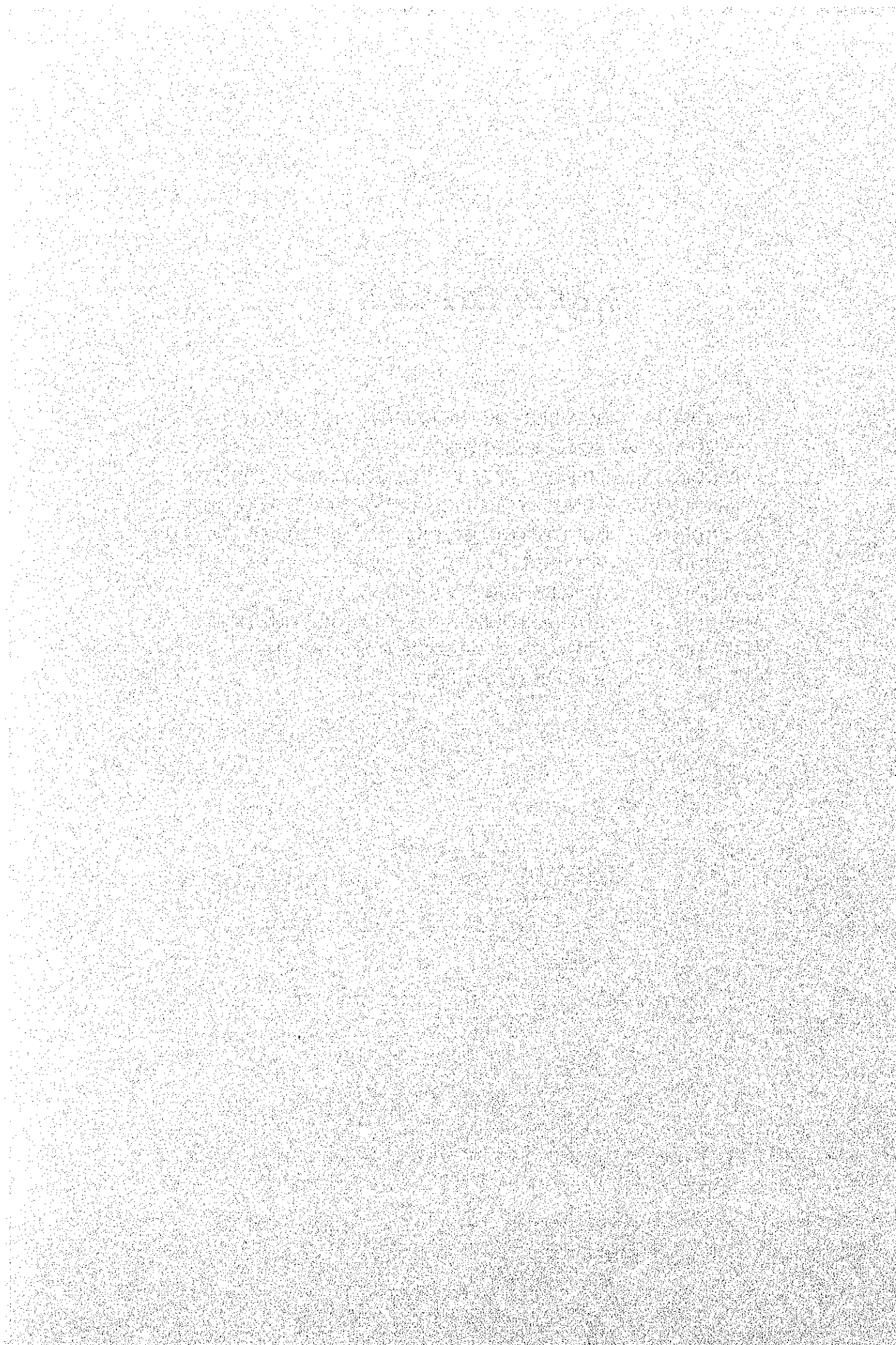


APPENDIXES

APPENDIX-1	MEMBERS OF THE BASIC DESIGN STUDY
APPENDIX-2	SURVEY SCHEDULE
APPENDIX-3	MEETING MEMBERS OF GOI AND GOJ PERSONS
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APPENDIX-7	TRAFFIC SURVEY RESULTS
APPENDIX-8	BORING LOGS OF SUBSOIL INVESTIGATION
APPENDIX-9	ESTIMATION OF COSTS BORNE BY THE RECIPIENT COUNTRY



APPENDIX-1 MEMBERS OF THE BASIC DESIGN STUDY

(1) Field Survey

OKAMOTO Shigeru	Leader Deputy Director, Study Review and Coordination Division, Grant Aid Study and Design Department JICA
SUZUKI Motohiro	Bridge Planner Manager, Maintenance Planning Division, Maintenance Department, Honshu-Shikoku Bridge Authority
ENOMOTO Koji	Chief Consultant Nippon Koei Co., Ltd.
MATSUZAWA Katsufumi	Bridge Designer Nippon Koei Co., Ltd.
HONMA Masahito	Traffic Planner Nippon Koei Co., Ltd.
KACHI Toshio	Natural Conditions Surveyor Katahira & Engineers International
FUJITAKA Katsumi	Cost Estimator Nippon Koei Co., Ltd.

(2) Explanation of the Draft Report

OKAMOTO Shigeru	Leader Deputy Director, Study Review and Coordination Division, Grant Aid Study and Design Department JICA
SUZUKI Motohiro	Bridge Planner Manager, Maintenance Planning Division, Maintenance Department, Honshu-Shikoku Bridge Authority
ENOMOTO Koji	Chief Consultant Nippon Koei Co., Ltd.
MATSUZAWA Katsufumi	Bridge Designer Nippon Koei Co., Ltd.

APPENDIX-2 SURVEY SCHEDULE

(1) Field Survey

	Date	Survey Activities
July	19 (Tue)	- Mr. Enomoto & Mr. Kachi arrived in Delhi
	20 (Wed)	- Visit JICA India Office and Ministry of Surface Transport (MOST)
	21 (Thu)	- Internal Meeting
	22 (Fri)	- Procurement of Topographic Survey Company and Geotechnical survey Company
	31 (Sun)	- Meeting with JICA India and MOST
Aug.		- Data Collection
		- Site Investigation
		- Mr. Honma arrived in Delhi on 24th (Sun)
	1 (Mon)	- Preliminary Performance for Traffic Volume Survey
	2 (Tue)	- Determine the Locations of Boring
		- Traffic Volume Survey
	3 (Wed)	- Traffic Volume Survey
	4 (Thu)	- Data Collection
	through	- Site Investigation
	7 (Sun)	- Mr. Fujitaka arrived in Delhi on 5th (Fri)
		- Mr. Matsuzawa arrived in Delhi on 7th (Sun)
	8 (Mon)	- Meeting with JICA India Courtesy Call to Ministry of Finance (MOF)
		- Meeting with MOST
	9 (Tue)	- Site Investigation
		- Meeting with MOST regarding Location of the New Bridge
10 (Wed)	- Site Visit of Improvement Project of National Highway, No. 2	
11 (Thu)	- Data Collection	
through	- Meeting with Most regarding Bridge Configuration	
16 (Tue)	- Supervising Topo. & Geotech. Survey at the field	
	- Mr. Kachi left Delhi on 14th (Sun)	
	- Leader (Mr. Okamoto) and Bridge Planner (Mr. Suzuki) arrived in Delhi on 16th (Tue)	
	- Internal Meeting	
17 (Wed)	- Courtesy Call to Embassy of Japan (EOJ), MOF of India	
	- Meeting with MOST	

(Continued)

Date	Survey Activities
18 (Thu)	- Meeting with MOST
19 (Fri)	- Meeting with MOST regarding Draft Minutes of Discussions, Mr. Honma Left Delhi
20 (Sat) through 21 (Sun)	- Data Collection
22 (Mon) through 32 (Tue)	- Discussion and Draft Minutes of Discussions and Technical Note
24 (Wed)	- Signing Minutes of Discussions and Technical Note - Visit EOJ
25 (Thu)	- Internal Meeting
26 (Fri) through 31 (Wed)	- Data Collection, Leader (Mr. Okamoto), Bridge Planner (Mr. Suzuki) and Bridge Designer (Mr. Matsuzawa) left Delhi - Site Visit of Asphalt Plants & Bridge Construction Site
Sept. 1 (Thu)	- Left India

(2) Explanation of the Draft Report

Date	Survey Activities
Nov. 9 (Wed)	- Mr. Enomoto and Mr. Matsuzawa arrived in Delhi
10 (Thu)	- Visit JICA India Office and Embassy of Japan (EOJ)
11 (Fri)	- Meeting with MOST
12 (Sat)	- Meeting with the Government of Delhi
13 (Sun)	- Site Investigation, Leader (Mr. Okamoto) & Bridge Planner (Mr. Suzuki) arrived in Delhi
14 (Mon)	- Meeting with MOST and MOF
15 (Tue)	- Meeting with EOJ, MOST and MOF
16 (Wed)	- Meeting with MOST
17 (Thu)	- Signing Minutes of Discussion
18 (Fri)	- Left Delhi
19 (Sat)	- Arrived at Narita

APPENDIX-3 MEETING MEMBERS OF GOI AND GOJ PERSONS

Department of Economic Affairs, Ministry of Finance, Government of India

Mrs. Rama MURALI	Joint Secretary
Mr. D. N. Narashimha RAJU	Deputy Secretary
Mr. G. S. GREWAL	Under Secretary
Mr. Mool CHAND	Section Secretary

Ministry of Surface Transport, Government of India

Mr. M. V. SASTRY	Director General (Road Development)
Mr. N.K. SINHA	Chief Engineer (Project Implementation Cell)
Mr. K.B. SARKAR	Predecessor of Chief Engineer (Project Implementation Cell)
Mr. M. R. KACHHWAHA	Chief Engineer (Bridges)
Mr. O. N. SAXENA	Superintending Engineer (Bridges)
Mr. B. R. SURI	Superintending Engineer (Bridges)
Mr. P. R. ACHARYA	Deputy Financial Adviser
Mr. Madan MOHAN	Assistant Financial Adviser

Ministry of Urban Development, Government of India

Mr. O. D. MOHINDRA	Additional Director General cum Project Manager (Chief Engineer), Yamuna Bridge Project Zone Delhi
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**Public Works Department, Government of the National Capital Territory
of Delhi**

Mr. O.P. PUROHIT	Superintending Engineer, Yamuna Bridge Project, Circle I
Mr. V. D. GUPTA	Superintending Engineer, Yamuna Bridge Project (Plan)
Mr. R. L. RAKHEJA	Executive Engineer, Yamuna Bridge Project

Embassy of Japan

Mr. Cyusei YAMADA	The Japanese Ambassador in India
Mr. Michio HIROSE	First Secretary
Mr. Masato FUKUSHIMA	First Secretary

JICA India Office at MOST

Mr. Minoru SASAGO	Resident Representative
Mr. Masahiro NOMURA	Deputy Resident Representative
Mr. Toshifumi SAKAI	Deputy Resident Representative

JICA Expert

Mr. Hiroshi NAKAO	Ministry of Surface Transport (Roads Wing)
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MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY ON THE PROJECT FOR CONSTRUCTION OF THE NIZAMUDDIN BRIDGE IN INDIA


In response to a request from the Government of India, the Government of Japan decided to conduct a Basic Design Study on the Project for Construction of the Nizamuddin Bridge in India (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent a study team to India headed by Mr. Shigeru OKAMOTO, Deputy Director, Study Review and Coordination Division, Grant Aid Study and Design Department of JICA. The team is scheduled to stay in the country from July 19 to August 30, 1994.

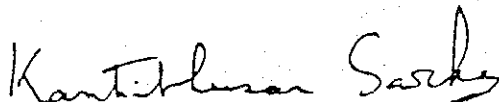
The team held discussions with the officials of the Government of India and conducted field surveys in the study area.

In the course of the discussion and field surveys, both parties have confirmed the main items described in the attached sheets. Upon completion of the study team's trip to India, it will prepare the Basic Design Study Report in Japan.

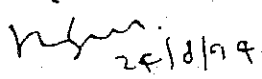
Delhi, 24th August 1994.



Shigeru OKAMOTO
Leader
Basic Design Study Team
Japan International
Cooperation Agency



K. B. SARKAR
Chief Engineer (PIC)
Ministry of Surface Transport
Government of India



D. N. NARASIMHA RAJU
Deputy Secretary
Department of Economic Affairs
Ministry of Finance
Government of India

ATTACHMENT

1. Name of the Project

The Project for Construction of the Nizamuddin Bridge in India.

2. Objective of the Project

The objective of the Project is to construct a new 550m long four-lane bridge crossing the Yamuna River for substitution of the existing Nizamuddin Bridge.

3. Project Location

The Project Location is on the downstream side of the existing bridge as shown in Annex-I.

4. Executing Agency of the Government of India

The Ministry of Surface Transport (hereinafter referred to as "MOST") through Public Works Department of the Delhi Government is responsible for the execution of the Project.

5. Scope of the Project

After discussions with the Basic Design Study Team, the request for the Project by the Government of India was confirmed as follows:

- 1) Bridge Name : Nizamuddin Bridge
- 2) Route : National Highway No.24
- 3) Location of Bridge : Near Nizamuddin in Delhi
- 4) Bridge Length : Approx. 550 m
- 5) Approach Road Length : Approx. 700 m on the left bank side
Approx. 300 m on the right bank side
- 6) Number of Lanes : 4 lanes
- 7) Bridge Width : 22.500 meters (15-meter lane width plus 6 meters for side-walks)
- 8) Structural Type of Bridges
 - Superstructure : Prestressed Concrete Type
 - Substructure : To be determined in the study and analysis
 - Foundation : To be determined based on the results of the geotechnical investigation
- 9) Design Standard
 - (1) Live Load : In accordance with Japanese Standards and being checked by Indian Standards (Indian Roads Congress Code)

(2) Design Standard : In accordance with Japanese Standards and Indian Standards by the Indian Roads Congress

10) Public Utilities and Facilities on the New Bridge

- Water Main : Excluded
- Telephone Line : Loading will be considered in the design
- Electricity Cable / Wire : Loading will be considered in the design
- Lighting Facility : To be provided

It should be noted that the final components of the Project will be decided upon after further studies are made.

6. Japan's Grant Aid System

- 1) The Government of India fully understood Japan's Grant Aid system as described in Annex-II.
- 2) The Government of India has understood the roles of Japanese consultant as executing detailed design and construction supervision and contractor as executing the work covered by Japan's Grant Aid to be contracted for implementing the Project after signing Exchange of Notes (E/N).
- 3) The Government of India agreed that the contract with the above Japanese contractor shall be executed in accordance with the "GUIDELINES FOR PROCUREMENT UNDER THE JAPANESE GRANT, 1991, JICA".
- 4) On condition that the Grant Aid Assistance by the Government of Japan is extended to the Project, the Government of India will take necessary measures as described in Annex-III for the smooth implementation of the Project.
- 5) MOST has agreed to secure the budget and other necessary clearances for fulfilling the undertakings to be covered by the Government of India prior to the commencement of the Project.

7. Fee of Use

No fee will be collected for use of this bridge being situated in urban limit of Delhi Metropolis.

8. Schedule of the Study

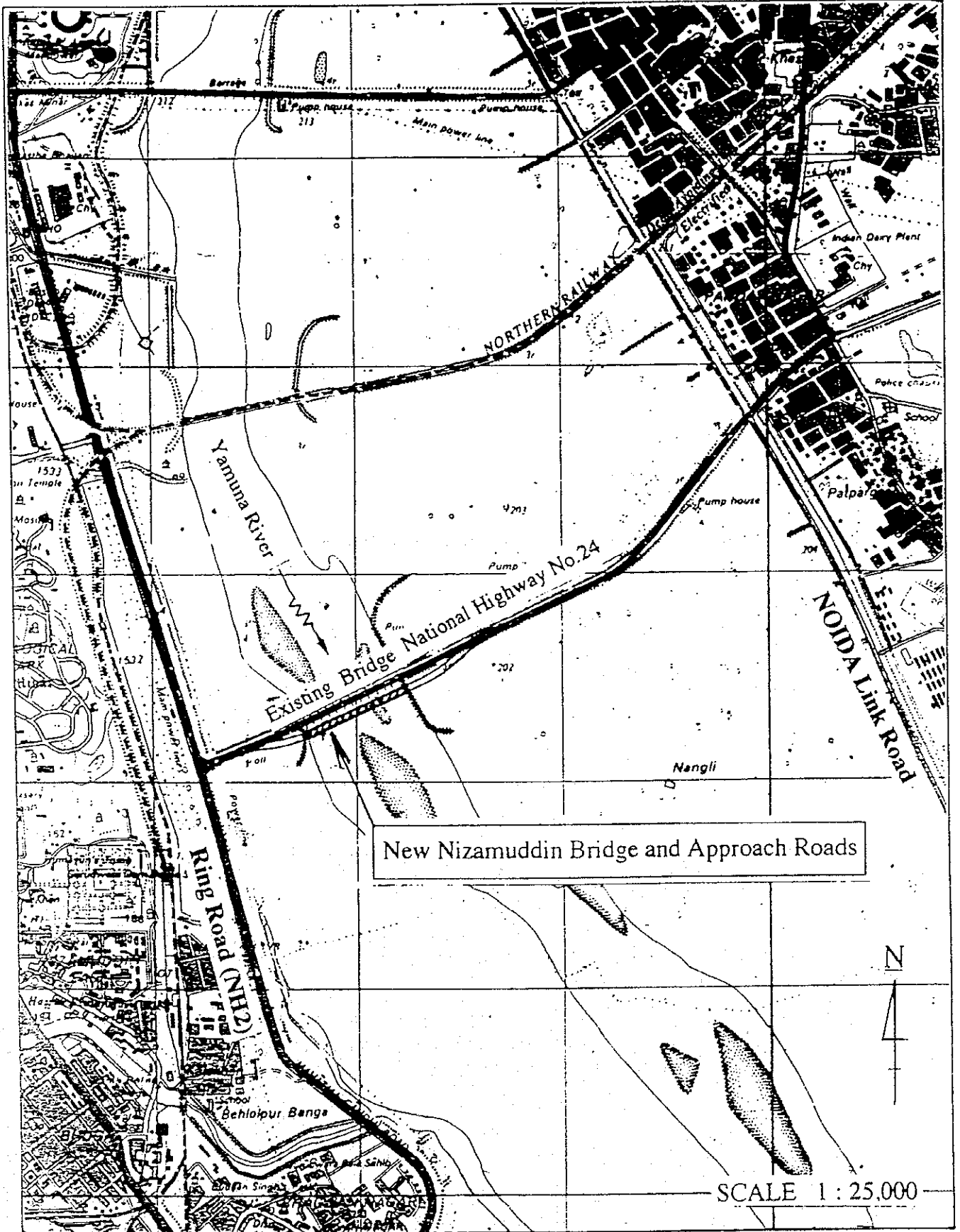
- 1) The Study Team will continue its studies in India until August 30, 1994.
- 2) JICA will prepare the draft final report and dispatch a mission to India in November 1994 in order to explain its contents.
- 3) In case that the contents of the report are accepted in principle by the Indian side, JICA will complete the final report and send it to the Government of India by the end of January 1995.

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ANNEX-I

PROJECT LOCATION MAP



New Nizamuddin Bridge and Approach Roads

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ANNEX-II

JAPAN'S GRANT AID PROGRAM

1. Japan's Grant Aid Procedures

The Japan's Grant Aid Program is extended in the following procedures.

- 1) • **Application** (A request made by the recipient country)
- **Study** (Basic Design Study conducted by JICA)
- **Appraisal & Approval** (Appraisal by the Government of Japan and Approval by the Cabinet of Japan)
- **Determination of** (Exchange of Notes between both Governments)
- Implementation**
- **Implementation** (Implementation of the Project)

- 2) At the **first step**, application, a request made by the recipient country, is examined by the Government of Japan (the Ministry of Foreign Affairs), whether or not it is suitable for Grant Aid. If the request is confirmed that it has the high priority as the Project for Grant Aid, the Government of Japan instructs JICA to conduct the Study.

At the **second step**, the Study (the Basic Design Study) is conducted by JICA basically under contracts with a Japanese consulting firm to carry out.

At the **third step** (appraisal & approval), the Government of Japan appraise whether or not the Project is suitable for Japan's Grant Aid Program based on the Basic Design Study report prepared by JICA and is then submitted for approval by the Cabinet.

At the **fourth step** the Project approved by the Cabinet is officially determined to implement by signing the Exchange of Notes between both Governments.

In the course of implementation of the Project, JICA will take charge of expediting the execution by assisting the recipient country in terms of the procedures of tender, contract and others.

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2. Contents of the Study

1) Contents of the Study

The purpose of the Study (the Basic Design Study), conducted by JICA, is to provide basic document necessary for the appraisal by the Government of Japan whether or not the project is viable for Japan's Grant Aid Program. The contents of the Study are as follows:

- a) to confirm the background of the request, objectives, effects of the Project and maintenance ability of the recipient country necessary for the implementation,
- b) to evaluate the appropriateness of the Grant Aid from the technological, social and economical points of views,
- c) to confirm the basic concept of the plan mutually agreed upon through discussion between both sides,
- d) to prepare a basic design of the Project,
- e) to estimate the rough cost of the Project.

The contents of the original request are not necessarily approved as the contents of the Grant Aid as it is. The Basic Design of the Project is confirmed considering the Japan's Grant Aid scheme.

In the implementation of the Project, the Government of Japan requests the recipient country to take necessary measures in order to promote it's self-reliance. Those undertakings must be guaranteed even if the recipient implementing entity does not have jurisdiction. Therefore the implementation of the Project is confirmed by all relevant organizations in the recipient country in the Minutes of Discussions.

2) Selection of Consultants

For the smooth implementation of the study, JICA selects a consultant among those consultants who registered to JICA by evaluating proposals submitted by those consultants. The selected consultant carries out the Basic Design Study and prepares a report based upon the terms of reference made by JICA.

At the stage of implementation after the Exchange of Notes, for concluding the contract regarding the Detailed Design and Construction Supervision of the Project between a consultant and the recipient country, JICA recommends the same consultant which participated in the Basic Design Study to the recipient country in order to maintain the technical consistency between the Basic Design Study and the Detailed Design as well as to avoid undue delay caused by the selection of a new consultant.

3. Japan's Grant Aid Scheme

1) What is Grant Aid ?

The Grant Aid Programme provides the recipient country with nonreimbursable funds needed to procure facilities, equipment and services (labor or transportation, etc.) for economic and social development in the

country under the following principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not extended in a form of donation in kind to the recipient country.

2) Exchange of Notes (E/N)

The Japan's Grant Aid is extended in accordance with the Exchange of Notes between both Governments, in which the Objectives of the Project, Period, Conditions and Amount of the Grant etc. are confirmed.

3) "The period of the Grant Aid" is within the Japanese fiscal year in which the Cabinet approved the Project. Within the fiscal year, all procedure such as Exchange of Notes, concluding contracts by the recipient country with the consultant and contractor and the final payment to them must be completed.

In the case of a big project which requires net construction period more than 12 months, the period of the Grant Aid is designated covering more than one fiscal year depending on Basic Design Study Report.

However in case of the delay of delivery, installation or construction due to events such as weather, the period of the Grant Aid can be further extended for one fiscal year at most by mutual agreement between both Governments.

4) The Grant Aid is used properly and exclusively for the purchase of the products, in principle, of Japan or the recipient country and the services of the Japanese or the recipient country's nationals. The term "Japanese nationals" means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons.

When both Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of the third country (other than Japan or the recipient country).

However in terms of the principle of the Grant Aid, the Prime contractors, that is the Consultant, Contractor and Procurement firm, necessary for the implementation of the Grant Aid are limited to "Japanese nationals".

5) Necessity of the "Verification"

The Government of recipient country or its designated authority will conclude the contracts in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. The "Verification" is necessary because the source of the Grant Aid is the taxes of Japanese nationals.

6) Undertakings required to the Government of recipient country

As described in Annex-III.

7) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign the necessary staff for operation and maintenance of them as well as to bear all the expenses other than those to be borne by the Grant Aid.

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8) "Re-export"

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

9) Banking Arrangement (B/A)

- a) The Government of the recipient country or its designated authority shall open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by Government of the recipient country or its designated authority under the contracts verified.
- b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay issued by the Government of the recipient country or its designated authority.

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ANNEX-III

**NECESSARY MEASURES TO BE TAKEN
BY THE GOVERNMENT OF INDIA
IN CASE JAPAN'S GRANT AID IS EXECUTED**

- 1) To provide the Japanese side with the data and information necessary for the implementation of the Project.
- 2) To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities.
- 3) To secure land necessary for the execution of the Project and provide enough space for construction of such items as temporary offices, working areas and storage yards for equipment and materials.
- 4) To construct/develop access roads/detours for the transportation of materials and equipment to the Project site prior to the commencement of the construction.
- 5) To demolish or remove and relocate, if necessary, any existing public utilities, facilities and encroachments that may interfere the works and area of the Project.
- 6) To bear advising commissions of the Authorization to Pay (A/P) and payment commission to the Japanese foreign exchange bank for banking services based upon the Banking Arrangement (B/A).
- 7) To assist prompt unloading and ensure customs duties exemption and customs clearance of the equipment and materials for the Project at port of disembarkation.
- 8) To accord Japanese nationals, whose services may be required in connection with the supply of products and the services under the verified contract, such facilities as may be necessary for their entry into India and stay therein for the performance of their work.
- 9) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in India with respect to the supply of the products and services under the verified contracts.
- 10) To bear all the expenses other than those to be borne by the Grant, necessary in connection with the implementation of the Project.
- 11) To coordinate and solve any matters related which may arise with third party and inhabitants living in the Project area during implementation of the Project.
- 12) To ensure the necessary budget, clearances and personnel for proper and effective operation and maintenance of the facilities and equipment provided under the Grant Aid.
- 13) To maintain as well as to use properly and effectively the facilities constructed under the Grant Aid in terms of the policy of the Grant Aid.

**MINUTES OF DISCUSSIONS
BASIC DESIGN STUDY ON THE PROJECT FOR
CONSTRUCTION OF THE NIZAMUDDIN BRIDGE IN INDIA**

In August 1994, Japan International Cooperation Agency (JICA) dispatched a Basic Design Study team on the Project for Construction of the Nizamuddin Bridge in India (hereinafter referred to as "the Project") to India and through discussions, field survey, and technical examination of the results in Japan, has prepared the Draft Report of the Study.

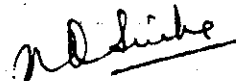
In order to explain and to consult the Indian side on the components of the Draft Report, JICA sent to India a study team, which is headed by Mr. Shigeru Okamoto, Deputy Director, Study Review and Coordination Division, Grant Aid Study and Design Department, JICA and is scheduled to stay in the country from 9th to 18th November 1994.

As a result of discussions, both parties confirmed the main items described on the attached sheets.


Delhi, 17th November 1994



Shigeru Okamoto
Leader
Basic Design Study Team
Japan International
Cooperation Agency



N. K. Sinha
Chief Engineer (PIC)
Ministry of Surface Transport
Government of India



Rama Murali
Joint Secretary
Department of Economic Affairs
Ministry of Finance
Government of India

ATTACHMENT

1. Components of the Draft Report

- (1) The Government of India have agreed and accepted in principle the contents of the Draft Report including the scope of the Project, the configurations of the bridge to be constructed and the tentative implementation schedule which was proposed by the team.
- (2) The bridge to be constructed under the Project is designed so that all traffic through the existing Nizamuddin Bridge will be shifted to the new bridge after the completion.

2. Japan's Grant Aid System

- (1) The Government of India have understood the system of Japanese Grant Aid explained by the Team.
- (2) In case the Grant Aid by the Government of Japan is extended to the Project, two separate Exchange of Notes (E/N) will be exchanged; first one covers the consultant services for the Detailed Design and second one covers the Construction Work as well as the consultant services for the Construction Supervision.
- (3) The Government of India will take necessary measures described in Annex-I according to the tentative implementation schedule as per Annex-II, for smooth implementation of the Project on condition that the Grant Aid by the Government of Japan is extended to the Project.
- (4) Sales Tax and Excise Duty for construction materials and others to be procured in India will not be borne by the Grant.

3. Further Schedule of the Basic Design (B/D) Study

The Team will make the Final Report in accordance with the confirmed items, and send it to the Government of India by the end of January, 1995.

ANNEX-I

**NECESSARY MEASURES TO BE TAKEN
BY THE GOVERNMENT OF INDIA
IN CASE JAPAN'S GRANT AID IS EXECUTED**

- 1) To provide the Japanese side with the data and information necessary for the implementation of the Project.
- 2) To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities.
- 3) To secure land necessary for the execution of the Project and provide enough space for construction of such items as temporary offices, working areas and storage yards for equipment and materials.
- 4) To construct/develop access roads/detours for the transportation of materials and equipment to the Project site prior to the commencement of the construction.
- 5) To demolish or remove and relocate, if necessary, any existing public utilities, facilities and encroachments that may interfere the works and area of the Project.
- 6) To bear advising commissions of the Authorization to Pay (A/P) and payment commission to the Japanese foreign exchange bank for banking services based upon the Banking Arrangement (B/A).
- 7) To assist prompt unloading by ensuring customs duties exemption and customs clearance of the equipment and materials for the Project at port of disembarkation.
- 8) To accord Japanese nationals, whose services may be required in connection with the supply of products and the services under the verified contract, such facilities as may be necessary for their entry into India and stay therein for the performance of their work.
- 9) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in India with respect to the supply of the products and services under the verified contracts.
- 10) To bear all the expenses other than those to be borne by the Grant, necessary in connection with the implementation of the Project.
- 11) To coordinate and solve any matters related which may arise with third party and inhabitants living in the Project area during implementation of the Project.
- 12) To ensure the necessary budget, clearances and personnel for proper and effective operation and maintenance of the facilities and equipment provided under the Grant Aid.
- 13) To maintain as well as to use properly and effectively the facilities constructed under the Grant Aid in terms of the policy of the Grant Aid.

APPENDIX-6 TECHNICAL NOTES

TECHNICAL NOTE

ON

BASIC DESIGN CONDITIONS

FOR

CONSTRUCTION OF THE NIZAMUDDIN BRIDGE

ON NATIONAL HIGHWAY NO. 24 IN DELHI

AUGUST 1994

MINISTRY OF SURFACE TRANSPORT GOVERNMENT OF INDIA

BASIC DESIGN STUDY TEAM JICA

TECHNICAL NOTE

With regard to the Basic Design Study on the Project for Construction of the Nizamuddin Bridge and the Minutes of Discussions for the Project signed on 24th August 1994, Ministry of Surface Transport, Government of India and Basic Design Study Team, JICA have agreed on the major design conditions so as the home work of the study to be carried out in Japan after accomplishment of the field survey in India.

A. GEOMETRIC DESIGN REQUIREMENTS

- 1) National Highway No.24 (NH24) is to be classified into Arterial Category.
- 2) Design speed is to be 80 km per hour.
- 3) Number of traffic lanes is to be 4 (four).
- 4) The new bridge is to be located on the downstream side of the existing one and the connecting points of the new approach roads to the existing approaches are to be between the bridge and existing intersections.
- 5) Distance to be separated between the existing and the new bridge will be determined based on the following factors:
 - Area affected by the adjacent foundations,
 - Cross-sectional requirements of the roads,
 - Geological requirements,
 - Future plan of grade-separation intersection.

B. BRIDGE STRUCTURES AND APPROACH ROADS

- 1) Bridge length is approximately 550m.
- 2) Overall bridge width is 22.500 meters, including 15-meter lane width plus 6 meters for side-walks as shown in the proposed bridge cross-section.
- 3) Approach road length will be approx. 300m on the Ring Road (National Highway No.2) side and approx. 700m on the NOIDA Link Road side.
- 4) The new deck level will be determined considering the following factors:
 - Design Flood Level (D.F.L), including afflux : 205.68m (1988.)
 - Vertical Clearance 1.5m, as per Indian Roads Congress codal provisions (IRC : 5 - 1985.)
 - Elevation of the soffit of the existing girders

5) Span Arrangement

The conceivable span length will be 42.3 meters, mitigating the adverse hydraulic effect. The 84.6 meter span length, however, will be studied as an alternative.

6) The superstructure will be Prestressed Concrete post-tension type.

7) The type of foundation will be selected after comparison study from the economical and technical viewpoint, conceivable types will be concrete caisson foundation and large diameter cast-in-situ concrete pile foundations.

The type of foundation was discussed with Ministry of Surface Transport (MOST), the JICA Study Team was in favor of large size of pile foundations. Ministry's officials, however, insisted on adoption of caisson foundation as per IRC-SP-33.


C. STANDARDS AND SPECIFICATIONS

1) The design live loads in the Specification for Highway Bridge, Japan Road Association (JRA) will be applied and structural safety will be checked in conformity with Indian Roads Congress, Standard Specifications & Code of Practice for Road Bridges.

2) On the seismic design, the basis for the seismic design of structures may be equivalent static force method. The horizontal seismic forces are to be calculated based on seismic coefficient which will be estimated through Japanese Standards (JRA) and Indian Roads Congress Standards with specific reference to I.R.C. Code for stability consideration.

3) Design Standards


Design Standards to be applied for the Basic Design Study are to be in accordance with Japanese Standards and Indian Roads Congress, Standard Specifications & Code of Practice for Road Bridges.

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D. PUBLIC UTILITIES AND FACILITIES ON THE NEW BRIDGE

- 1) Water Mains : No water main is to be supported by or carried on the superstructure of the new bridge. However, in the design of substructure and foundation, the future extension of the caps to support the water-main installation will be considered.
- 2) Telephone Line : Loading will be considered in the design.
- 3) Electricity Cable / Wire : Loading will be considered in the design.
- 4) Lighting Facilities : To be provided, including the posts.

Delhi, 24th August, 1994.

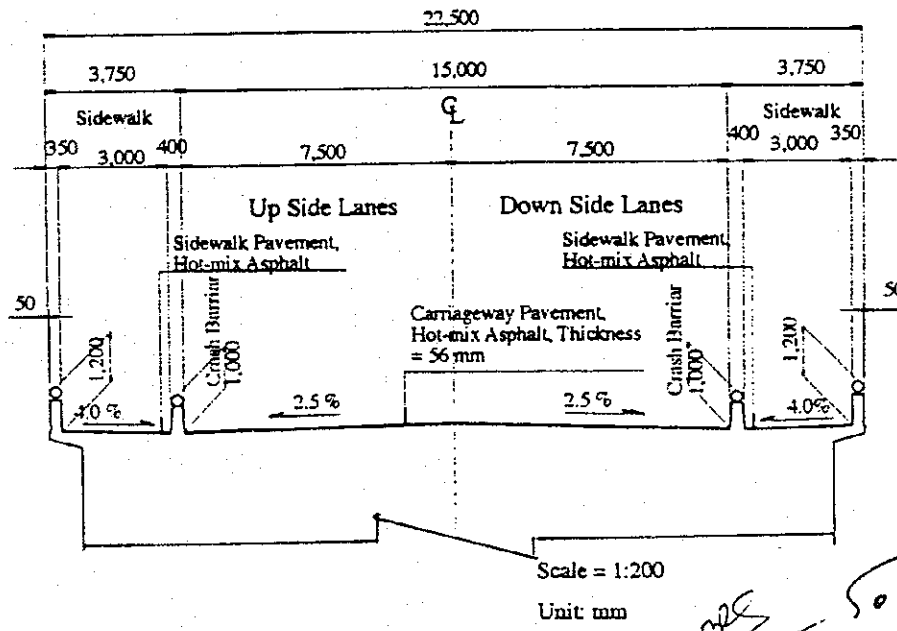


Shigeru OKAMOTO
Leader
Basic Design Study Team
Japan International
Cooperation Agency



M. R. KACHHWAHA
Chief Engineer (Bridges)
Ministry of Surface Transport
Government of India

THE PROPOSED BRIDGE CROSS-SECTION OF THE NIZAMUDDIN BRIDGE



APPENDIX-7 TRAFFIC SURVEY RESULTS

SUMMARY OF TRAFFIC COUNTING SURVEY

24 HOUR TRAFFIC VOLUME (No. of Vehicles & PCU)

BRIDGE	Vehicle	1	2	3	4	5	6	TOTAL
		TRUCK	BUS	CAR	S/C/M/C	ATRKS	BICYCLE	TOTAL (PCU)
WAZIRABAD		6,698	4,155	3,830	12,301	1,886	17,924	46,794
ISBT		7,744	5,754	9,612	29,054	7,809	20,646	80,619
OLD YAMUNA		1,003	1,055	3,763	26,892	18,635	50,112	101,460
I.T.O.		3,898	7,855	23,522	54,574	21,620	19,496	130,965
NIZAMUDDIN		6,783	2,314	25,964	22,464	4,458	9,366	71,349
OKHLA		4,254	438	8,034	10,194	646	5,595	29,181
TOTAL		30,380	21,571	74,745	155,479	55,054	123,139	460,368

Vehicle Composition by Each Bridge

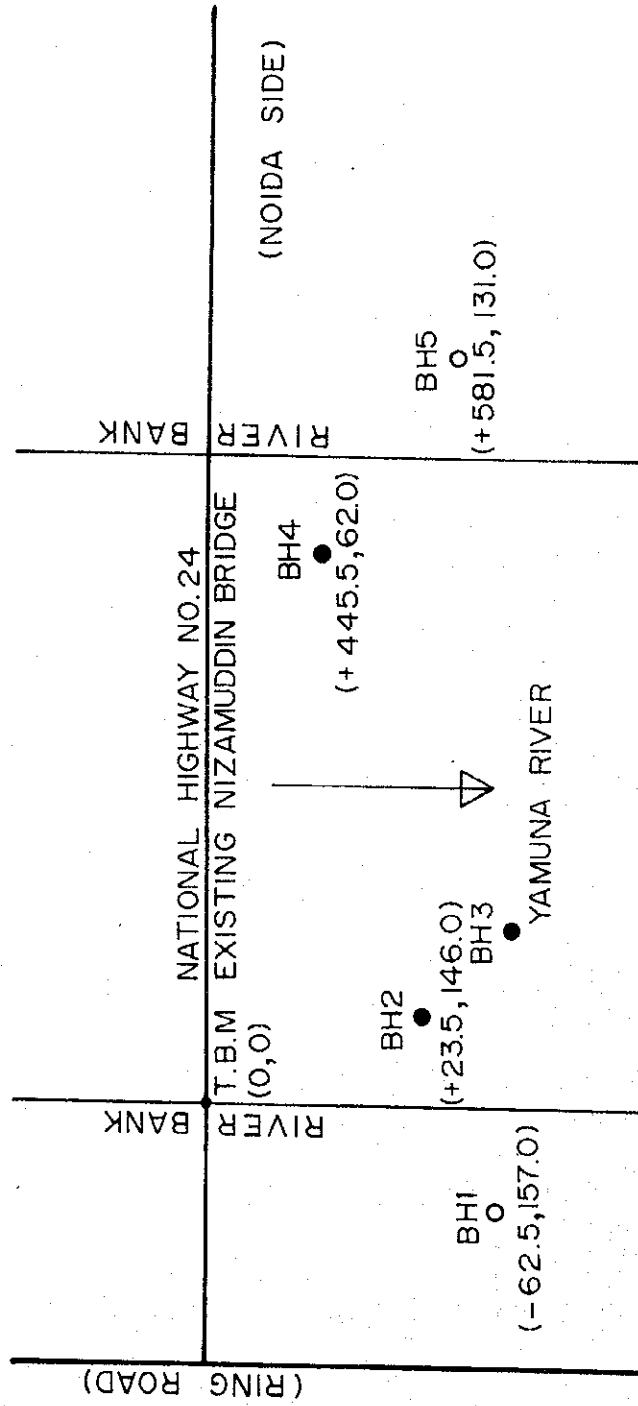
BRIDGE	Vehicle	1	2	3	4	5	6	TOTAL
		TRUCK	BUS	CAR	S/C/M/C	ATRKS	BICYCLE	TOTAL
WAZIRABAD		14.31	8.88	8.18	26.29	4.03	38.30	100.00
ISBT		9.61	7.14	11.92	36.04	9.69	25.61	100.00
OLD YAMUNA		0.99	1.04	3.71	26.51	18.37	49.39	100.00
I.T.O.		2.98	6.00	17.96	41.67	16.51	14.89	100.00
NIZAMUDDIN		9.51	3.24	36.39	31.48	6.25	13.13	100.00
OKHLA		14.58	1.50	27.60	34.93	2.21	19.17	100.00
TOTAL		6.60	4.69	16.24	33.77	11.96	26.75	100.00

Bridge Traffic Composition by Vehicle Type

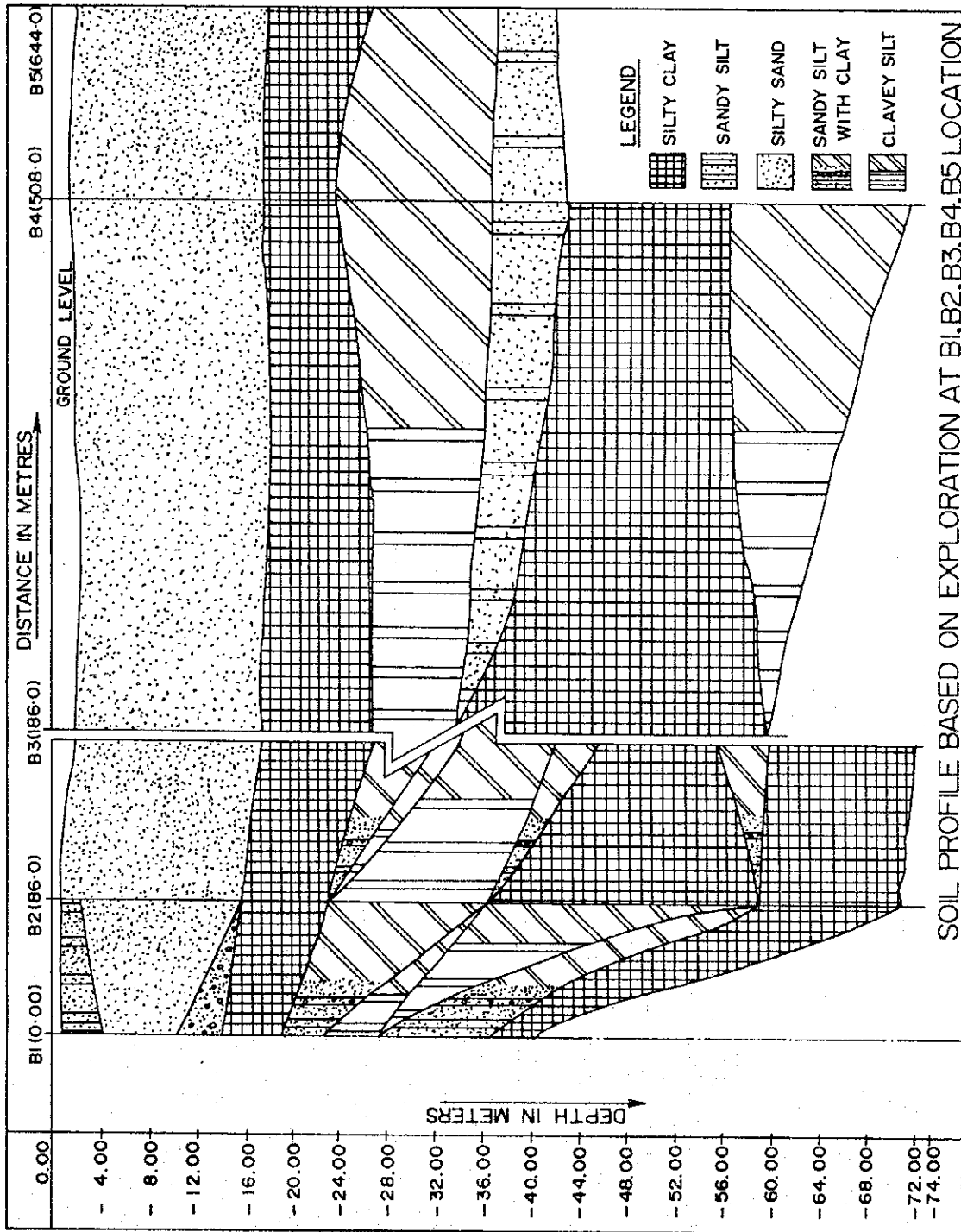
BRIDGE	Vehicle	1	2	3	4	5	6	TOTAL
		TRUCK	BUS	CAR	S/C/M/C	ATRKS	BICYCLE	TOTAL
WAZIRABAD		22.05	19.26	5.12	7.91	3.43	14.56	10.16
I.S.B.T		25.49	26.67	12.86	18.69	14.18	16.77	17.51
OLD YAMUNA		3.30	4.89	5.03	17.30	33.85	40.70	22.04
I.T.O.		12.83	36.41	31.47	35.10	39.27	15.83	28.45
NIZAMUDDIN		22.33	10.73	34.74	14.45	8.10	7.61	15.50
OKHLA		14.00	2.03	10.78	6.56	1.17	4.54	6.34
TOTAL		100.00	100.00	100.00	100.00	100.00	100.00	100.00

Table		HOURLY TRAFFIC VOLUME BY DIRECTION IN PCU										GOING OUT OF DELHI (PCU)		TOTAL	
COMING INTO DELHI (PCU)		GOING OUT OF DELHI (PCU)										TOTAL		TOTAL	
TIME	WAZI- RABAD	ISBT	OLD YAMUNA	ITO	NIZAMU- DDIN	OKHILA	TOTAL	TIME	WAZI- RABAD	ISBT	OLD YAMUNA	ITO	NIZAMU- DDIN	OKHILA	TOTAL
7-8	1246	1675	1710	2571	1510	477	9188	7-8	670	879	731	1647	798	577	5301
8	3068	2717	3074	4997	4043	1260	19158	8	877	1141	928	1686	1135	937	6702
9	2939	4311	4969	7742	5403	1438	26801	9	1103	1423	1250	2095	998	930	7798
10	1857	4107	3755	6678	2512	814	19721	10	1095	1728	1197	2325	1343	734	8420
11	1226	2808	2654	4826	2067	738	14318	11	1209	1753	1328	2636	1354	800	9080
12	998	1945	1739	4512	1911	598	11703	12	1367	1898	1662	3358	1219	692	10195
13	1095	1761	1859	3767	1683	643	10806	13	1294	1714	1594	3421	1725	681	10427
14	1094	1844	1783	3119	1731	620	10190	14	1340	1712	1835	3296	2017	687	10885
15	1003	1946	2023	3728	2037	676	11412	15	1316	1970	1622	2635	1750	719	10011
16	953	1926	2680	3917	1829	696	11999	16	1586	1879	1785	2868	1976	658	10751
17	812	1897	2203	3725	1795	832	11262	17	2129	2876	2387	3869	2886	1159	15305
18	1297	2231	3645	2562	1974	1029	12738	18	3283	3835	2500	4356	3354	368	8893
19	1144	2028	615	2633	1533	1644	9595	19	2187	3997	2052	4176	3604	1111	17126
20	1260	1819	760	2284	2009	1733	9864	20	2228	5123	2275	4088	3083	801	17597
21	883	2001	726	1900	1473	1238	8219	21	1766	3149	2858	2737	2191	525	13225
22	628	1350	543	956	1133	844	5453	22	1427	1680	1146	2815	1305	286	8657
23	507	1088	348	722	1201	322	4187	23	681	917	794	1632	893	237	5153
24	413	636	125	362	496	233	2264	24	505	623	343	707	531	121	2829
1	295	472	66	300	360	159	1652	1	243	450	151	469	384	91	1787
2	217	575	66	309	277	270	1712	2	170	403	109	286	306	84	1357
3	252	421	93	241	259	149	1414	3	603	515	97	295	321	57	1886
4	287	555	273	348	316	41	1820	4	535	413	102	382	387	64	1881
5	487	548	606	711	532	143	3026	5	489	490	329	492	473	141	2413
6-7	699	893	1004	1347	854	344	5141	6-7	640	653	693	719	669	281	3653
TOTAL	24653	41548	37314	64254	38934	16935	223636	TOTAL	28735	41218	29761	53182	34695	13736	201325
Peak Traffic	3068	4311	4969	7742	5403	1733	26801	Peak Traffic	3281	5123	2858	4556	3604	1368	18893
Capacity /Hr./lane in PCU	(India) (HCM)	1000 1800						Capacity /Hr./lane in PCU	(India) (HCM)	1000 1800					

Location of Geotechnical Survey (Bore Holes)
 S = 1 : 4.000



- Penetration Depth 40x2 location
- Penetration Depth 70x3 location



BORING LOG & STANDARD PENETRATION TEST
(BH.1-1)

DESCRIPTION OF SOIL STRATA	LOG OF BORE HOLE	DEPTH IN METRE	NO. OF BLOW PER 30cm	STANDARD PENETRATION RESISTANCE CURVE										
				NO. OF BLOWS N / 30 cm										
				10	20	30	40	50	60	70	80	90	100	
SANDY SILT	SANDY SILT	1.00	9											
		2.00	13											
		3.00	14											
SILTY SAND	SILTY SAND	4.00	16											
		5.00												
		6.00	11											
		7.00	15											
		8.00	25											
		9.00	27											
SILTY SAND WITH GRAVEL	SILTY SAND WITH GRAVEL	10.00												
		11.00	25											
		12.00	27											
SILTY CLAY	SILTY CLAY	13.00	30											
		14.00	30											
		15.00												
		16.00	32											
		17.00	53											
		18.00	44											
SANDY SILTY WITH CLAY AND GRAVELS	SANDY SILTY WITH CLAY	19.00	47											
		20.00												
		21.00	53											
		22.00	40											

(BH.1-2)

DESCRIPTION OF SOIL STRATA	LOG OF BORE HOLE	DEPTH IN METRE	NO. OF BLOW PER 30cm	STANDARD PENETRATION RESISTANCE CURVE											
				NO. OF BLOWS N / 30 cm											
				10	20	30	40	50	60	70	80	90	100		
CLAYEY SILT	CLAYEY SILT	23.00	41												
		24.00	43												
		25.00													
		26.00	54												
SANDY SILT WITH CLAY	SANDY SILT WITH CLAY	27.00	55												
		28.00	60												
		29.00	61												
		30.00													
		31.00	60												
		32.00	63												
		33.00	67												
		34.00	70												
SILT CLAY	SILTY CLAY	35.00													
		36.00	71												
		37.00	78												
		38.00	80												
		39.00	77												
		40.00													

BORING LOG & STANDARD PENETRTION TEST (BH.2-1)

DESCRIPTION OF SOIL STRATA	LOG OF BORE HOLE	DEPTH IN METRE	NO. OF BLOW PER 30 cm	STANDARD PENETRATION RESISTANCE CURVE										
				NO. OF BLOWS N/30cm										
				10	20	30	40	50	60	70	80	90	100	
SANDY SILT	SANDY SILT	1.00	8											
POORY GRADED SILTY SAND	SILTY SAND	2.00	12											
		3.00	13											
		4.00	17											
		5.00												
		6.00	17											
		7.00	18											
		8.00	23											
		9.00	25											
		10.00												
		11.00	25											
		12.00	27											
		13.00	31											
		14.00	32											
		SILTY CLAY	SILTY CLAY	15.00										
16.00	28													
17.00	37													
18.00	39													
19.00	46													
20.00														
SANDY CLAYEY SILT	SANDY CLAYEY SILT	21.00	45											
		22.00	43											
		23.00	45											
		24.00	49											
		25.00												
		26.00	54											

(BH.2-2)

DESCRIPTION OF SOIL STRATA	LOG OF BORE HOLE	DEPTH IN METRE	NO. OF BLOW PER 30 cm	STANDARD PENETRATION RESISTANCE CURVE										
				NO. OF BLOWS N/30cm										
				10	20	30	40	50	60	70	80	90	100	
	SANDY CLAYEY SILT	27.00	50											
		28.00	58											
		29.00	53											
		30.00												
		31.00	64											
		32.00	74											
		33.00	72											
		34.00	76											
		35.00												
CLAYEY SILT		36.00	80											
		37.00	87											
		38.00	78											
		39.00	89											
		40.00												
		41.00	92											
		42.00	84											
		43.00	87											
		44.00	83											
		45.00												
		46.00	88											
		47.00	89											
		48.00	96											
		49.00												
		50.00												

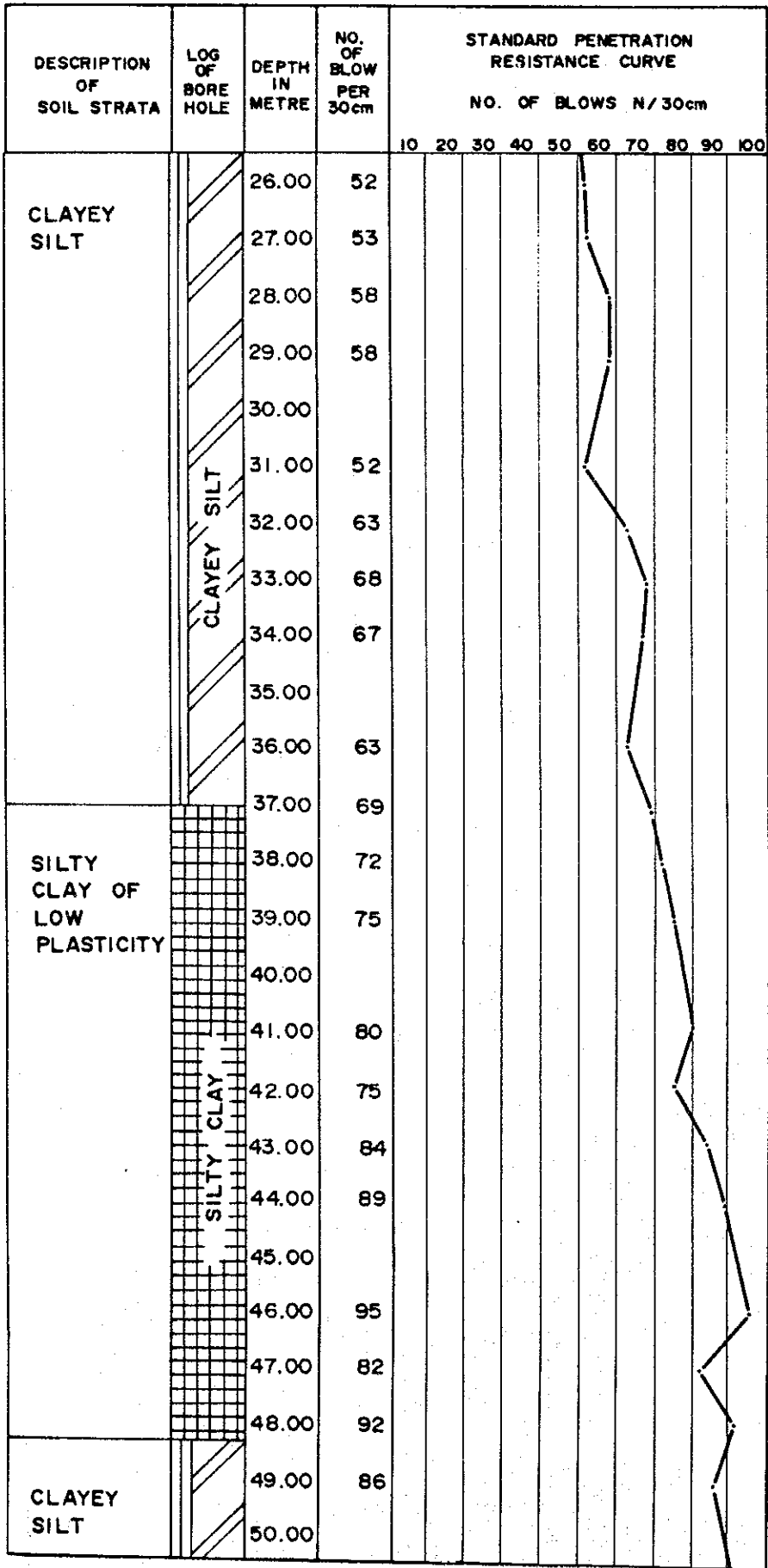
(BH.2-3)

DESCRIPTION OF SOIL STRATA	LOG OF BORE HOLE	DEPTH IN METRE	NO. OF BLOW PER 30 cm	STANDARD PENETRATION RESISTANCE CURVE												
				NO. OF BLOWS N/30cm												
				10	20	30	40	50	60	70	80	90	100			
		51.00	107												<	
		52.00	110												<	
		53.00	119												<	
		54.00	119												<	
		55.00														
		56.00	118												<	
		57.00	123												<	
		58.00	111												<	
		59.00	122												<	
SILTY CLAY	SILTY CLAY	60.00														
		61.00	102												<	
		62.00	111													<
		63.00	106													<
		64.00	111													<
		65.00														
		66.00	124													<
		67.00	131													<
		68.00	128													<
		69.00	135													<
		70.00														

**BORING LOG & STANDARD PENETRATION TEST
(BH.3-1)**

DESCRIPTION OF SOIL STRATA	LOG OF BORE HOLE	DEPTH IN METRE	NO. OF BLOW PER 30cm	STANDARD PENETRATION RESISTANCE CURVE										
				NO. OF BLOWS N/30cm										
				10	20	30	40	50	60	70	80	90	100	
POORY GRADED SAND	SILTY SAND	1.00	1											
		2.00	2											
		3.00	2											
		4.00	3											
		5.00												
		6.00	4											
		7.00	6											
		8.00	11											
		9.00	11											
		10.00												
		11.00	14											
		12.00	16											
		13.00	19											
		14.00	31											
		15.00												
SILTY CLAY OF LOW PLASTICITY	SILTY CLAY	16.00	28											
		17.00	26											
		18.00	28											
		19.00	36											
		20.00												
		21.00	40											
		22.00	43											
		23.00	47											
		24.00	48											
		25.00												

(BH.3-2)



(BH.3-3)

DESCRIPTION OF SOIL STRATA	LOG OF BORE HOLE	DEPTH IN METRE	NO. OF BLOW PER 30cm	STANDARD PENETRATION RESISTANCE CURVE										
				NO. OF BLOWS N/30cm										
				10	20	30	40	50	60	70	80	90	100	
	CLAYEY SILT	51.00	92											
		52.00	101											
		53.00	100											
		54.00	100											
		55.00												
		56.00	100											
		57.00	100											
		58.00	100											
		59.00	100											
		60.00												
SILTY CLAY OF LOW PLASTICITY	SILTY CLAY	61.00	100											
		62.00	100											
		63.00	100											
		64.00	100											
		65.00												
		66.00	100											
		67.00	100											
		68.00	100											
		69.00	100											
			70.00											

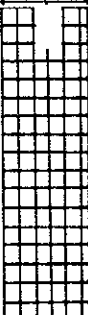




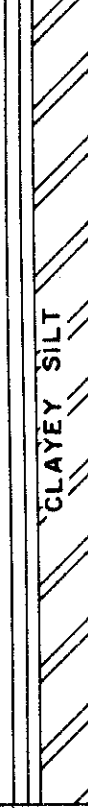
BORING LOG & STANDARD PENETRATION TEST
(BH.4-1)

DESCRIPTION OF SOIL STRATA	LOG OF BORE HOLE	DEPTH IN METRE	NO. OF BLOW PER 30 cm	STANDARD PENETRATION RESISTANCE CURVE										
				NO. OF BLOWS N/30 cm										
				10	20	30	40	50	60	70	80	90	100	
POORLY GRADED SAND	SILTY SAND	1.00	8											
		2.00	10											
		3.00	9											
		4.00	12											
		5.00												
		6.00	13											
		7.00	15											
		8.00	15											
		9.00	15											
		10.00	1											
SILTY CLAY OF LOW PLASTICITY	SILTY CLAY	11.00	12											
		12.00	21											
		13.00	33											
		14.00	32											
		15.00												
		16.00	38											
		17.00	38											
		18.00	39											
		19.00	41											
		20.00												
CRAYEY SILT		21.00	44											
		22.00	42											
		23.00	47											
		24.00	53											
		25.00												

(BH.4-2)

DESCRIPTION OF SOIL STRATA	LOG OF BORE HOLE	DEPTH IN METRE	NO. OF BLOW PER 30cm	STANDARD PENETRATION RESISTANCE CURVE											
				NO. OF BLOWS N/30 cm											
				10	20	30	40	50	60	70	80	90	100		
	CLAYEY SILT	26.00	57												
		27.00	55												
		28.00	55												
		29.00	53												
		30.00													
		31.00	62												
		32.00	62												
		33.00	64												
		34.00	65												
		35.00													
SANDY SILT	SANDY SILT	36.00	76												
		37.00	79												
		38.00	81												
		39.00	82												
		40.00													
SILTY CLAY OF LOW PLASTICITY	SILTY CLAY	41.00	85												
		42.00	89												
		43.00	90												
		44.00	86												
		45.00													
		46.00	98												
		47.00	90												
		48.00	94												
		49.00	97												
		50.00													

(BH.4-3)

DESCRIPTION OF SOIL STRATA	LOG OF BORE HOLE	DEPTH IN METRE	NO. OF BLOW PER 30cm	STANDARD PENETRATION RESISTANCE CURVE											
				NO. OF BLOWS N/30cm											
				10	20	30	40	50	60	70	80	90	100		
		51.00	90												
		52.00	96												
		53.00	101												
		54.00	106												
		55.00													
CLAYEY SILT	 CLAYEY SILT	56.00	109												
		57.00	116												
		58.00	124												
		59.00	115												
		60.00													
		61.00	112												
		62.00	119												
		63.00	117												
		64.00	119												
		65.00													
		66.00	119												
		67.00	122												
		68.00	128												
		69.00	136												
				70.00											

**BORING LOG & STANDARD PENETRATION TEST
(BH.5-1)**

DESCRIPTION OF SOIL STRATA	LOG OF BORE HOLE	DEPTH IN METRE	NO. OF BLOW PER 30 cm	STANDARD PENETRATION RESISTANCE CURVE										
				NO. OF BLOWS N/ 30 cm										
				10	20	30	40	50	60	70	80	90	100	
POORLY GRADED SAND	SILTY SAND	1.00	4											
		2.00	5											
		3.00	9											
		4.00	10											
		5.00												
		6.00	10											
		7.00	15											
		8.00	14											
		9.00	17											
		10.00												
		11.00	19											
		12.00	24											
		13.00	26											
		14.00	30											
		15.00												
		SILTY CLAY OF LOW PLASTICITY	SILTY CLAY	16.00	28									
17.00	32													
18.00	35													
19.00	37													
20.00														
21.00	36													
22.00	39													
23.00	42													
24.00	44													
25.00														

(BH.5-2)

DESCRIPTION OF SOIL STRATA	LOG OF BORE HOLE	DEPTH IN METRE	NO. OF BLOW PER 30 cm	STANDARD PENETRATION RESISTANCE CURVE											
				NO. OF BLOWS N/30 cm											
				10	20	30	40	50	60	70	80	90	100		
CLAYEY SILT	CLAYEY SILT	26.00	47												
		27.00	48												
		28.00	56												
		29.00	58												
		30.00													
		31.00	61												
		32.00	66												
		33.00	71												
		34.00	78												
		35.00													
SANDY SILT	SANDY SILT	36.00	81												
		37.00	86												
		38.00	89												
		39.00	96												
		40.00													

APPENDIX-9 ESTIMATION OF COSTS BORNE BY THE RECIPIENT COUNTRY

(1) Estimated Costs

Type of Expenditure	Estimated Cost	
	Local Currency (Mil. Rs)	Converted to Yen (Mil. ¥)
a) Purchase Cost for Construction Area	7.3	24
b) Leasing for Construction Yard	6.5	21
c) Replacement of Water Mains	6.0	19
d) Transfer of Encroachments	0.6	2
e) Transfer of Electricity Wires and Posts	3.2	10
f) Clearing/Grubbing for Approach Roads and Construction Yard	0.4	1
g) Managing/Supervising by Executing Agency	2.6	8
Total	2.6 Mil. Rs	85 Mil. ¥

Note: The estimated costs above are subject to further confirmation with the Indian Government

(2) Conditions for Estimation

- a) Estimated in November 1994
- b) Exchange Rates: 1US\$ = 100,000 Yen
1US\$ = 32.11 Rs
1Rs = 3.20 Yen
- c) Construction Period: The Construction period will be phased into three terms (i.e. 3 fiscal Years)

JICA

