 ~ 40 m)

Dense sand strata

Deep foundation of suitable type and dimensions will have to be adopted to support the proposed bridge structures at the abutments and piers (where necessary).

(see Table 3.2.2.3 - pages: 3-44 to 3-65)

2.3.2 Suggested foundation depth

(see Table 3.2.1.3 - page: 3-33)

3. HYDROLOGICAL STUDY

* Hydrological investigation:

Bangladesh Water Development Board (BWDB)

Water Resources Planning Organization (WARPO)

* Data was processed to find:

Water level

Flow velocity

Discharges

For setting the level of road embankment

For design of bridges and cross-drainage structures

* Flood:

20 ~ 25 years' magnitude for design of road embankment

20 ~ 25 years' magnitude for small to medium bridges and culverts

100 years' magnitude for major bridges

* Finally,

Road levels were set with respect to (w.r.t) water level of 1987 flood

Design discharges of bridges estimated based on high water level of 1988 flood

Design height of smaller bridges were fixed w.r.t. normal flood with a free board of 1 m

3.1 Hydrological setting of project roads

Dhaka-Daudkandi Road

* Seven (7) bridges on this road which require to be replaced as per program
* Physical verification of site and channel condition showed that slight increase or decrease in the length of bridges may be made considering the present day hydrological condition
* Accordingly, in consultation with bridge engineer, length of bridges have been fixed

3.2 Provision of navigation under bridges

* Dhaka-Daudkandi Road Section passes through flood plains and intercept a good number of rivers and flood overflow channels
* Due to changed hydrological condition and changes in mode of transportation it is observed that some adjustments are now necessary
* In fixing the height, local information on boat traffic, their size and volume and all other relevant information were used for fixing vertical clearance
* Usually structural depth is added to the design flood level and to it the clearance height according to the class of navigable route is added
* The provision of both vertical and horizontal clearances has been fixed according to the size of the channel and category of boats using them and cost effectiveness of the structure

See Table 4.3 - Page: 4-15

4. TRAFFIC STUDIES

* Traffic surveys
* Demand forecasting procedures
* Calculation of pavement damage factor
* The data have been identified as volume, vehicle mix and equivalent standard axles (ESA) likely to be encountered on project road sections approximately ten years after completion of construction targeted to year 2010.
* Jamuna bridge study
  Bridge volume in year 2020 = 11,300 vehicles per day (vpd)
* Meghna-Gumti bridge project
  Bridge traffic volumes (year 1994) = 4500 - 5000 vehicles/day
  Bridge traffic volumes (year 2020) = 12000 vehicles/day

4.1 Traffic volume

4.1.1 Existing conditions

Dhaka-Chittagong Corridor
(see Table 5.1)

* Highest volumes are found near Dhaka-Daudkandi segment/ section: 16700 vehicles/ day
* Additional count in early 1995 about 1 Km south of Sylhet junction confirmed that total daily volume north of Meghna bridge is among the highest found on the Bangladesh inter-urban road system (see Table 5.2)
* Dhaka-Daudkandi road segment volume (North of Sylhet Junction)
  * Daily demand: 16700 vehicles
    34% (5600) vehicles: buses
    37% (6100) vehicles: trucks
  * Hourly demand: 1000 vehicles between 10:00 & 20:00 hours (relatively constant)
  * Late night volumes are considerable
    (see Fig. 5.2)
  * Peak hour pattern
    (see Fig. 5.3)
  * Hourly passenger car units (pcu) demand
    (see Fig. 5.4)
  * Cumulative hourly pcu pattern
    (see Fig. 5.5)

4.1.2 Forecast demand

* Feasibility study forecasts
  Sensitive to truck types: large (3+axle) units after turn of century
* Approach used to develop forecasts for current study
  * Apply feasibility study growth rates to observed conditions
  * To assist economic feasibility studies, forecasts be available until 20 years
  * Road design will be governed by a 10 year horizon (year 2010) since, over the post-2010 decade, additional road improvements may be implemented, to include resurfacing

* Absolute number of vehicles forecast over this horizon will invariably be limited at some point by roadway capacity
* Road capacities (World Bank, ADB) are used to estimate road section capacities
* Capacities will vary by road section due to:
    Carriageway width
    Shoulder width
    Roadside activity
    Traffic mix
* 7% peak hour factor is adopted to estimate daily capacities
* Forecasting process
    (see Table 5.3)
    * Upon reaching saturation, forecast activity is constrained by the maximum capacity expected to occur throughout Dhaka-Chittagong corridor by 2010
    * Dhaka-Meghna Bridge sub-section of Dhaka-Daudkandi road is assumed to feature 4 lanes

4.2 Vehicle damage factors
    (see Table 5.4)
* Average vehicle weight getting heavier with the passage of time
* Estimation of year 2010 ESA factors
    * Hinges on likely increase of larger (3 or more axle) trucks in traffic stream, cargo loading practices, status of bridge weight limitations, and degree of "on-the-road" enforcement of maximum truck weights by the authorities
    * To ensure a conservative and safe approach to engineering design

	Year 2010 ESA factors
* Small truck (2 axle)	2.0
* Large truck (3+ axle)	3.0
* Cars/utilities/vans	0.003
* Buses	0.280
* Auto rickshaws/ motorcycles	0.001

    * Resultant ESA per day
        (see Table 5.5)
    * Year 2010 ESA values
        Dhaka-Chittagong Corridor 20000 ESA per day

5. ROAD GEOMETRY

Geometric design of road alignment:
    Horizontal alignment:
        Design speed:
            Desirable: 100 Km/hr
            Absolute minimum: 65 Km/hr

Dhaka-Daudkandi Section
* RHD proposes to construct 4-lane bridges at these locations, which will require some shift of alignment
* Road alignment at 7 places (varying lengths) has been shifted to right side by about 9 m from the center line of the existing bridges for accommodating 4-lane bridges

6. BRIDGES AND CULVERTS STRUCTURES

6.1 Existing Structures

6.1.1 Culvert structures (Cs) - 216 Nos.

* R. C. pipe (P)
* Steel Armco pipe (A)
* Culverts with R.C. deck supported on brick abutments
* Single cell or multiple cell R.C. box culverts (C)
* Brick masonry arches (Ar)

6.1.2 Bridges (Br) - 76 Nos.

* PC superstructure (s/s) over R.C. piers & abutments on piled/well foundation
* Simply supported R.C. T-beam s/s over R.C. piers & abutments on piled/well foundation
* R.C. balanced cantilever s/s over R.C. piers & abutments on piled/well foundation
* Japanese plate girder thru-type s/s supported on brick masonry piers & abutments on brick walls
* Thru-type truss bridge of single lane with brick masonry piers & abutments supported on brick walls
* R.C. deck slab supported on rolled steel joists with brick masonry piers & abutments

6.1.3 Available information

"As built" drawings are very few:

* Only information about accessible parts of the structures
* No information of foundation structures
* Partial information on reinforced concrete components and abutment structures

6.1.4 Brief description of Dhaka-Daudkandi Road

* Located in between Sitalakkha bridge (400 m) & Meghna Gumti bridge (1410 m)
* 12 bridges excluding Meghna bridge (930 m) - all need replacement
* Meghna & Meghna-Gumti bridges:
  Prestressed concrete cantilever bridges founded on bored piles
  Constructed recently by progressive cantilever method
  Carriageway width = 7.2 m

6.2 Evaluation

Assessment: Visual examination:

* Structural adequacy & safety
* Functional adequacy & serviceability
* Residual life of structure

6.2.1 Evaluation of structural adequacy

* Deck condition: Severity of cracks
  Sapling of concrete
  Delimitation of concrete
  Corrosion in reinforcement
  Cracks &/or excessive sag
  Excessive movement of bearings, if any, was recorded

* Bearing: Condition & performance
  - Noticing displacements
  - Noticing cracks
  - Corrosion &/or
  - Rusting in case of steel bearings

* Substructure & Foundation: Distress in substructure
  - Sign of movement:
    - Lateral
    - Vertical
  - Deterioration of concrete
  - Corrosion of steel
  - Collision damage etc.

  Distress in foundation
  - Sign of:
    - settlement
    - lateral movement
    - sliding
    - scour

6.2.2 Assessment of functional adequacy & serviceability

* Findings of hydrological investigations were considered while evaluating the adequacy of linear waterway and head-room clearance
* Suitable protective measures adopted where signs of scour near foundation level
* Footpaths - necessary near villages and towns
* Bridges with substandard approach alignments:
  - Suggested for reconstruction from geometric point of view of road
  - In case of large structures modify approach geometry

6.2.3 Assessment of residual life

* Design life: 50 years (Normally)
* Life expectation
* Faster aging: Lack of maintenance, accidents
  - Shorter residual life than estimated from design

6.3 Replacement Criteria

* Structural inadequacy: Underdesign
  - Weakened over service life
* Functional/ Serviceability Deficiency: One lane to two lanes
* Change in road alignment: Horizontal
  - Vertical - rise in deck level

6.4 Rehabilitation

* Highly specialized techniques
* Ascertain present condition of the structures
* Correct diagnosis crucially important in devising the process & techniques for carrying out the scheme of rehabilitation - high degree of expertise in implementation

6.5 Structures for New Construction

6.5.1 Type of structures

On appraisal of the various forms of structure, the following structure types have been selected for adoption within the physical limits indicated:

Type of structure	Length of structure along road C/L
* Concealed R.C. box culvert	1.0 to 4.5 m & one 2x4.5m
* R.C. box culvert	1.0 to 6.0 m or multiple max. 4 vents
* R.C. T-beam & slab deck supported on R.C. abutments & wingwalls	15 m single span
* PSC girders & R.C. slab deck supported on R.C. abutments & wingwalls	20 to 45 m or multiple (Single span or with intermediate piers)

6.5.2 Criteria of selection

* Hydraulic parameters
* Foundation parameters
* Physical parameters
* Materials of construction
* Construction methods

6.5.2.1 Hydraulic parameters

* More reliance of structure's past performance in assessing their hydraulic design parameters
* Where existing structures inadequate, the opening suitably increased on the basis of hydraulic analysis
* In certain areas, the hydrology of the region has since changed due to implementation of the flood control/ irrigation/ drainage projects:

  Due to this, the waterway widths of some structures have been found to be greater than the present requirements;

  Relevant structures have been proposed to be either closed down or replaced by a structure of significantly less vantage determined from analytical assessment of the new drainage basin

6.5.2.2 Foundation parameters

* Permissible bearing capacity at the foundation level is low = 5 to 10 t/sq.m.

  R.C.C. box structure
* For span greater than 10 m pile/well foundation adopted
* No bridge foundation on open excavation:

  Loose soil for top few meters

  Future scouring effect in the channel bed

6.5.2.3 Physical parameters

* Height of the approach embankment
* Uniformity in bed level of the waterway
* Magnitude of the waterway
* Period for which waterway keeps dry
* Obstacles - like discarded foundations of structures being replace
* Box culverts - suitable and economical where following physical parameters are satisfied:

Embankment height is between 2.5 to 5.5 m
Bed is of uniform level
The waterway keeps dry for reasonable periods in a year

* Bridges preferred over box culvert where a structure is required to span a waterway having a gorge.

6.5.2.4 Materials of construction

* Brick masonry
* Reinforced concrete
* Prestressed concrete - most bridges of prestressed concrete deck
  P.C. simply supported girder bridges - economical for span ranging from 30 to 50 m for reasonable good foundation conditions
* Brick masonry arch culverts

6.5.2.5 Construction methods

* Conventional construction methods
  In situ reinforced concrete construction for sub-structures
* For 4-lane bridge on Dhaka-Daudkandi road 2 bridges of 2 lanes each side by side which will eliminate the necessity of costly diversion bride on each site
* Piers and abutments are designed on cast-in-situ bored piles
* Minimum distance between first and second phase
  bridge foundation piles: = 2 m (3 times the proposed pile dia)
  So no difficulty in driving the board piles by usual pile driving equipment
  Precaution taken in retaining earth behind the abutments by sheet piling in between two foundations until 2nd phase bridge is completed
* New bridges located on the old bridge locations, staggered position of abutments and piers are proposed for new bridges, so that old and new foundations do not interfere - old bridge foundation dismantled for clearance of channel bed
* Length of new bride has adequate provision for waterway not to interfere in the channel flow due to double set of piers during 1st phase construction

6.6 Design Standards

6.6.1 Loading

* Live load: AASHTO HS20-44 loading + impact + traction forces
* Seismic forces: Zone II in seismic zoning map of Bangladesh
* Wind load: Per wind speed map of Bangladesh
* Others: Stipulations of AASHTO
* Combination of forces: Stipulations of AASHTO

6.6.2 Roadway width over structures

* Structure with total length
  equal or less than 10 m: Full roadway width adopted
  = 12.2 m for new structures decided by RHD
  = 12.2 to 7.2 m for existing structures retained
* Structures with total length
  over 10 m
  2-lane: 7.5 m carriageway & 1.25 m sidewalk on each side of deck
  4-lane: 7.5 m carriageway on each side with 1 m median and 1.25 m sidewalk on each side of bridge deck

* Reduced pavement width
  2-lane: 6.7 m

6.6.3 Vertical clearance

* Navigation clearance: Minimum 7.6 m (25 ft) under a new bridge across National waterways as stipulated by Bangladesh Inland Water Transport Authority (BIWTA) - not applicable in present case
* Others: Minimum vertical clearance of 1 m above HFL with a return period of 50 years where no navigational vertical clearance is necessary

6.7 Design of Various Structures & Elements

6.7.1 R.C.C. box structures

* Opening: 1 to 6 m
* Continuous box structure: Maximum of 4 vents
* Concrete: Grade C25
* Reinforcement: High yield deformed bars
* Economy: 5 to 7% in using above concrete and reinforcement

6.7.2 R.C. T beam and slab

* Span: 15 m
* Concrete: Grade C25
* Reinforcement: High yield deformed bars

6.7.3 Abutments and piers

6.7.3.1 Abutments

* Designed for retaining full earth
* Spill-through type abutments avoided in view of the possible danger of erosion and lack of maintenance
* Buried abutments with earth-cone in front have been devised where active earth pressure becomes excessive
* R. C. abutments proposed - suitably designed inverted filter layers placed against the inner faces of the abutments have been recommended - the fill behind the abutments shall be selected granular material
* All bridge structures provided with U-Type wing walls at both upstream & downstream

6.7.3.2 Piers

* Twin columns, circular in shape with pier cap
* R.C. structures for piers

6.7.3.3 Foundations

* Piled foundations for bridges over streams where the expected scouring effect is not significant
* Bridges over rivers where scouring is anticipated, brick masonry well foundations may be adopted

6.7.4 Pedestrian/ traffic railing & parapets

* Category A: R.C.C.
  Designed as combined traffic & pedestrian railing to withstand the specified load of 10 Kips applied at a height of 1.2 m
* Category B: R.C.C. parapets
  Used for single span box culverts
* Category C: For use in rehabilitated constricted two-lane bridge decks, with hand railings provided on top of crash barriers

6.7.5 Erosion control

* Brick flat pitching
* Sodding
* Adequate erosion control measures with brick filled gabions where erosion of banks prominent.

7. ENVIRONMENT

Short-term construction impacts

* Short-term construction phase impacts include disturbance of river sediments in the vicinity of reconstructed bridges and culverts, suspension of sediments in water column and potential disruption of aquatic communities
* Construction phase activities require:
  - Temporary occupation of land for construction offices and camps
  - Construction material excavation
  - Brick manufacturing
  - Material stockyards
  - Construction material handling
  - Movement of construction vehicles and machinery

  These operations would result in the short-term destruction of vegetation, disturbance of soils, and increase in noise levels, air pollutants emitted from vehicles and machinery, and dust - local and short lived
* Short-term impacts on public health may result from water supply and sanitation practices particularly at construction camps - diseases
* Long-term implications of construction phase activities
  - Excavation of borrow materials and brick manufacturing
  - Employment opportunities during project construction depend on:
    - Construction methods
    - Construction material requirements
    - Borrow area and brick yield locations
    - Construction scheduling

Long-term impacts

* High flood periods: Mid-August to Mid-October
* Drainage pattern and flooding is significantly affected by man-made structures, in particular communication infrastructure
* Existing railway and road embankments detain and impound flood waters
* The height of the embankments and the design characteristics and condition of associated drainage structures determine the effects of the structures on flood elevations
* The proposed roadway improvements, bridge and culvert reconstruction are being designed

to maintain the existing drainage patterns and minimize impacts to the timing, frequency, and duration of flood events

* Traffic volumes:
  These are expected to increase on the project roadways over the next several decades
  The projected traffic increases, and the resulting, long-term increases in noise and air pollution levels in the vicinity of the project, therefore are not evaluated as impacts of the proposed action.
* Long-term, permanent impacts of the proposed action would comprise the removal of existing trees from the right-of-ways of the project roadways, the involuntary resettlement of households and the displacement of agricultural and fishery resources.

10. 参考資料リスト

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