## APPENDIX 1.4 MINUTES OF DISCUSSIONS

(1) Site Survey

MINUTES OF DISCUSSIONS ON
THE BASIC DESIGN STUDY ON
THE PROJECT FOR THE CONSTRUCTION OF MULTIPURPOSE CYCLONE SHELTERS ( PHASE - II )
IN THE PEOPLE'S REPUBLIC OF BANGLADESH

In response to the request from the Government of People's Republic of Bangladesh, the Government of Japan decided to conduct a Basic Design Study on the Project for the Construction of Multipurpose Cyclone Shelters ( Phase-II ) (here-in-after referred to as "the Project"), and entrusted the study to Japan International Cooperation Agency (JICA). JICA sent to Bangladesh the Study team headed by Mr. Masayuki WATANABE, Development Specialist in the field of Natural Disaster Prevention, JICA, and scheduled to stay in the country from the 24th of January to the 28th of February, 1994.

The Team held a series of discussions on the Project with the officials concerned of the Government of Bangladesh and conducted a field survey at the Project area.

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

Dhaka, the 2nd of February, 1994

( MASAYUKI WATANABE )
Team Leader,
Basic Design Study Team,
JICA

( DEWAN ZAKIR HUSSAIN )
Deputy Secretary,
Economic Relations Division,
Government of Bangladesh

Wittnessed by:

( ABUL HUSSAM CHOWDHURY )
Deputy Secretary,
Primary and Mass Education Division

( SERAJUL ISLAM )
Assistant Chief,
Local Government Division

( MD. MONOWAR HOSSAIN CHOWDHURY )
Additional Chief Engineer,
Local Government Engineering Department

# ATTACHMENT

1. TITLE OF THE PROJECT

The title of the Project is "The Project for the Construction of Multi-purpose Cyclone Shelters ( Phase-II )".

2. OBJECTIVES OF THE PROJECT

The objectives of the Project are to re-construct damaged/disaster prone Primary school buildings as Cyclone shelter cum Primary schools not only for protecting people from Natural Disasters such as Cyclone, Tidal surge, Tornado and Flood, but also improving facilities in primary and mass education.

3. EXECUTING AGENCY

The Local Government Engineering Department (LGED) takes the responsibility of executing the project in consultation with the Primary and Mass Education Division (PMED).

4. COMPONENTS OF THE PROJECT REQUEST BY THE BANGLADESH SIDE

The summary of the request for facilities and equipment from the Bangladesh side are shown in the Annex-1, yet the final components of the Project will be decided after further studies.

5. PROJECT SITE

Based on the request on the project sites from the Bangladesh side, the Project Sites will be selected from the list in Annex-2, nevertheless the Project sites will be finalized after further studies.

6. JAPANESE GRANT AID PROGRAMME

The Government of Bangladesh has understood the system of Japan's Grant Aid Programme explained by the Team.

(1) The consulting firm that was selected by JICA as per their set procedure and takes charge of the Basic Design work will be employed in principle as the project consultant for smooth implementation of the Grant Aid Project.

(2) Procuring products and services for implementing the Grant Aid Project shall be executed in accordance with "GUIDELINE FOR PROCUREMENT UNDER THE JAPANESE GRANT, 1991, JICA".

7. NECESSARY MEASURES TO BE TAKEN BY BANGLADESH SIDE

(1) The Government of Bangladesh will take the necessary measures described in Annex-3 for smooth implementation of the Project on condition that the Grant Aid by the Government of Japan is extended to the Project.

(2) Bangladesh Side has especially assured following items to the Team.
- Construction of KILLAs in confirmed sites.
- Construction of Access Road, if necessary.
- Usage of the Shelters in ordinary time only for educational purposes.

8. SCHEDULE OF THE STUDY

(1) The consultants will proceed to further studies in Bangladesh until the 28th of February, 1994.

(2) JICA will prepare a Draft Study Report and dispatch a Draft Report Explanation Team in April, 1994 in order to explain and to incorporate the suggestions made by the Bangladesh Side in the Final Report.

(3) In case that the Draft Study Report is accepted by the Bangladesh Side, JICA will complete the Study Report and send it to the Bangladesh side by June, 1994.

Annex-1 REQUEST FOR FACILITIES AND EQUIPMENT UNDER THE PROJECT FROM THE BANGLADESH SIDE

Each shelter is consist from:

(1) Several classrooms of 37.15m² or more in size, and each classroom is equipped with:
One Black board,
Desks and chairs for 50 pupils, and
A pair of desk and chair for teacher;

(2) One teachers' room;

(3) One store room;

(4) Two toilet rooms;

(5) A set of hand-pump and tube-well for water supply; and

(6) Other necessary equipment might be included based on the result of further studies.

Annex-2 PROPOSED PROJECT SITES

| | District | Thana | Union | Name of School | |
|---|---|---|---|---|---|
| 1. | Chittagong | Banskhali | Saral | West Kaharghona | G.P.S. |
| 2. | Chittagong | Banskhali | Sadhonpur | Rata Khordo | G.P.S. |
| 3. | Chittagong | Banskhali | Jaldi | Jaldi Vadalia | G.P.S. |
| 4. | Cox's Bazar | Sadar | Jalalabad | Eidagon Bahar Chara | G.P.S. |
| 5. | Cox's Bazar | Sadar | Jalalabad | South Khorulia | G.P.S. |
| 6. | Cox's Bazar | Sadar | Khoruskul | Khoruskul Dhiran | G.P.S. |
| 7. | Cox's Bazar | Sadar | Chawfaldang | Khonkar Khil | G.P.S. |
| 8. | Cox's Bazar | Sadar | P.M. Khall | Parania Para | G.P.S. |
| 9. | Cox's Bazar | Chokoria | East Borobhola | Boro Bheola | G.P.S. |
| 10. | Cox's Bazar | Chokoria | Harbang | Harbang | G.P.S. |
| 11. | Cox's Bazar | Chokoria | Badarkhali | Kutubnagar | G.P.S. |
| 12. | Cox's Bazar | Chokoria | Chiringa | Middle Chokoria | G.P.S. |
| 13. | Cox's Bazar | Chokoria | B.M. Char | Bheola Manikchar | G.P.S. |
| 14. | Cox's Bazar | Ramu | — | Goalia Palong | G.P.S. |
| 15. | Cox's Bazar | Ramu | — | Lomuri Para | G.P.S. |
| 16. | Cox's Bazar | Ramu | — | Chainda | G.P.S. |
| 17. | Cox's Bazar | Ukhia | — | Sonaichari | G.P.S. |
| 18. | Cox's Bazar | Ukhia | — | Rahmaterbil | G.P.S. |
| 19. | Noakali | Hatiya | Tomoruddi | Madankhali | G.P.S. |
| 20. | Noakali | Hatiya | Char Keshor | Ishwar Pni Hallama | G.P.S. |
| 21. | Feni | Chagalniya | Chagalnaiya | Chagalniya | G.P.S. |
| 22. | Feni | Chagalniya | Matua | Matua | G.P.S. |
| 23. | Feni | Chagalniya | Radhanagar | Kashipur | G.P.S. |
| 24. | Feni | Chagalniya | South Satar | South Star | G.P.S. |
| 25. | Laximpur | Ramgonj | Noagaon | Noagaon | G.P.S. |
| 26. | Laximpur | Ramgonj | Lamchar | Kasim Nagar | G.P.S. |
| 27. | Laximpur | Sadar | Shakchar | Matabarhat | G.P.S. |
| 28. | Laximpur | Sadar | Kushakhali | Kushakhali | G.P.S. |
| 29. | Feni | Sadar | Forhadnagar | South Forhadnagar | G.P.S. |
| 30. | Feni | Sadar | Kalldaha | Cheoria | G.P.S. |

| | District | Thana | Union | Name of School | |
|---|---|---|---|---|---|
| 31. | Cox's Bazar | Chokoria | — | Fulchori | G.P.S. |
| 32. | Cox's Bazar | Chokoria | — | Khotakhali | G.P.S. |
| 33. | Cox's Bazar | Chokoria | — | Maddaya Magnama | G.P.S. |
| 34. | Cox's Bazar | Chokoria | — | Sutachura | G.P.S. |
| 35. | Cox's Bazar | Chokoria | — | Ringbong | G.P.S. |
| 36. | Noakali | Hatiya | — | Horni Ahmadia | G.P.S. |
| 37. | Noakali | Hatiya | — | Purbo Maijchora | G.P.S. |
| 38. | Noakali | Hatiya | — | Tamaroddi Sirajia | G.P.S. |
| 39. | Feni | Chagalniya | — | Alokdia | G.P.S. |
| 40. | Feni | Chagalniya | — | Uttor Haripur | G.P.S. |
| 41. | Laximpur | Sadar | — | Chor Ruhita | G.P.S. |
| 42. | Laximpur | Sadar | — | South Shakchor | G.P.S. |
| 43. | Laximpur | Sadar | — | South Chor Romani Mohon | G.P.S. |
| 44. | Laximpur | Sadar | — | South Tumchor | G.P.S. |
| 45. | Laximpur | Sadar | — | East Chormanasha | G.P.S. |
| 46. | Feni | Sadar | — | Sreepur | G.P.S. |
| 47. | Feni | Sadar | — | Katalia | G.P.S. |
| 48. | Feni | Sadar | — | Ratanpur | G.P.S. |
| 49. | Feni | Sadar | — | Mothbaria | G.P.S. |
| 50. | Feni | Sadar | — | Izzatpur | G.P.S. |

G.P.S.: Government Primary School

## Annex-3 NECESSARY MEASURES TO BE TAKEN BY BANGLADESH SIDE

Following necessary measures should be taken by the Government of Bangladesh on condition that the Grant Aid by the Government of Japan is extended to the Project;

1. To provide data and information necessary for the Project;

2. To secure and clear the sites for the Project;

3. To provide proper access roads for constructing the Multipurpose Shelters;

4. To bear commissions to the Japanese foreign exchange bank for its banking services, namely the advising commission of the "Authorization to Pay" and payment commission;

5. To ensure necessary payment of taxes and to take necessary procedures for customs clearance of the materials and equipment for the Project at the port of disembarkation promptly;

6. In order to exempt Japanese juridical and physical nationals engaged in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in Bangladesh with respect to the supply of the products and services under the verified contracts. The cost of duties, internal taxes and other fiscal levies to be imposed under the Bangladesh Regulations shall be borne by the relevant Ministry/Agency concerned with the Project for which necessary budget provision shall be made by them;

7. To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into Bangladesh and stay therein for the performance of their work;

8. To provide necessary permissions, licenses and other authorizations for carrying out the Project, if necessary;

9. To maintain and use properly and effectively the facilities constructed and the equipment provided under the Project;

10. To bear all the expenses, other than those to be borne by the Grant Aid within the scope of the Project.

Annex-4 LIST OF THE PARTICIPANTS IN THE JOINT-MEETING ON THE PROJECT

1. JAPANESE SIDE

- Mr. Masayuki WATANABE, Leader, Basic Design Study Team on the Project.
- Mr. Ichirou MUKAI, Member, Basic Design Study Team on the Project.
- Mr. Hisashi TAKADA, Member, Basic Design Study Team on the Project.
- Mr. Sakae NAKAMURA, Member, Basic Design Study Team on the Project.
- Mr. Sumitada OKAMOTO, Member, Basic Design Study Team on the Project.
- Mr. Kenichi YOKOYAMA, First Secretary, Embassy of Japan
- Mr. Yuki ARATSU, Deputy Resident Representative, JICA

2. BANGLADESH SIDE

- Mr. Dewan Zakir Hussain, Deputy Secretary, Economic Relations Division
- Mr. Abul Hussam Chowdhury, Deputy Secretary, Primary and Mass Education Division
- Mr. Md. Monowar Hossain Chowdhury, Additional Chief Engineer, Local Government Engineering Department
- Mr. Nizam Uddin Choudhury, Assistant Chief, Planning Commission
- Mr. Serajul Islam, Assistant Chief, Local Government Division
- Mr. Sirajul Haq Talukder, Research Officer, Economic Relations Division
- Mr. Saroj Kumar Sarker, Executive Engineer, Local Government Engineering Department
- Mr. Md. Zahangir Alam, Project Director, Cyclone Shelter Project, Local Government Engineering Department

(2) Draft Final Report Explanation

MINUTES OF DISCUSSIONS ON
THE BASIC DESIGN STUDY ON
THE PROJECT FOR THE CONSTRUCTION OF MULTIPURPOSE CYCLONE SHELTERS (II)
IN THE PEOPLE'S REPUBLIC OF BANGLADESH
(Draft Report Explanation)

From the 23rd January to the 1st March, 1994, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team on the Project for the Construction of Multipurpose Cyclone Shelters (II) (here-in-after referred to as "the Project") to Bangladesh, and through discussions, field survey, and technical examination of the results in Japan, has prepared the Draft Study Report.

In order to explain and to consult the Bangladesh side on the components of the Draft Study Report, JICA sent to Bangladesh a Draft Report Explanation Team, headed by Mr. Masayuki WATANABE, Development Specialist in the field of Natural Disaster Prevention, JICA, and stayed in the country from the 7th to the 21st of April, 1994.

As a result of discussions, both parties agreed the main items described on the attached sheets, subject to the approval of competent higher authority of Government of Bangladesh.

Dhaka, 28th of April, 1994.

(HIDEO MORIKAWA)
on behalf of
HIRONAO SUZUKI
Resident Representative
Japan International Cooperation Agency
JICA Bangladesh Office

28/4/94
(DEWAN ZAKIR HUSSAIN)
Deputy Secretary
Economic Relations Division
Ministry of Finance
Government of Bangladesh

Witnessed by:

(MOHINI MOHAN CHAKRABARTY)
Deputy Secretary
Primary and Mass Education Division

28.4.94
(SERAJUL ISLAM)
Assistant Chief
Local Government Division

28/4/94
(MD. MONOWAR HOSSAIN CHOWDHURY)
Additional Chief Engineer
Local Government Engineering Department

# ATTACHMENT

1. CONTENTS OF THE DRAFT STUDY REPORT

The main items are highlighted as follows.

(1) Project sites have been selected according to the criteria mentioned below. The Project sites are listed in Annex-1.

a) The structure of shelters under the Project are anti tidal-surge shelters, therefore, priority was given according to damage caused by tidal-surge: and

b) The Project covered the sites where no existing sheltering spaces such as, cyclone shelters, public buildings with enough height and space, hill topography, etc., were found within 1.0 Km. radius.

(2) The design of shelters under the Project are varied with its size into three (3) types, consisting of three (3), four (4), and five (5) classrooms. The design of each type of the shelters is shown in Annex-2.

The number of classrooms in each site is determined taking into account of pupil's number in the morning shift of Class 1 and 2, having the maximum number of up to five (5). The Annex-1 shows a list of the number of classrooms in each site.

2. NECESSARY MEASURES TO BE TAKEN BY BANGLADESH SIDE

(1) The Government of Bangladesh will take necessary measures described in Annex-3 for smooth implementation of the Project on condition that the Grant Aid by the Government of Japan is extended to the Project.

(2) Bangladesh Side has especially assured following measures, which are listed in Annex-4:

a) To arrange additional land for the shelter construction in the Sites No. II-3 and No. II-10 as shown in Annex-5, and LGED will inform JICA of the progress at the end of each month starting from May, 1994.

b) To construct KILLAS in confirmed sites.

c) To construct an Access Road at site No. II-13 (Annex-6).

d) To provide adequate teachers after the completion of shelter construction.

e) To use the shelters in normal time for educational purposes.

3. JAPAN'S GRANT AID SYSTEM

The Government of Bangladesh has understood the system of Japan's Grant Aid Programme explained by the Team including the following matters.

(1) The consulting firm that was selected by JICA as per their set procedure and takes charge of the Basic Design Work will be employed in principle as the project consultant for smooth implementation of the Grant Aid Project.

(2) Procuring products and services for implementing the Grant Aid Project shall be executed in accordance with "GUIDELINES FOR PROCUREMENT UNDER THE JAPANESE GRANT, 1991. JICA".

4. SCHEDULE FOR THE STUDY REPORT FINALIZATION

(1) Bangladesh side will send its comments on the Draft Report in writing by 9 of May, 1994 to JICA Bangladesh Office. Further discussions explaining project cost and engineering aspects of the draft report will be held between two sides as soon as possible.

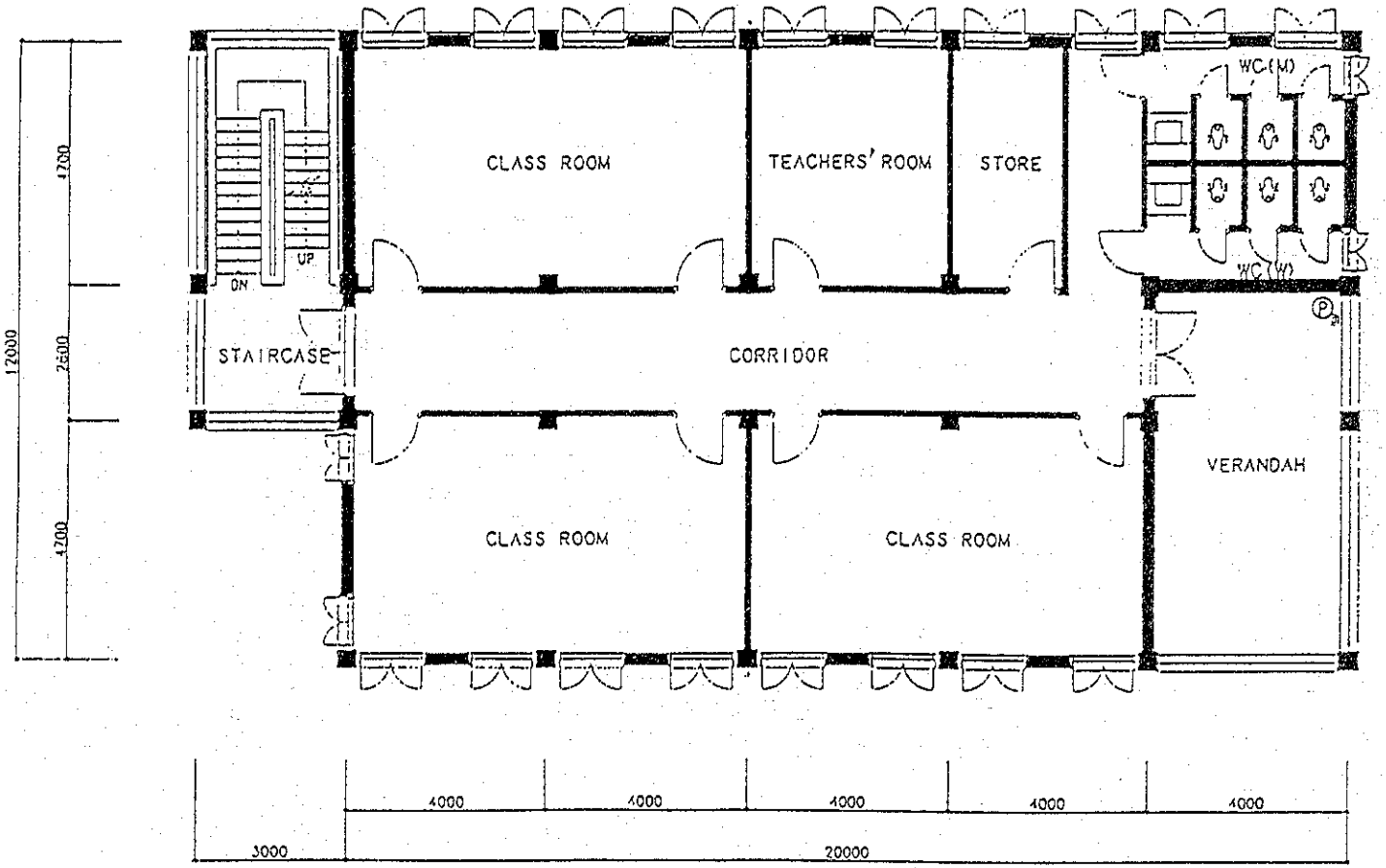
(2) The Team will finalize the Study Report in accordance with the confirmed items, and send it to the Government of Bangladesh by July, 1994 at the latest.

Annex-1: SELECTED PROJECT SITES

| Site No. | District | Thana | Name of School | Pupils in Class 1 & 2 | Proposed No. of Classrooms | No. of Teachers Assigned |
|---|---|---|---|---|---|---|
| II-1) | Chittagong | Banskhali | West Kaharghona | 140 | 3 | 4 |
| II-2) | Chittagong | Banskhali | Rata Khordo | 100 | 3 | 4 |
| II-3) | Chittagong | Banskhali | Jaldi Vadalia | 190 | 4 | 5 |
| II-4) | Cox's Bazar | Sadar | Edigaon Bahar Chara | 264 | 5 | 6 |
| II-5) | Cox's Bazar | Sadar | South Khorulia | 295 | 5 | 4 |
| II-6) | Cox's Bazar | Sadar | Khoruskul Dhiran | 495 | 5 | 6 |
| II-7) | Cox's Bazar | Chokoria | Boro Bheola | 208 | 4 | 6 |
| II-8) | Cox's Bazar | Chokoria | Kutubnagar | 166 | 3 | 5 |
| II-9) | Cox's Bazar | Chokoria | Middle Chokoria | 195 | 4 | 9 |
| II-10) | Cox's Bazar | Ramu | Lomuri Para | 138 | 3 | 5 |
| II-11) | Cox's Bazar | Ukhia | Sonaichari | 315 | 5 | 5 |
| II-12) | Cox's Bazar | Chokoria | Fulchari | 322 | 5 | 4 |
| II-13) | Cox's Bazar | Chokoria | Khotakhali | 261 | 5 | 8 |
| II-14) | Cox's Bazar | Chokoria | Maddaya Magnama | 238 | 5 | 6 |
| II-15) | Cox's Bazar | Chokoria | Sutachura | 261 | 5 | 3 |

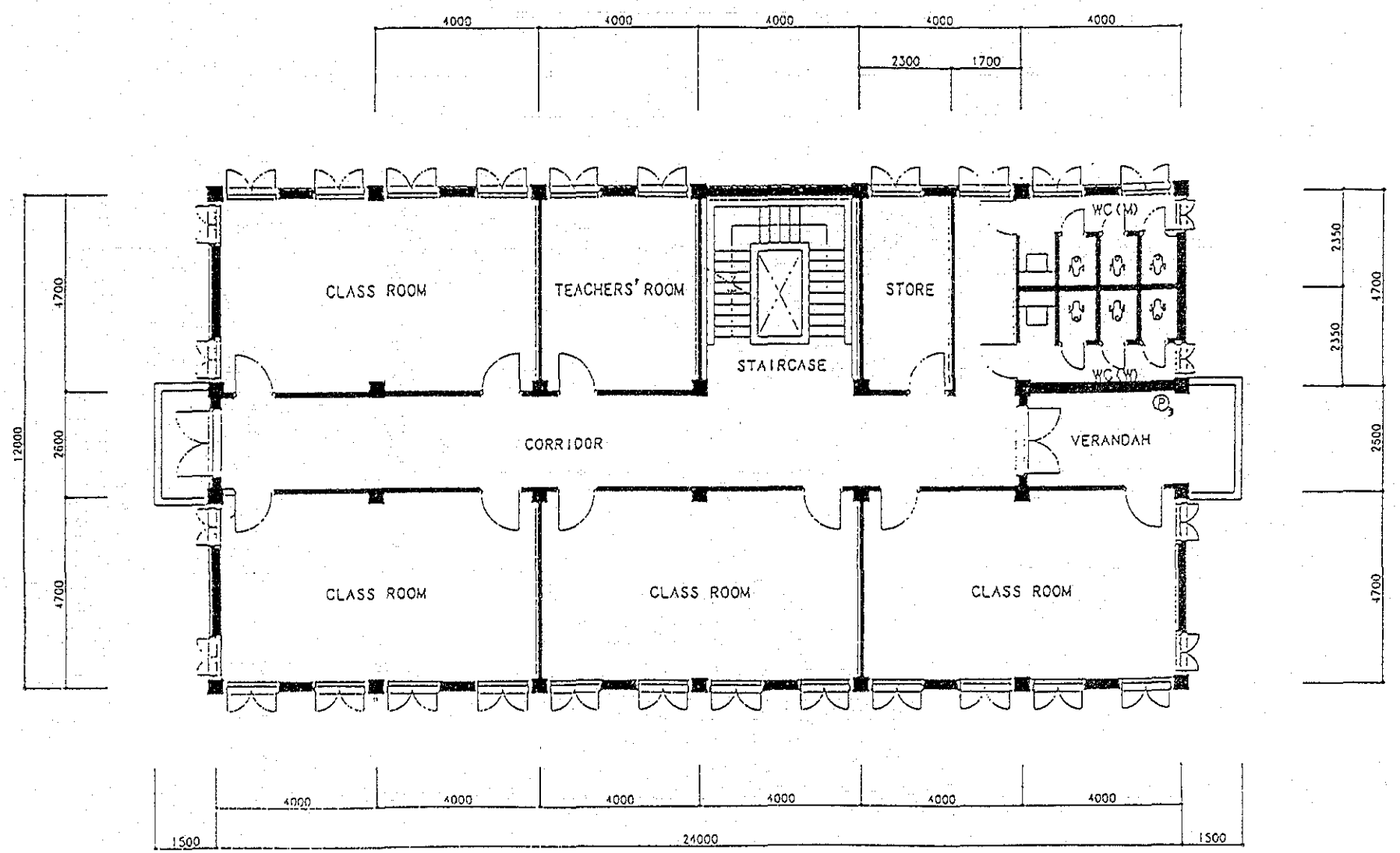
* The number of classrooms in each site is obtained considering the number of pupils in the morning shift. Class 1 and 2. However the maximum number of classrooms is five (5) counting on that the existing classrooms will be utilized even after the completion of shelter construction.

Annex-2-1 TYPE OF CYCLONE SHELTER (3-CLASSROOM TYPE)



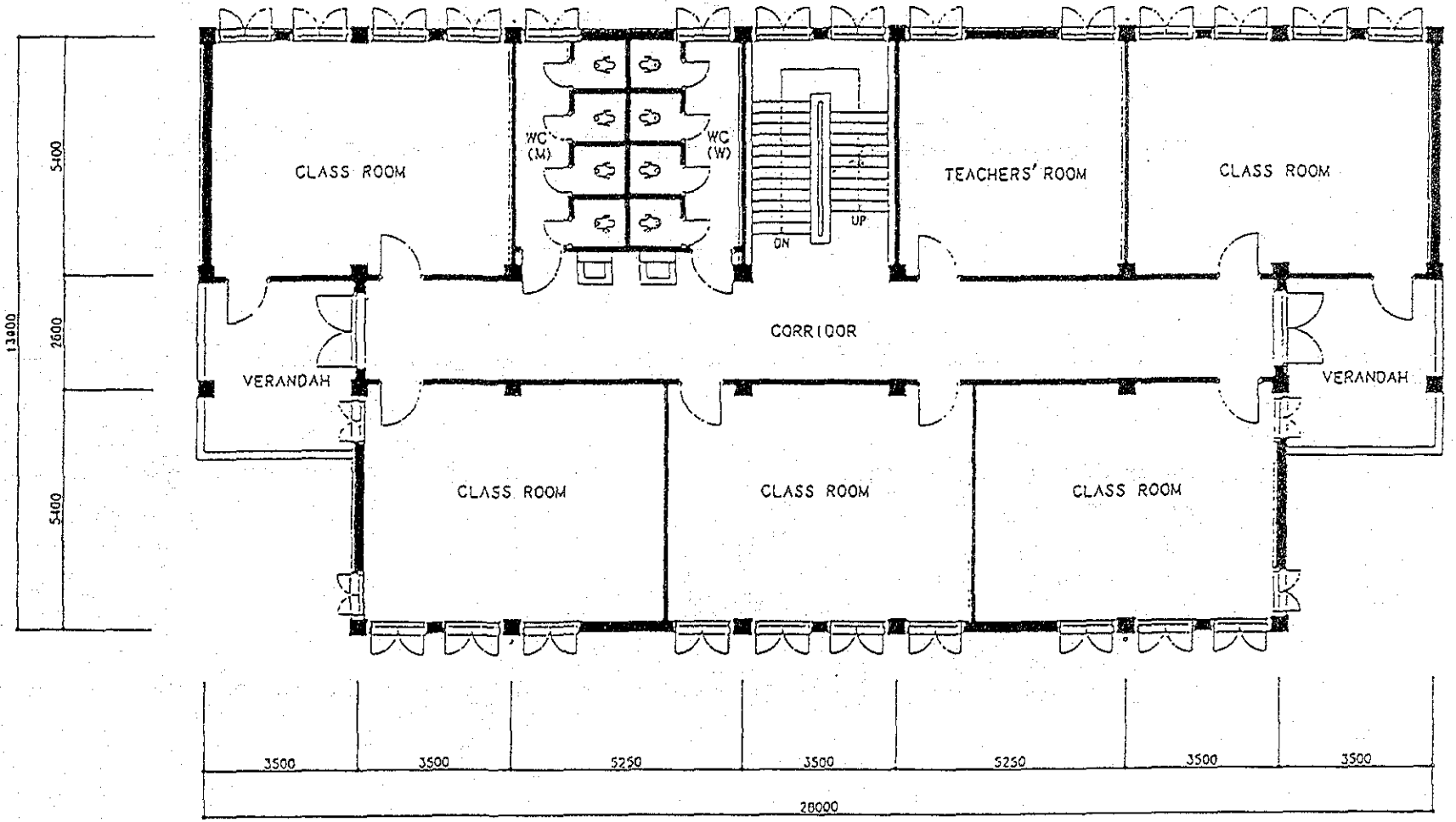

C-3 FIRST FLOOR PLAN S=1:100

Annex-2-2 TYPE OF CYCLONE SHELTER (4-CLASSROOM TYPE)




C-4 FIRST FLOOR PLAN S=1:100

Annex-2-3 TYPE OF CYCLONE SHELTER (5-CLASSROOM TYPE)




C-5 FIRST FLOOR PLAN S=1:100

Annex-3 : NECESSARY MEASURES TO BE TAKEN BY BANGLADESH SIDE

Following necessary measures should be taken by the Government of Bangladesh on condition that the Grant Aid by the Government of Japan is extended to the Project;

1. To secure the site for the Project.

2. To clear and level the Project site prior to commencement of construction, if necessary.

3. To construct proper access roads for constructing the Multipurpose Shelters.

4. To keep provision for continuation of classes during construction.

5. To bear commissions to the Japanese foreign exchange bank for its banking services, namely the advising commission of the "Authorization to Pay" and payment commission.

6. To ensure necessary payment of taxes and to take necessary procedures for customs clearance of the materials and equipment for the Project at the port of disembarkation promptly.

7. In order to exempt Japanese juridical and physical nationals engaged in the Project from customs duties, internal taxes and other fiscal levies which may be imposed in Bangladesh with respect to the supply of the products and services under the verified contracts. The cost of duties, internal taxes and other fiscal levies to be imposed under the Bangladesh Regulations shall be borne by the relevant Ministry/Agency concerned with the Project for which necessary budget provision shall be made by them.

8. To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for the entry into Bangladesh and stay therein for the performance of their work.

9. To provide necessary permissions, licenses and other authorizations for carrying out the Project, if necessary.

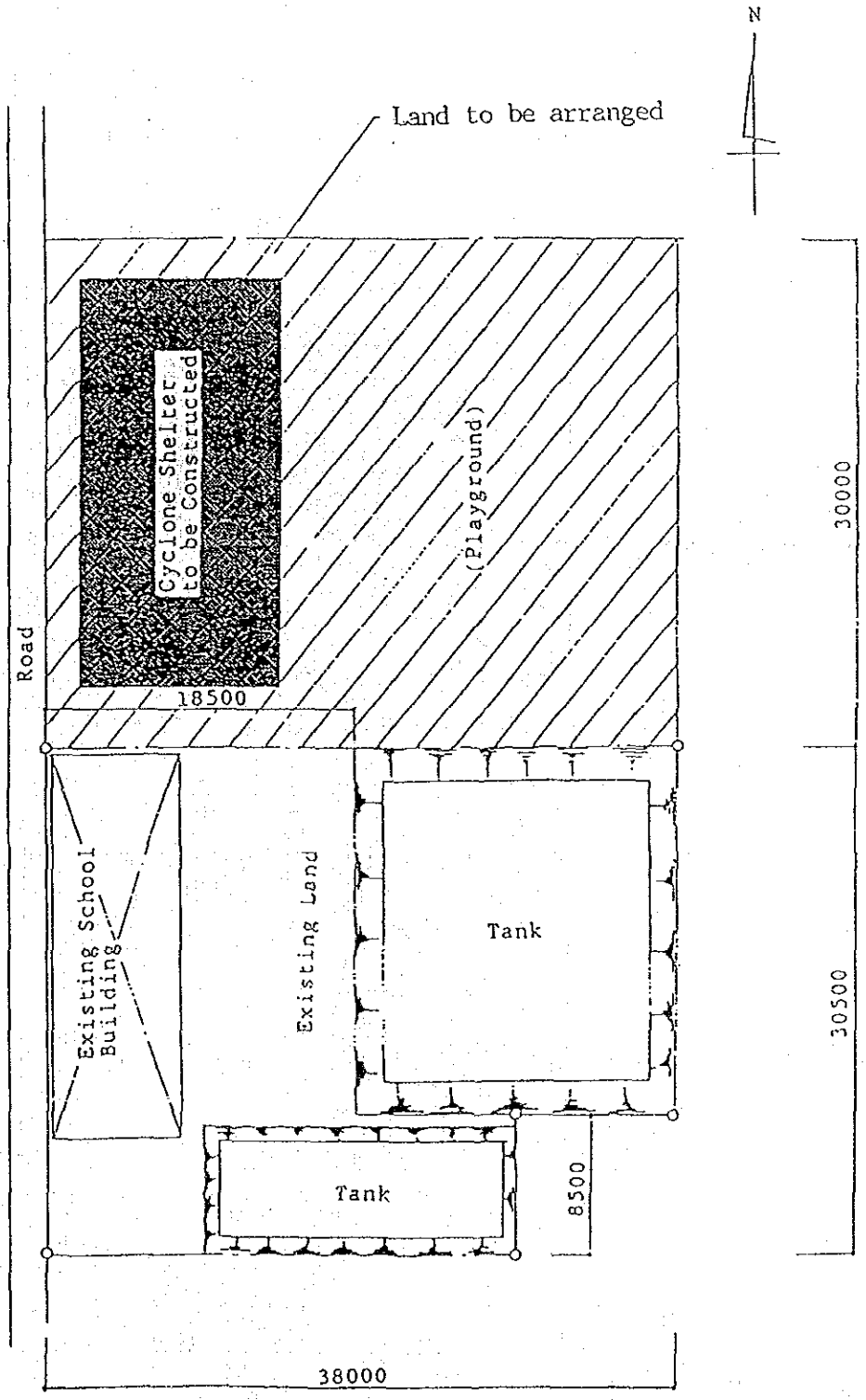
10. To maintain and use properly and effectively the facilities constructed and the equipment provided under the Project.

11. To bear all expenses, other than those to be borne by the Grant Aid within the scope of the Project.

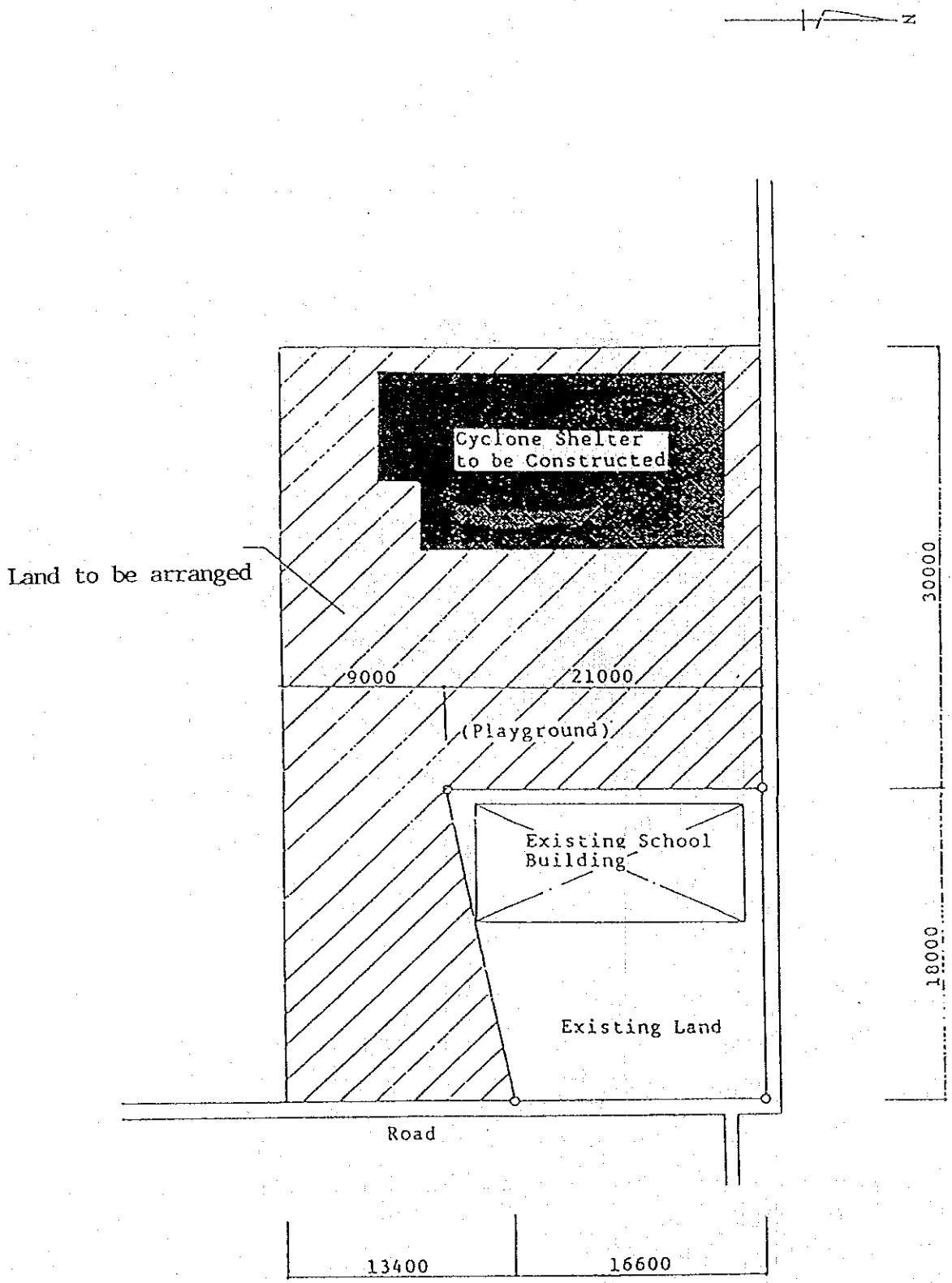
Annex-4 : NECESSARY MEASURES TO BE TAKEN BY BANGLADESH SIDE IN EACH SELECTED PROJECT SITE

| Site No. | Land Arrangement for Construction | Access road for Works | To Clear the Site | Killa Construction |
|---|---|---|---|---|
| II-1) | - | - | Necessary | Necessary |
| II-2) | - | - | Necessary | Necessary |
| II-3) | Arrangement of land required | - | - | Necessary |
| II-4) | - | - | - | Necessary |
| II-5) | - | - | - | Necessary |
| II-6) | - | - | - | Necessary |
| II-7) | - | - | Necessary | Necessary |
| II-8) | - | - | - | Necessary |
| II-9) | - | - | - | Necessary |
| II-10) | Arrangement of land required | - | - | Necessary |
| II-11) | - | - | Necessary | Necessary |
| II-12) | - | - | Necessary | Necessary |
| II-13) | - | Necessary | Necessary | Necessary |
| II-14) | - | - | - | Necessary |
| II-15) | - | - | - | Necessary |

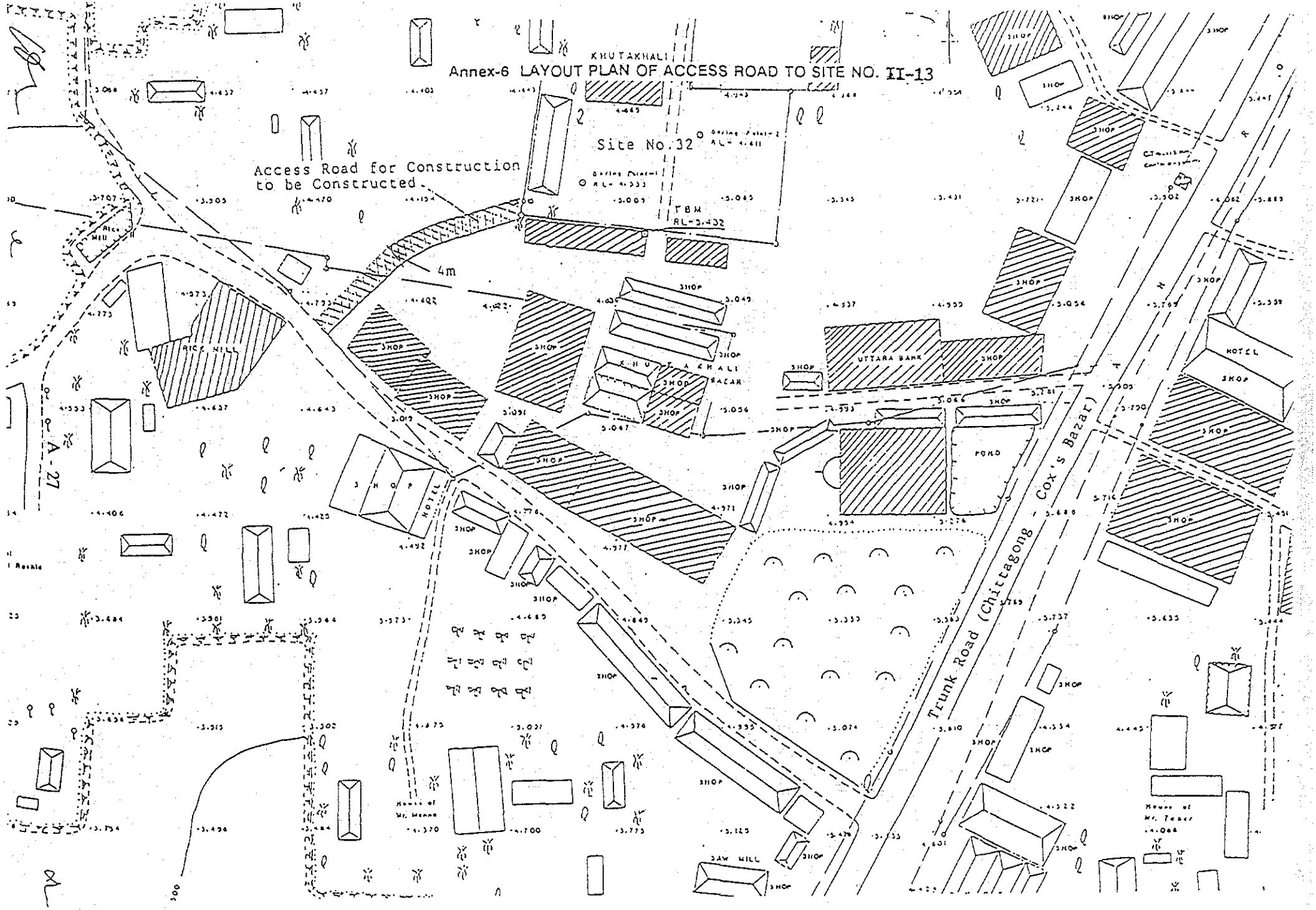
Annex-5-1 SITE PLAN (SITE NO. II-3)



Annex-5-2 SITE PLAN (SITE NO. II-10)



Annex-6 LAYOUT PLAN OF ACCESS ROAD TO SITE NO. II-13



Annex-7 : LIST OF THE PARTICIPANTS IN THE JOINT-MEETING ON THE PROJECT

1. JAPANESE SIDE

- Mr. Masayuki WATANABE, Leader, Basic Design Study Team on the Project
- Mr. Yukihiro KOIZUMI, Member, Basic Design Study Team on the Project.
- Mr. Hisashi TAKADA, Member, Basic Design Study Team on the Project
- Mr. Sakae NAKAMURA, Member, Basic Design Study Team on the Project
- Mr. Kenichi YOKOYAMA, First Secretary, Embassy of Japan

2. BANGLADESH SIDE

- Mr. Dewan Zakir Hussain, Deputy Secretary, Economic Relations Division
- Mr. Mohini Mohan Chakrabarty, Deputy Secretary, Primary and Mass Education Division
- Mr. Md. Monowar Hossain Chowdhury, Additional Chief Engineer, Local Government Engineering Department
- Mr. Nizam Uddin Choudhury, Assistant Chief, Planning Commission
- Mr. Serajul Islam, Assistant Chief, Local Government Division
- Mr. Sirajul Haq Talukder, Research Officer, Economic Relations Division
- Mr. Md. Zahangir Alam, Project Director, Cyclone Shelter Project, Local Government Engineering Department
- Mr. Md. Shafizul Islam, Senior Assistant Secretary Finance Division, Ministry of Finance

# APPENDIX 2

## APPENDIX 2 GENERAL DATA ON PRIMARY EDUCATION

(1) Education System in Bangladesh

The education system in Bangladesh has 3 components, i.e. standard school education, Madrasah education and Tol education, and each of these components is summarised below.

1) Standard School Education

| | | | | |
|---|---|---|---|---|
| a. Primary Education | : | primary | (Class 1 - Class 5) | 5 years |
| b. Secondary Education | : | junior secondary | (Class 6 - Class 8) | 3 years |
| | | secondary | (Class 9 & Class 10) | 2 years |
| | | higher secondary | (Class 11 & Class 12) | 2 years |
| | | special schools | | 1 - 2 years |
| | | teacher training for primary education | | 1 year |
| c. Higher Education | : | university | 3 - 5 years | |
| | | diploma courses | 1 - 3 years | |
| | | post-graduate (master's degree and doctor's degree) | | |

[National Examinations]

- Secondary School Certificate (SSC) : at end of Class 10 year
- Higher Secondary Certificate (HSC) : at end of Class 12 year

Performance in these 2 examinations largely determines the future of a student. The examination results are given in 4 grades, i.e. First Division (60 points or more), Second Division (45 - 59 points), Pass (33 - 44 points) and Failure (32 points or less).

[Promotion in Primary Education]

There are 3 end-of-term examinations for each year. A pupil cannot move to a higher class without passing (33% of correct answers) all the subjects. Since 1989, however, the revised system allows automatic promotion from Class 1 to Class 2. The attendance rate of a pupil has no relevance to promotion.

[Enrolment Age]

In general, children commence primary education between the age of 6 and 10 although some children enrol in primary schools at a later age.

[Compulsory Education]

Primary education for 5 years was declared compulsory in 1990.

[School Year]

The school year begins on January 1st and ends on December 31st.

2) Madrasah Education (Islamic Education)

This is the independent, traditional Islamic education system in Bangladesh.

- Primary School (Ibtedayee) : 5 years
- Junior Secondary School (Dakhil) : 5 years
- Senior Secondary School (Alim) : 2 years
- University (Fazil) : 2 years
- Graduate School (Kamil) : 2 years

The main subjects of primary education are the Koran, Arabic, languages, arithmetic and science.

[Dakhil, Alim and Fazil Examinations]

The Dakhil, Alim and Fazil examinations are conducted in the same manner as standard school education examinations. In addition to the official Madrasah education system, there are also private educational institutions (Forquania Madrasah and Hafizia Madrasah, etc.) which provide upto 4 years of education.

3) Tol Education

Tol education is designed to provide religious education based on Hinduism and Buddhism. It is conducted on a small scale and is independent from standard school education.

4) Non-Formal Education

- Literacy education for adults

- Non-formal education for non-enrolled children and drop-outs, mainly provided by NGOs in the form of a 1 - 2 year preparatory course designed to allow children to re-enter the standard school education system

(2) Current State of Primary Schools

1) Number of Standard Primary Schools, Pupils and Teachers

The number of standard primary schools, pupils and teachers as of 1990 are given in Table A-2-1.

Table A-2-1 Primary Education Data (1990)

| Number of Schools | Number of Pupils | Number of Teachers |
|---|---|---|
| Public : 37,655 | 10,128,293 | 158,113 |
| Private : 8,275 | 1,811,656 | 31,395 |
| Total : 45,930 | 11,939,949 (Girls: 44.9%) | 189,508 (Women: 19.4%) |

Source: Bangladesh Educational Statistics, 1992

While some private schools are highly reputed in urban areas, most are run by local communities in remote areas with 80% of the teachers' wage bill being borne by the central government and the remainder by parents in many cases.

2) Number of Primary Schools, Pupils and Teachers for Madrasah Education

The number of primary schools, pupils and teachers for Madrasah education are given in Table A-2-2.

Table A-2-2 Madrasah Education Data (1990)

| Number of Schools | Number of Pupils | Number of Teachers |
|---|---|---|
| 15,986 | 1,730,491 | 57,698 |

Source: Bangladesh Educational Statistics, 1992

The total number of pupils undergoing standard school education and Madrasah education is approximately 13.67 million. As the number of school age children (6 - 10 years) is estimated to be approximately 17,020,000 out of Bangladesh's total population of 19.9 million, the enrolment rate appears to be as high as 80%.

According to the PMED, however, the actual enrolment rate is far below the 80% suggested by the statistics. The number of school age children (6 - 10 years) is expected to increase as follows.

1991 : 17,020,000
1992 : 17,350,000
1993 : 17,645,000
1994 : 17,912,000
1995 : 18,255,000
1996 : 18,564,000
1997 : 18,863,000
1998 : 19,150,000
1999 : 19,424,000
2000 : 19,697,000

3) Curriculum

The official curriculum for standard primary education is given in Table A-2-3 and Table A-2-4.

Table A-2-3 Curriculum for Class 1 and Class 2

| Subject | | Weekly Periods (30 mins/period) | Rate of Allocation (%) |
|---|---|---|---|
| Language | 10 | 5.0 | 33.3 |
| Arithmetic | 6 | 3.0 | 20.0 |
| Environment | 5 | 2.5 | 16.7 |
| Religion | 3 | 1.5 | 10.0 |
| Physical Education | 3 | 1.5 | 10.0 |
| Art and Music, etc. | 3 | 1.5 | 10.0 |
| Total | 30 | 15.0 | 100.0 |

Table A-2-4 Curriculum for Class 3, Class 4 and Class 5

| Subject | | Weekly Periods (30 mins/period) | Rate of Allocation (%) |
|---|---|---|---|
| Language | 7 | 4.08 | 20.5 |
| Arithmetic | 6 | 3.50 | 17.6 |
| Environment | 6 | 3.50 | 17.6 |
| Religion | 3 | 1.75 | 8.9 |
| Physical Education | 3 | 1.75 | 8.9 |
| Art | 2 | 1.17 | 5.9 |
| Music | 2 | 1.17 | 5.9 |
| English | 5 | 2.97 | 14.7 |
| Total | 34 | 19.84 | 100.0 |

Primary education in Bangladesh is provided in 2 shifts with the morning shift for Class 1 and Class 2 and the afternoon shift for Class 3, Class 4 and Class 5. The actual time-tables for these 2 shifts are given in Table A-2-5 and Table A-2-6.

Table A-2-5 Time-Table for Class 1 and Class 2 (Morning Shift)

| Day | 1st Period 10:00-10:30 | 2nd Period 10:30-11:00 | 3rd Period 11:00-11:30 | 4th Period 11:30-12:00 | 12:00-12:15 |
|---|---|---|---|---|---|
| Saturday | Bengali | Arithmetic | Environment | Religion | School Assembly |
| Sunday | Bengali | Arithmetic | Environment | Religion | |
| Monday | Bengali | Arithmetic | Environment | Art | |
| Tuesday | Bengali | Arithmetic | Environment | Art | |
| Wednesday | Bengali | Arithmetic | Writing | PE | |
| Thursday | Bengali | Arithmetic | Recitation | Health | |

Table A-2-6 Time-Table for Class 3, Class 4 and Class 5 (Afternoon Shift)

| Day | 12:00-12:15 | 1st Period 12:15-12:50 | 2nd Period 12:50-1:25 | 3rd Period 1:25-2:00 | Break 2:00-2:30 | 4th Period 2:30-3:05 | 5th Period 3:05-3:40 | 6th Period 3:40-4:15 |
|---|---|---|---|---|---|---|---|---|
| Saturday | School Assembly | Bengali | Arithmetic | English | - | Social Studies | Religion | Speech |
| Sunday | | Bengali | Arithmetic | English | - | Social Studies | Religion | Art |
| Monday | | Bengali | Arithmetic | English | - | Social Studies | Recitation | Art |
| Tuesday | | Bengali | Arithmetic | English | - | Science | Composition | PE |
| Wednesday | | Bengali | Arithmetic | English | - | Science | Composition | Health |
| Thursday | | Bengali | Arithmetic | English | Science | - | - | - |

Note: The actual time-tables are not identical to the suggested curriculum given in Table A-2-3 and Table A-2-4.

4) Enrolment and Drop-Out Rates

The enrolment rate at the Class 1 level is above 70% but many pupils subsequently drop out as shown below.

National Average Drop-Out Rate for Each Grade (1990)

| | |
|---|---|
| Class 1 | : 19.3% |
| Class 2 | : 12.0% |
| Class 3 | : 15.6% |
| Class 4 | : 15.8% |
| Class 5 | : 11.0% |

Source: Bangladesh Educational Statistics, 1992

As many as 55% of the pupils commencing primary education drop out without completing their education, resulting in a completion rate of only 45%. The low enrolment rate and high drop-out rate can be largely explained by the following 3 fields of causes.

① Parents

Issues relating to the attitude of parents towards education, their own educational background, poverty, expectations vis-a-vis child labour, cost of schooling and relationship between educational career and employment, etc.

② Children

Issues relating to their interest in school, pleasure of being able to read and write, attitude towards teachers, need to earn money for the family, distance to school, proper clothing, homework, toilet facilities and examinations, etc.

③ School

Issues relating to available facilities, quality of teachers, quality of education and system of promotion, etc.

5) *School Facilities*

The basic primary school facilities are outlined below.

- Basic Unit : 3 classrooms plus a teachers' room
- Class Size : maximum of 50 pupils (in reality, most classes are extremely over-crowded with 100 or more pupils)
- Large School : 5, 8 or 11 classrooms
- Desks and Chairs : wooden or steel long desks and chairs (3 seater chairs are often shared by 5 pupils with some pupils sitting on the floor)
- Drinking Water : groundwater from a hand-pump borehole or tap water (some 40% of the hand-pumps are out of order)
- Toilets : shared toilets at small schools but separate toilets for boys and girls at large schools
- Playground : some 60% of primary schools have their own playground
- Building Structure : Kacha Type
  - Pillars and Beams : wood
  - Walls : bamboo or palm leaf panels
  - Roof : corrugated galvanised iron sheeting
  - Floor : earth

  Semi-Pucca Type
  - Pillars and Beams : RC
  - Walls : brick masonry
  - Roof : corrugated galvanised iron sheeting
  - Floor : concrete

  Pucca Type
  - Pillars and Beams : RC
  - Walls : brick masonry
  - Roof : RC
  - Floor : concrete

6) Teachers

- Basic Teaching Strength : 3 teachers plus a head master
- Qualifications : SCC Second Division or higher for female teachers and HSC Second Division or higher for male teachers. After recruitment by a primary school on a provisional basis, a teacher candidate undergoes a one year teacher training course (at a PTI) to qualify as a

proper teacher. The ratio of teachers having undergone teacher training at a PTI currently stands at 80%.

[Primary Teacher Institute: PTI]

There is a total of 54 PTI's in Bangladesh which provide a one year teacher training course, a short training course for head master candidates and curriculum guidance.

7) Miscellaneous Information

| | | |
|---|---|---|
| School Fees | : | free |
| Examinations | : | a fee is payable for each examination |
| Textbooks | : | free |
| Uniform | : | to be purchased by each pupil |
| School Meals | : | none |

(3) Assistance by Aid Organizations for Education in Bangladesh

The development of the education sector in Bangladesh has been greatly assisted by international aid organizations and a number of donor countries. Prior to 1980, this assistance tended to focus on higher education but has since concentrated on primary education with the launching of the Universal Primary Education. Both the First and Second Primary Education Projects were implemented with the cooperation of many aid organizations with the IDA playing a coordinating role. The GEP, which is currently being implemented, is also assisted by various aid organizations, led by the IDA. The projects of various aid organizations are listed below, most of which have been planned within the framework of the GEP. The amount invested is the 5 year total from 1990 to 1995.

1) International Aid Organizations

a. IDA

- Access to Primary Schools (construction of school buildings) — Soft Loan US$ 81.6 million
- Improvement of Quality of General Education (teacher training, curriculum improvement and textbook development) — Soft Loan US$ 77.3 million
- Institutional Development (GEP project management) — Soft Loan US$ 0.4 million

b. ADB (assistance limited to Chittagong Region)

- Access to Primary Schools — Soft Loan US$ 33.2 million
  (construction of school buildings and satellite schools)
- Improvement of Quality of General Education — Soft Loan US$ 23.3 million
  (teacher training, textbook development and population education)
- Institutional Development — Soft Loan US$ 1.0 million
  (GEP project management and management training)

c. UNDP

- Improvement of Quality of General Education — Grant US$ 1.8 million
  (teacher training, curriculum improvement for primary and secondary education, textbook development for secondary education and reform of secondary school examinations)
- Institutional Development — Grant US$ 2.8 million
  (GEP project management, management training and supervision of secondary education)
- Studies — Grant US$ 0.4 million

d. UNFPA

- Improvement of Quality of General Education — Grant US$ 2.4 million
  (population education)

e. UNICEF

- Improvement of Quality of General Education — Grant US$ 10.0 million
  (textbook development for primary education)

2) Bilateral Aid

a. Netherlands

- Access to Primary Schools — Grant US$ 6.8 million
  (construction of satellite schools; NGO aid)
- Improvement of Quality of General Education — Grant US$ 6.9 million
  (teacher training, curriculum development and textbook development)
- Studies — Grant US$ 0.3 million

b. Sweden

- Access to Primary Schools — Grant US$ 6.8 million

(construction of satellite schools; NGO aid)

- Improvement of Quality of General Education — Grant US$ 6.9 million
  (teacher training, curriculum development and textbook development)
- Studies — Grant US$ 6.9 million

c. UK

- Access to Primary Schools — Grant US$ 5.7 million
  (scholarship programme for girls)

d. Norway

- Textbook Printing Paper Supply — Grant US$ 9.8 million
  (1991 and 1992; 1993 onwards not yet finalised)

# APPENDIX 3

## APPENDIX 3 COMPARISON OF CYCLONE SHELTERS UNDER CONSTRUCTION

Cyclone shelters have been built in Bangladesh since the 1960's by the central government as well as by various aid organizations and some details of these cyclone shelters are given in Chapter 2 of the main text. The cyclone shelters under construction by the LGED and under the projects of aid organizations are compared here. The projects in question are those by the LGED, the FD, the BDRCS and the present Project (II).

(1) The cyclone shelters in question are roughly illustrated in Fig. A-3-1.

(2) Comparison Items

1) Main structure
2) Floor area (including ground floor piloti section)
3) Number of storys
4) Height of each floor
5) Type of foundations
6) Main features of interior finishing
7) Existence of auxiliary facilities (toilets, water supply facilities and septic tank, etc.)
8) Normal purpose of use and characteristics of the building

The above data for all types of cyclone shelters is compiled in Table A-3-1.

(3) Examination of Construction Cost

While the construction cost estimate has been conducted in a similar fashion for all the projects in question, a fair comparison is only possible through the application of the same (i) scope, (ii) time and (iii) conditions of estimation. The time of estimation is set at March, 1994. Those estimates which were conducted prior to March, 1994 are adjusted, assuming an average escalation rate of the construction cost based on price trends. The rate of escalation is calculated using the Schedule of Rate published by the PWD (Table A-3-2). The construction cost comparison results are compiled in Table A-3-3.

Fig. A-3-1 Illustration of Cyclone Shelters Under Construction by Different Organizations (Projects).

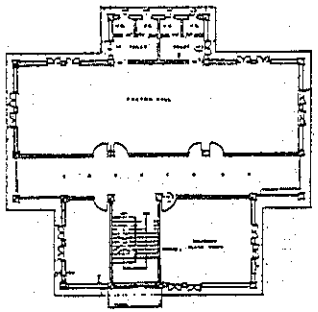
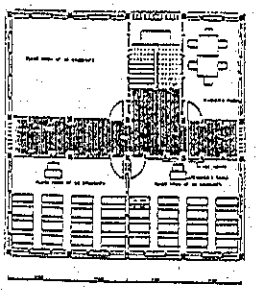
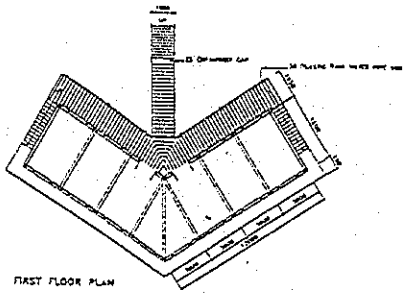
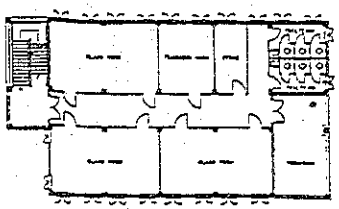
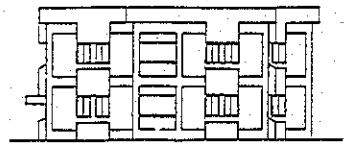
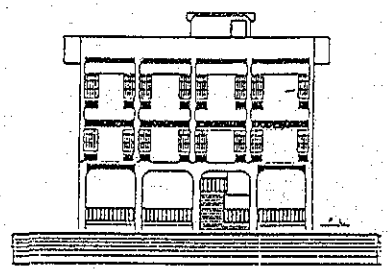
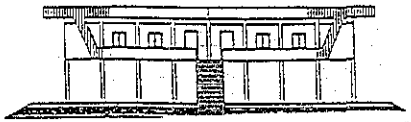
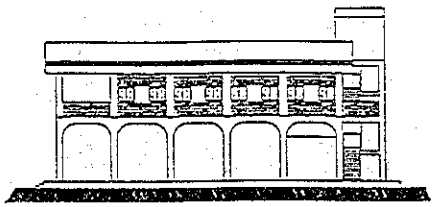
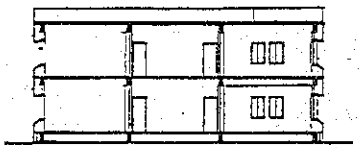
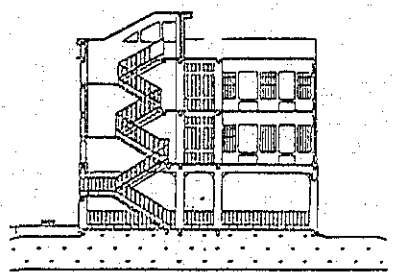
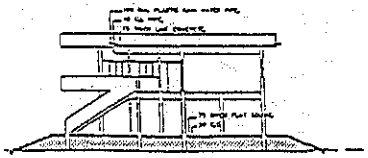
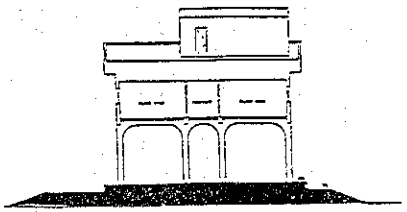
| | LGED TYPE | F D TYPE | BDRCS TYPE | JAPAN TYPE |
|---|---|---|---|---|
| FIRST FLOOR PLAN |  |  |   |  |
| ELEVATION |  |  |  |  |
| SECTION |  |  |  |  |

Table A-3-1 Comparison of Cyclone Shelters

| | LGED (average of 10 shelters) | FD | BDRCS (average of 40 shelters) | Phase II Project (average of 15 shelters) |
|---|---|---|---|---|
| Main Structure | RC | RC | RC | RC |
| Floor Area ($m^2$) (including piloti on ground floor) | 446 | 469 | 244 | 643 |
| Number of Storys | 2 | 3 | 2 | 2 |
| Floor Height (m) | | | | |
| Ground | 3.3 | 3.8 | 3.3 | 4.5 |
| First | 3.3 | 3.0 | 3.3 | 4.0 |
| Second | - | 3.0 | - | - |
| Type of Foundations | piles and direct independent footing | piles | piles and direct independent footing | piles and direct independent footing |
| Interior Finishing | mortar with paint finish | mortar with paint finish | mortar with paint finish | mortar with paint finish |
| Permanent Fixtures | none | blackboards | none | desks, chairs and blackboards |
| Auxiliary Facilities | borehole, toilets | toilet | borehole, toilets (outside shelter) | borehole, toilets |
| Normal Purpose of Use | - schools (constructed on a killa and supported by piles without a piloti section) | - schools (Madrasah)<br>- clinics<br>- community centres (constructed on high ground at convenient sites for access) | - schools (rather small and low building without internal partitions; single room construction) | - schools (rather large and high building with water supply of first floor; ample toilet facilities) |

Table A-3-2 Schedule of Rate by PWD

(Unit: TK)

| Item | 1983 | 1986 | (E/R) (%) | 1989 | (E/R) (%) | 1992 | (E/R) (%) | Average Annual Escalation Rate (%) | E/R for 1994 (%) |
|---|---|---|---|---|---|---|---|---|---|
| Skilled Labour | 30 | 40 | 33.3 | 55 | 37.5 | 60 | 9.1 | 8.9 | 17.8 |
| Mason | 50 | 70 | 40.0 | 95 | 35.7 | 120 | 26.3 | 11.33 | 22.7 |
| Carpenter | 55 | 75 | 36.4 | 100 | 33.3 | 120 | 20.0 | 10.0 | 20.0 |
| Painter | 55 | 75 | 36.4 | 100 | 33.3 | 120 | 20.0 | 10.0 | 20.0 |
| Plumber | 60 | 80 | 33.3 | 100 | 25.0 | 120 | 20.0 | 8.7 | 17.4 |
| Cement | 115 | 115 | 0.0 | 140 | 21.7 | 220 | 57.1 | 8.8 | 17.6 |
| Sand FM 1.5 | 141 | 177 | 25.5 | 212 | 19.8 | 250 | 17.9 | 7.0 | 14.0 |
| Sand FM 2.5 | 318 | 318 | 0.0 | 388 | 22.0 | 388 | 0 | 2.4 | 4.8 |
| Pea Gravel | 363 | 459 | 26.4 | 365 | -20.0 | 600 | 64.4 | 7.9 | 15.8 |
| Bricks | 1,200 | 1,402 | 16.8 | 1,950 | 39.1 | 2,100 | 7.7 | 7.1 | 14.2 |
| Steel Bars | 13,000 | 14,765 | 13.6 | 19,300 | 30.7 | 23,000 | 19.2 | 7.1 | 14.2 |
| Synthetic Enamel Paint | 88 | 99 | 12.5 | 110 | 11.1 | 144 | 30.9 | 6.1 | 12.2 |
| Timber | 6,000 | 8,476 | 41.3 | 12,300 | 45.1 | 19,423 | 57.9 | 16.0 | 32.0 |
| Average | | | 24.27 | | 25.7 | | 26.96 | 8.56 | 17.13 |

Table A-3-3 Comparison of Construction Cost

(Unit: 1,000 yen)

| Item | LGED | FD | BDRCS | Project (II) |
|---|---|---|---|---|
| Building Work | 12,686 | 13,813 | 6,866 | 29,339 |
| Direct Cost of Temporary Work | 0* | 0* | 0* | 1,386 |
| Auxiliary Construction (Borehole and Septic Tank, etc.) | 293 | 142 | 263 | 2,650 |
| Auxiliary Work Necessitated by Site Conditions | 4,340 (killa) | - | - | - |
| Sub-Total | 17,319 | 13,955 | 7,129 | 33,375 |
| Indirect Cost (Common Temporary Work and Overhead Expenses) | 2,165 (overhead expenses at 12.5%) | 1,745 (overhead expenses at 12.5%) | 891 (overhead expenses at 12.5%) | 10,133 (overhead expenses and common temp. work at 27%) |
| Total | 19,484 | 15,700 | 8,020 | 43,508 |
| Year of Estimation | 1994 | 1992 | 1988 | 1994 |
| Rate of Escalation | -- | 17.1% | 44.8% | - |
| Cost Based on Rate of Escalation | 19,484 | 18,385 | 11,613 | 43,508 |
| Cost per $m^2$ | 43.7 | 39.2 | 47.6 | 67.7 |
| Relative Cost Factor | 1 | 0.89 | 1.08 | 1.54 |

* Direct cost of temporary work is included in Building Work.

The relative construction cost factor per $m^2$ compared to that of the LGED is 0.89 for the FD, 1.08 for the BDRCS and 1.54 for the Project (II). The reasons for the varying construction cost from one organization (project) to another are compiled in the following table.

| Cost Item | Description | LGED/FD/BDRCS | Project (II) |
|---|---|---|---|
| Direct Temporary Work | building line and profile, base line, scaffolding, curing, cleaning | Yes | Yes |
| Fixtures 1) | desks, chairs | No | Yes |
| 2) | handpumps | Yes | Yes |
| Septic Tank | septic tanks and plumbing | Yes | Yes |
| Common Temporary Work | temporary enclosure, site office, work sheds (carpentry and reinforcement), storage, safety measures, machine and tool loss, bearing test, water supply | not accounted | accounted |
| Site Expenses | wages for Japanese (and local) staff, travelling expenses, accommodation, office expenses, stationary, insurance premiums, miscellaneous expenses | not accounted | accounted |
| Overheads | expenses at head office | accounted | accounted |

The relatively high direct construction cost of the Project (II) can be explained by the fact that the planned construction work under the Japanese grant aid system results in higher unit costs in Bangladesh due to the very much stricter demand for materials control, quality control, precision of work results and schedule control.

# APPENDIX 4

## APPENDIX 4 CALCULATION OF CYCLONIC STORM HEIGHT

In order to avoid the direct onslaught of the wave force of a cyclonic storm, the planned cyclone shelters will have a raised floor supported by stilts. As the stilts of those cyclone shelters of which the floor height is above the expected cyclonic storm height can easily stand firm against the wave force, the necessary cyclonic storm height to determine the floor height of the cyclone shelters is examined here.

In analysing cyclonic storms, the water level with a 50-year return period is used, as in the case of the Project (I), using the method adopted by the Master Plan for the Multi-Purpose Cyclone Shelter Programme.

The following 2 equations are proposed to calculate the cyclone storm height at the cyclone shelter sites.

$$H1 = h_{50} - (X - 1) K + h_w \quad \text{(A-4-1)}$$

$h_{50}$ : design surge height with 50-year return period (m)
(see Table 3-2-10 of main text)
X : distance of shelter from beach (km)
K : rate of decrease in surge height (m/km)
$h_w$ : amplitude of local wave in meters from mean water level
$h_w$ : $(h_{50} - (X - 1) K)/4$, $h_w = 1$ if $h_w < 1$

$$H_2 = Y_{50} - Y_g + h_f \quad \text{(A-4-2)}$$

$Y_{50}$ : 50-year extreme surface water level (m)
(see Table 3-2-11 of main text)
$Y_g$ : elevation of ground level at shelter site
$h_f$ : allowance for local wave (1m)

The Master Plan suggests that the higher value given by one of the above equations should be used as the design cyclonic storm height. According to the calculation results for the Project (I), however, Equation A-4-1 gives a much higher value. Consequently, the use of Equation A-4-1 appears appropriate to determine the floor height of the cyclone shelters. The calculation results of the cyclonic storm height using Equation A4-1 are given in Table A-4-1.

With regard to those sites where the calculated cyclonic surge height is low, the findings of the interview surveys on past cyclonic surge heights conducted as part of the site conditions survey are taken into consideration to determine the actual floor height of the first floor. The

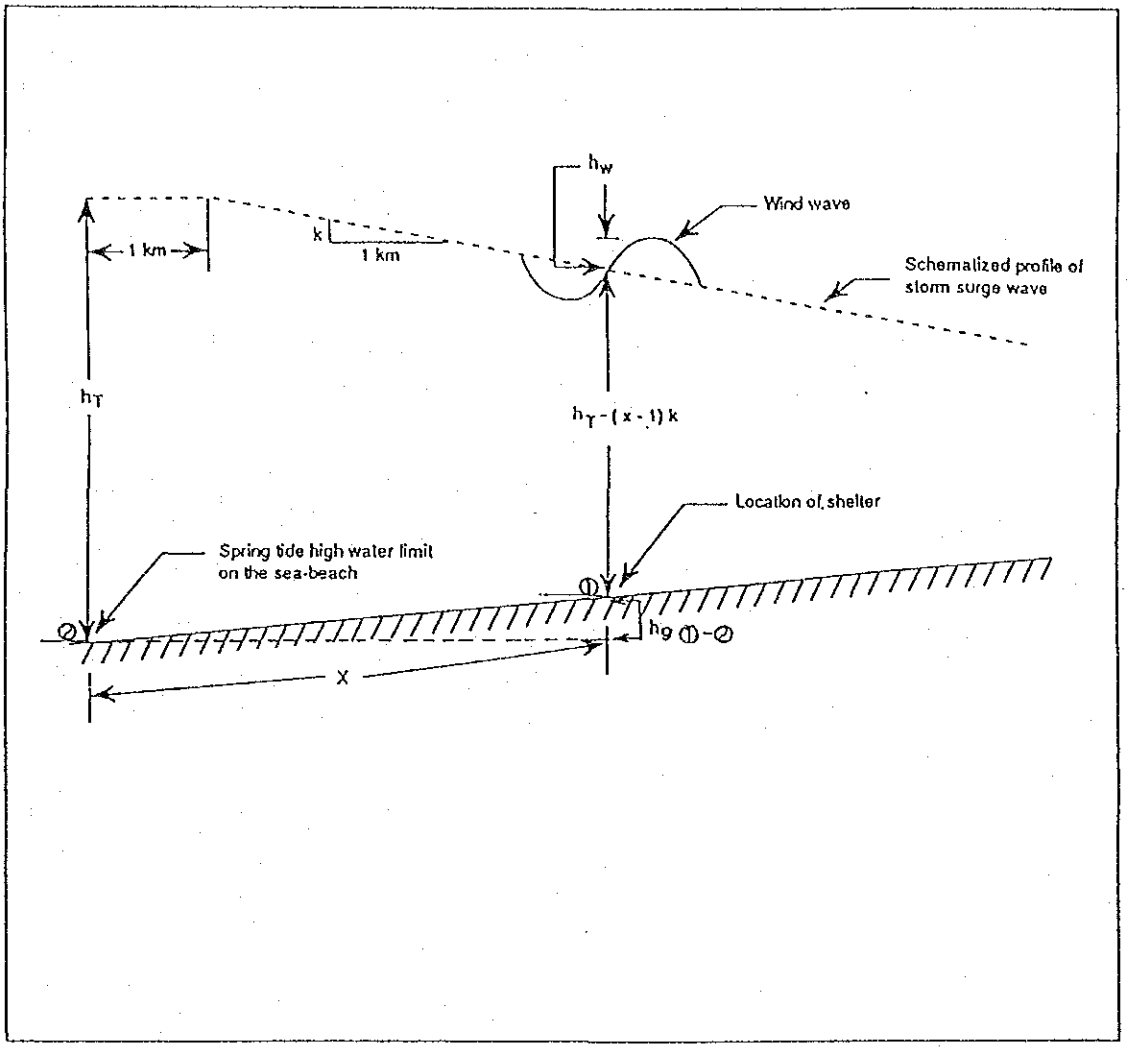
resulting proposed floor heights of the first floor (Hf) proposed for the cyclone shelters to be constructed under the Project (II) are given in Table A-4-1.

Table A-4-1 Tide Level at Cyclone Shelter Sites

| Site No | Thana | $h_{so}$ m | x km | K m/km | $h_{so}-(x-1)K$ m | $h_w$ m | $H_1$ m | ground level | | | $H_s$ | Hh | Hf |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | coastal | site | hg | | | |
| II-1 | Banskhali | 5.8 | 3.4 | 0.5 | 4.6 | 1.15 | 5.75 | 1.60 | 2.45 | 0.85 | 4.90 | 6.0 | 5.5 |
| II-2 | Banskhali | 〃 | 4.9 | 〃 | 3.85 | 1.00 | 4.85 | 1.60 | 3.45 | 1.85 | 3.00 | 4.3 | 3.5 |
| II-3 | Banskhali | 〃 | 3.9 | 〃 | 4.35 | 1.09 | 5.44 | 1.60 | 3.90 | 2.30 | 3.14 | 2.5 | 3.5 |
| II-4 | Sadar | 4.5 | 3.2 | 〃 | 3.40 | 1.0 | 4.40 | 1.50 | 4.60 | 3.10 | 1.30 | 3.5 | 3.5 |
| II-5 | Sadar | 〃 | 2.4 | 〃 | 3.80 | 1.0 | 4.80 | 1.50 | 3.60 | 2.10 | 2.70 | 2.6 | 3.5 |
| II-6 | Sadar | (7.1)<br>〃 | 2.4 | 〃 | (6.4)<br>3.8 | (1.6)<br>1.0 | (8.0)<br>4.80 | 1.50 | 7.40 | 5.90 | (2.10)<br>0 | 2.5 | 3.5 |
| II-7 | Chokoria | 5.8 | 3.0 | 〃 | 4.80 | 1.20 | 6.00 | 1.50 | 3.10 | 1.60 | 4.4 | 3.6 | 5.5 |
| II-8 | Chokoria | 〃 | 1.8 | 〃 | 5.4 | 1.35 | 6.75 | 1.50 | 1.30 | −0.20 | 6.95 | 4.0 | 7.0 |
| II-9 | Chokoria | 〃 | 6.4 | 〃 | 3.1 | 1.00 | 4.10 | 1.50 | 3.75 | 2.25 | 1.85 | 3.0 | 3.5 |
| II-10 | Ramu | 4.5 | 2.4 | 〃 | 3.8 | 1.00 | 4.80 | 1.50 | 4.90 | 3.40 | 1.40 | 2.5 | 3.5 |
| II-11 | Ukhia | (7.1)<br>〃 | 1.3 | 〃 | (6.95)<br>4.35 | (1.75)<br>1.09 | (8.70)<br>5.44 | 1.50 | 7.40 | 5.90 | (2.80)<br>0 | 3.0 | 3.5 |
| II-12 | Chokoria | 5.8 | 3.5 | 〃 | 4.05 | 1.01 | 5.06 | 1.50 | 2.55 | 1.05 | 4.01 | 4.3 | 5.5 |
| II-13 | Chokoria | 〃 | 4.2 | 〃 | 3.65 | 1.00 | 4.65 | 1.50 | 4.55 | 3.05 | 1.60 | 3.5 | 3.5 |
| II-14 | Chokoria | 〃 | 2.0 | 〃 | 5.30 | 1.35 | 6.65 | 1.50 | 1.20 | −0.30 | 6.95 | 6.1 | 7.0 |
| II-15 | Chokoria | 〃 | 2.4 | 〃 | 5.1 | 1.28 | 6.38 | 1.50 | 2.75 | 1.25 | 5.13 | 9.0 | 5.5 |

Hh: Surge height by hearing

Fig. A4-1 Illustration of the Parameters of Eqs. A4-1 in Determining the Required Height of Shelter



# APPENDIX 5

## APPENDIX 5 CALCULATION OF REQUIRED KILLA SIZE

The method to calculate the required killa size is explained here using Site No. II-1 as an example.

(1) Number of Animals to be Evacuated

As Site No. II-1 will have a 3-classroom type cyclone shelter, it will have the capacity to accommodate 1,650 evacuees (see Table 5-2-2). Assuming that these evacuees bring their animals with them, the number of animals to be evacuated to the killa is calculated as follows.

Cattle : $0.275^* \times 1{,}650 = 453.75 = 454$
Goats/Sheep : $0.185^* \times 1{,}650 = 305.25 = 306$

* 0.275 and 0.185 are the number of animals/person in Banskhali where Site No. II-1 is located (source: Master Plan).

(2) Land Area Occupied by Each Animal

Each animal is assumed to require the following land area for safe evacuation at the killa.

Cattle : $1.5\text{m} \times 1.0\text{m} = 1.5\ \text{m}^2$
Goats/Sheep : $0.8\text{m} \times 0.5\text{m} = 0.4\text{m}^2$

The total land area of the killa required to accommodate all animals is, therefore, calculated as follows.

Cattle : $1.5\ \text{m}^2 \times 454 = 681\ \text{m}^2$
Goats/Sheep : $0.4\ \text{m}^2 \times 306 = 122.4\ \text{m}^2 = 123\ \text{m}^2$

Total : $804\ \text{m}^2 = 810\ \text{m}^2$

Assuming an extra margin of some 30% to allow for passage and other space, the required land area for the killa is approximately 1,050 $\text{m}^2$.

(3) Land Area Occupied by Household Goods

The evacuees are expected to bring some household goods with them and, therefore, extra space should be provided at the killa. As space equivalent to the land area required

to accommodate animals should suffice for this purpose, the killa will have an additional 810 $m^2$.

(4) Required Land Area for Killa

Based on (2) and (3) above, the total land area required to accommodate animals and household goods is 1,860 $m^2$.

(5) Required Killa Size

The top part of the killa cannot be fully used for evacuation purposes as it is necessary not to include areas near the edges (slope shoulders) in the usable land area. The required area of 1,860 $m^2$ is, therefore, increased by 30% to ensure safety at the top of the killa and the resulting top section of the killa has an area of 2,420 $m^2$.

Using the standard top width of the killa of 36m for killas designed by the LGED, the required length is 67m. Based on the standard slope gradient of 1:2.0 used by the LGED for killa design and also based on the killa height of 5.5m being level with the design height of the first floor of the cyclone shelter at Site No. II-1, the bottom measurements of the killa are given as follows.

$$(36 + 5.5 \times 2 \times 2)\text{m} \times (67 + 5.5 \times 2 \times 2)\text{m} = 58\text{m} \times 89\text{m}$$

When using the bottom width of a killa designed by the LGED of 61m, the resulting bottom measurements and height of the killa are as follows.

| | |
|---|---|
| Width | 61m (200 ft) |
| Length | 85m (279 ft) |
| Height | 5.5m (18 ft) |

Given the bottom measurements of 61m x 85m and the slope measurement of 1:2.0, the measurements of the top section of the killa are 39m x 63m.

The required killa size for each Project Site, calculated based on the specific parameter values of each site, is given in the following table.

| Site No. | Number of Animals/Person | | Shelter Capacity | Design Floor | Required Killa |
|---|---|---|---|---|---|
| | *Cattle* | *Goats/Sheep* | *(persons)* | *Height (1st Floor)* | *Dimensions (m)* |
| II-1 | 0.275 | 0.185 | 1,650 | 5.5 | 61 × 85 × 5.5 |
| II-2 | 0.275 | 0.185 | 1,650 | 3.5 | 61 × 66 × 3.5 |
| II-3 | 0.275 | 0.185 | 1,910 | 3.5 | 61 × 76 × 3.5 |
| II-4 | 0.209 | 0.128 | 2,210 | 3.5 | 61 × 66 × 3.5 |
| II-5 | 0.209 | 0.128 | 2,210 | 3.5 | 61 × 66 × 3.5 |
| II-6 | 0.209 | 0.128 | 2,210 | 3.5 | 61 × 66 × 3.5 |
| II-7 | 0.237 | 0.169 | 1,910 | 5.5 | 61 × 84 × 5.5 |
| II-8 | 0.237 | 0.169 | 1,650 | 7.0 | 61 × 90 × 7.0 |
| II-9 | 0.237 | 0.169 | 1,910 | 3.5 | 61 × 66 × 3.5 |
| II-10 | 0.244 | 0.081 | 1,650 | 3.5 | 61 × 57 × 3.5 |
| II-11 | 0.266 | 0.134 | 2,210 | 3.5 | 61 × 80 × 3.5 |
| II-12 | 0.237 | 0.169 | 2,210 | 5.5 | 61 × 95 × 5.5 |
| II-13 | 0.237 | 0.169 | 2,210 | 3.5 | 61 × 75 × 3.5 |
| II-14 | 0.237 | 0.169 | 2,210 | 7.0 | 61 × 111 × 7.0 |
| II-15 | 0.237 | 0.169 | 2,210 | 5.5 | 61 × 95 × 5.5 |