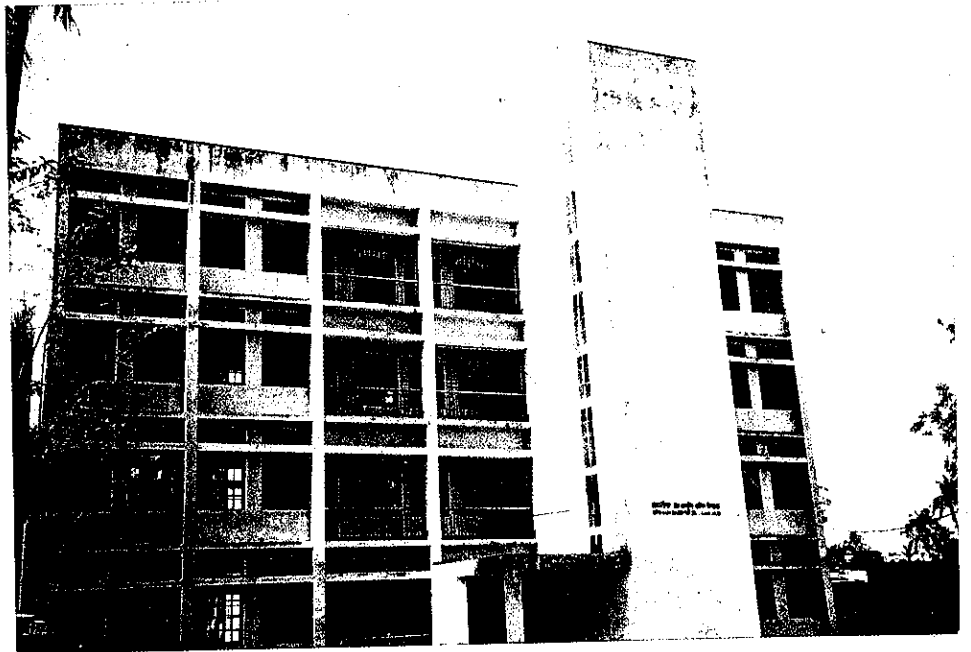
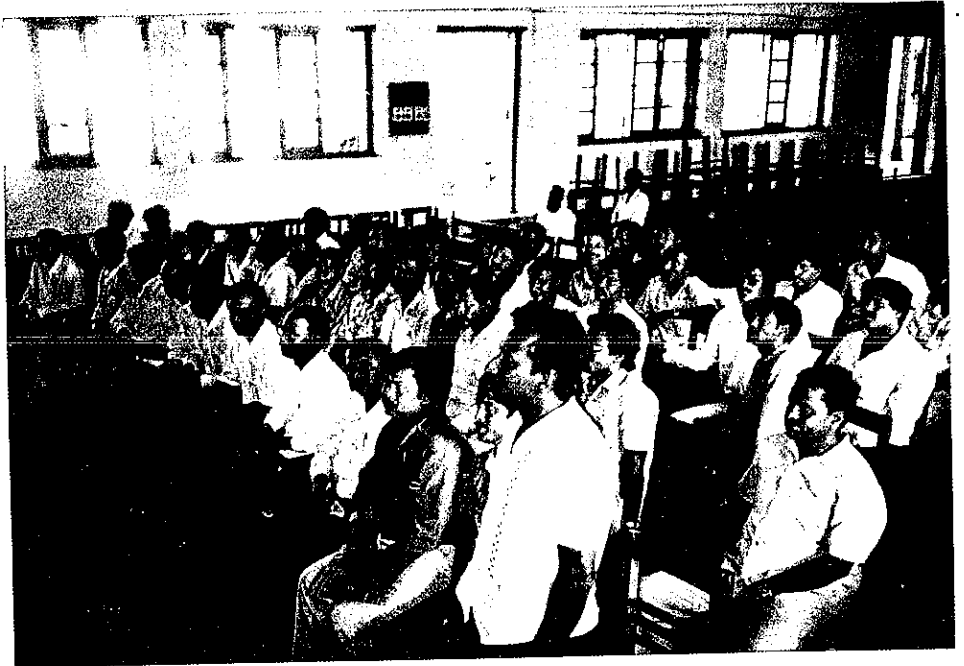


FOUR LEVEL
PUCCA SCHOOL
AT RAJSHAHI



PARTICIPANTS AT
CHITTAGONG
TRAINING SCHOOL

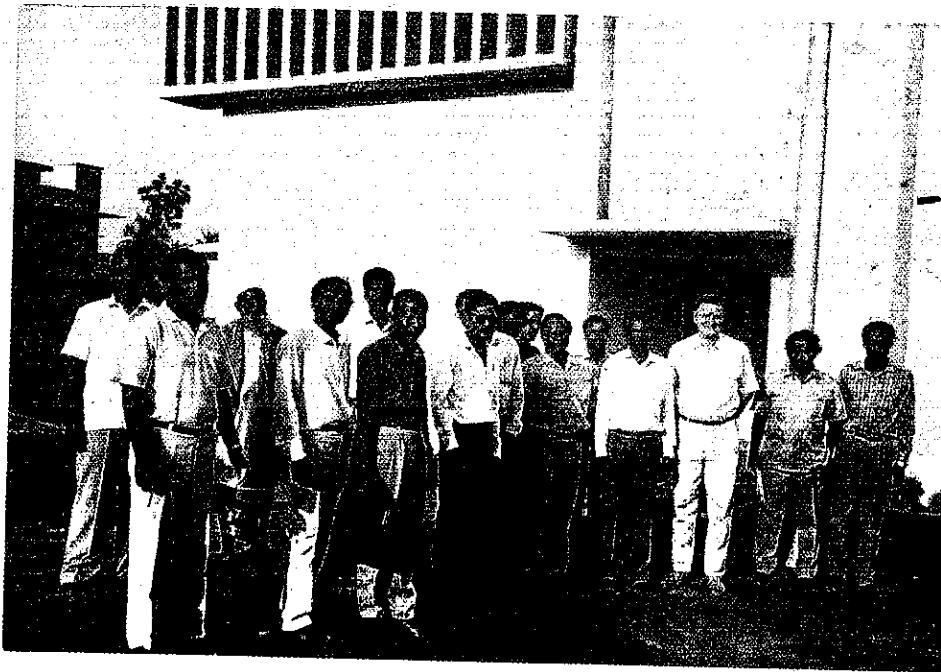


CHITTAGONG
PRESENTATION



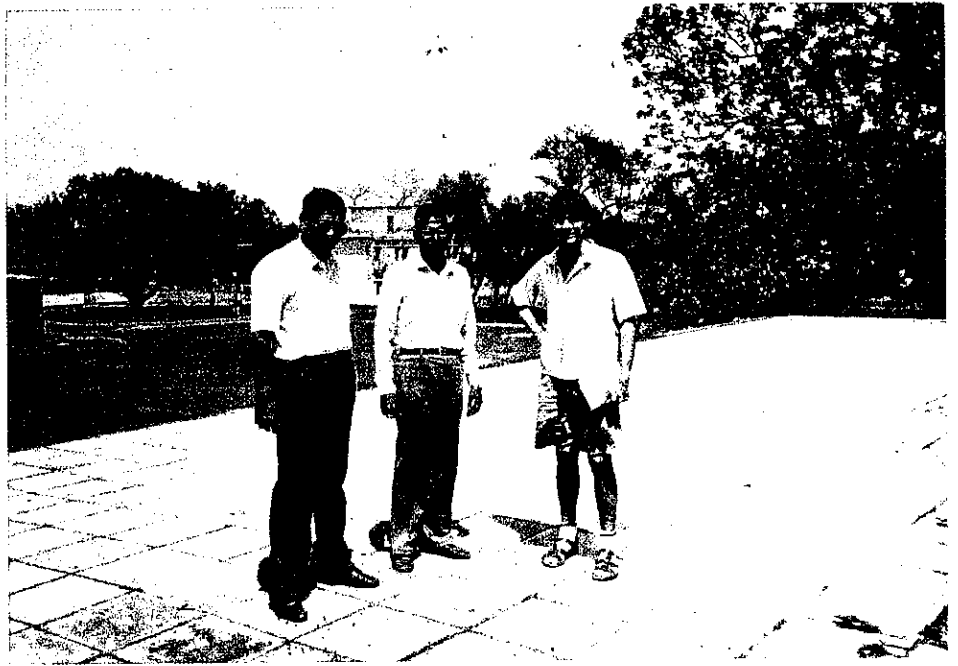
4.00 FIELD VISITS

1. Field visits and inspections were made to some 10 schools where discussions were held in relation to quality of design and construction techniques.
2. Demonstrations of requirements of fixings and connections were also made at one semi pucca school in Rajshahi (Nashata Government Primary School).
3. The importance of purlin and batten spacings, load areas, connections and tie down principles were explained.
4. Unesco style steel school furniture was examined and it was noted that its light weight and robust manufacture led to easy flexibility in layout of the classroom, especially for smaller informal classes - see photos.
5. The lack of pinboards in classrooms was also noted.
6. In addition the chalkboards need to be of a consistent size of 3 ft. height with widths from 6 ft. to 10 ft. Maintenance and renewal of repainting of chalkboards should be implemented.
7. In most pucca schools the ceiling was of exposed concrete with no provision for acoustic damping.
8. Cross ventilation was generally satisfactory except in some buildings with double loaded corridors where fixed glazing from classroom to corridor restricted air movement.
9. The size of windows in some cases could be increased to improve the natural lighting in the classrooms.



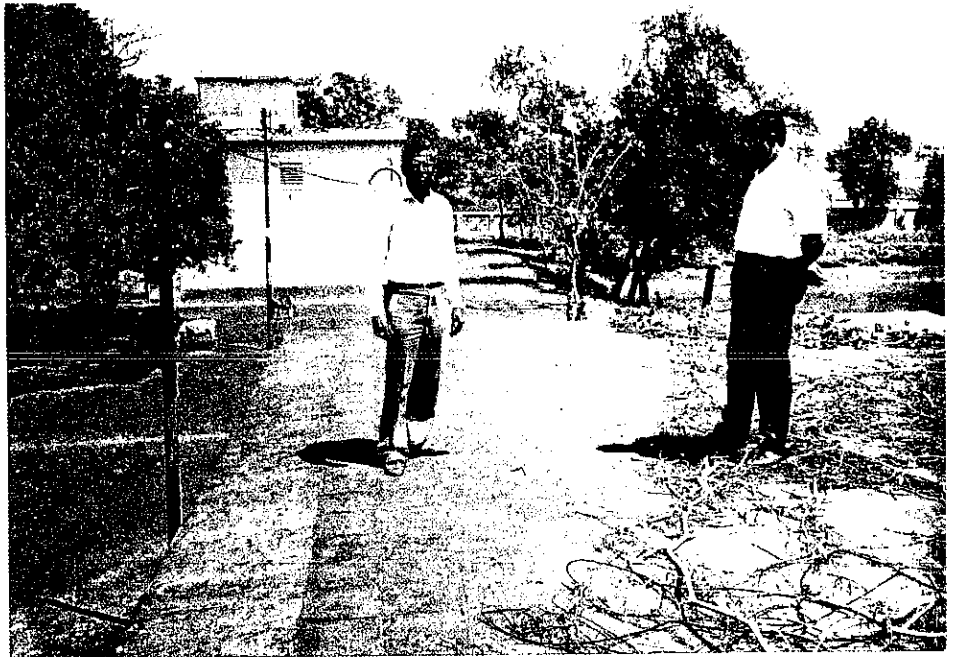
GROUP OF PARTICIPANTS AT KHULNA

CEMENT TILES
AT PUCCA SCHOOL
AT KUSHTIA

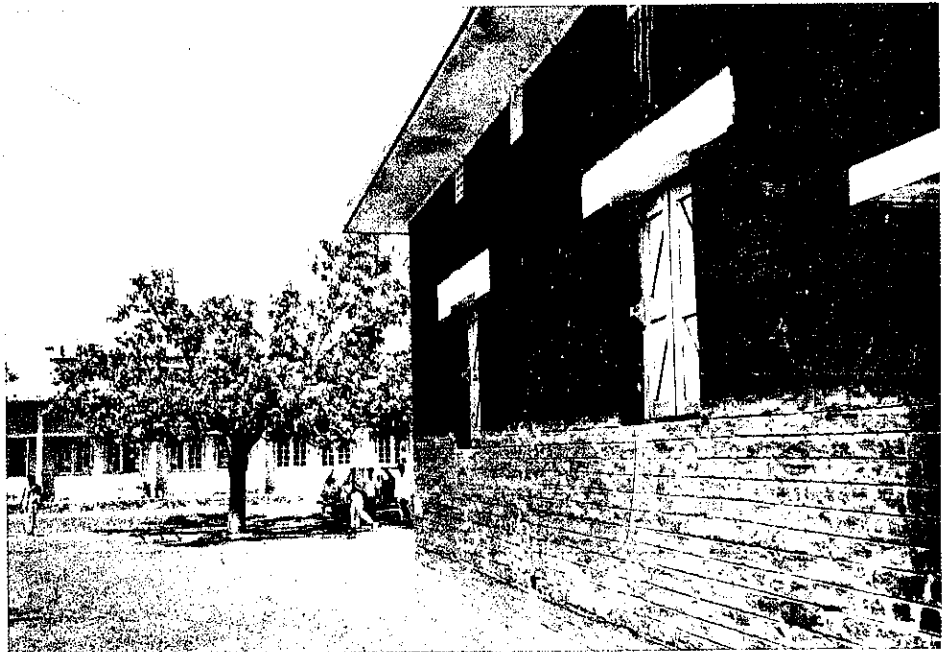


QUARRY TILES ON
ROOF OF PUCCA
SCHOOL AT KUSHTIA

USE OF TILES ON
CONCRETE ROOF
LAST LONGER, DRAIN
OFF RAINWATER AND
SAVES CEMENT USED
IN LIME CEMENT
USED TO COVER
CONCRETE ROOF
SLABS



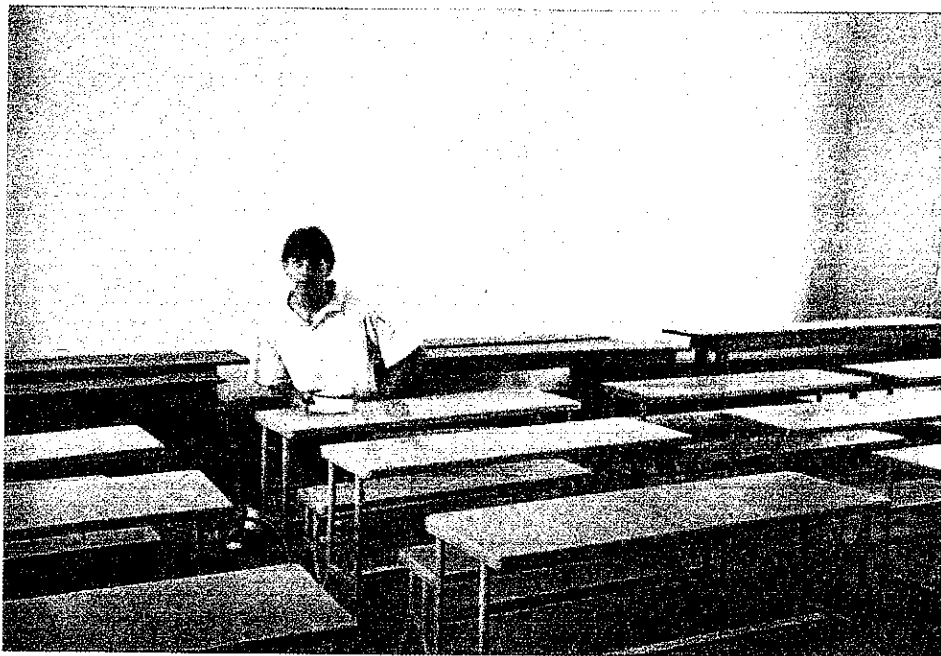
PUCCA SCHOOL
AT KUSHTIA





UNESCO STYLE
SCHOOL FURNITURE

NOTE FLEXIBILITIES
TO PROVIDE INFORMAL
TEACHING AREA



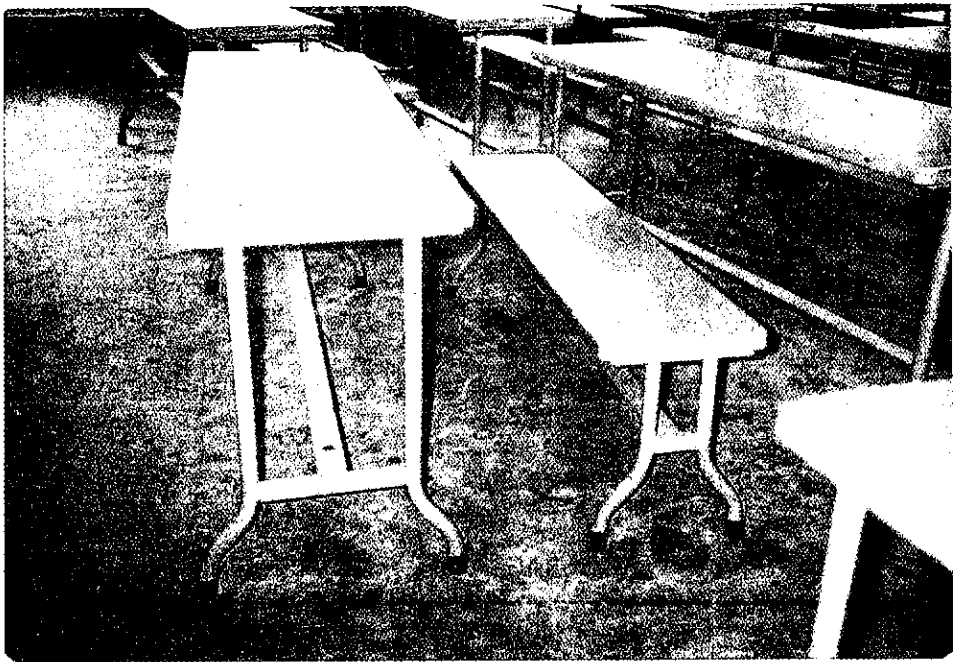
FURNITURE IS LIGHT,
ROBUST AND EASILY
MOVED



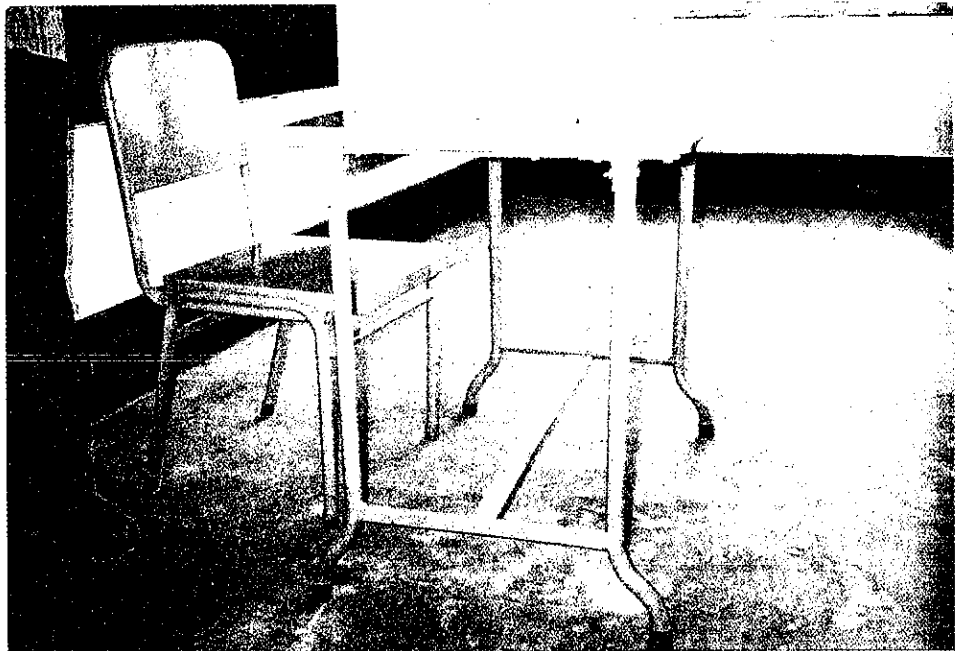
INFORMAL DISCUSSION
GROUP

TYPICAL STUDENTS
DESK AND SEAT

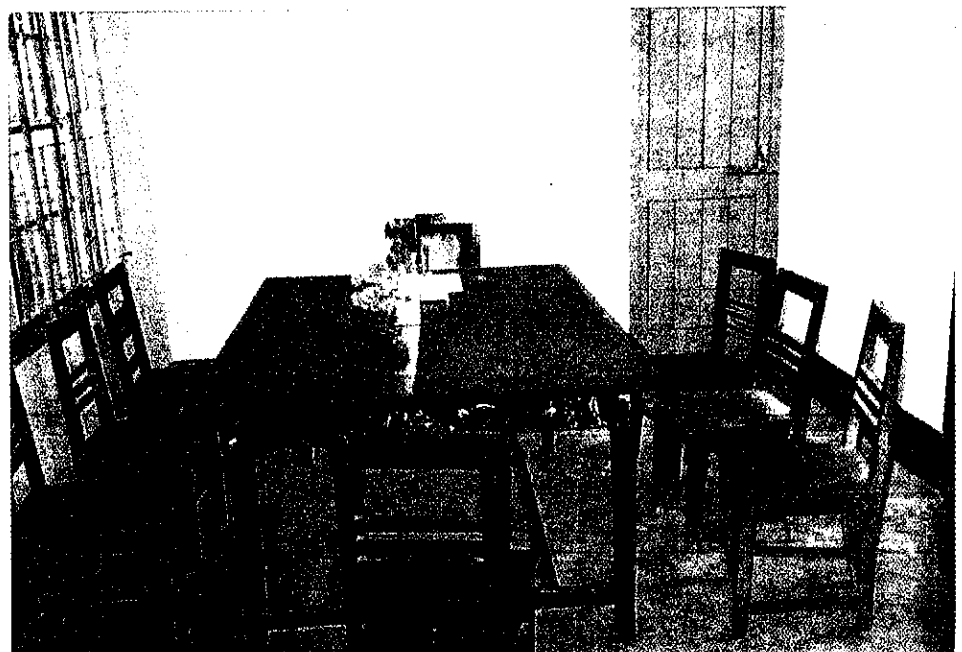
FOLLOWS DESIGNS
SUGGESTED BY
UNESCO/ PROAP



TEACHERS
DESK



TEACHERS ROOM
MEETING ROOM



4.00 FIELD VISITS (cont'd)**B. LIST OF SCHOOLS VISITED**

1. VIKARUNNESA NOON SCHOOL, DHAKA.
 - Pucca construction.
 - Urban School.
 - Visited 8th April, 1990.
2. GOVT. PRIMARY SCHOOL, DAR-E. SALAM MIRPUR, DHAKA.
 - Pucca construction.
 - Urban School.
 - (under construction).
 - Visited 8th April, 1990.
3. PRIMARY TRAINING INSTITUTE, KUSHTIA.
 - Pucca construction.
 - Urban School.
 - Visited 10th April, 1990.
4. GOVT. GIRLS' SCHOOL, KUSHTIA.
 - Pucca construction.
 - Urban School.
 - Visited 10th April, 1990.
5. PRIMARY TRAINING INSTITUTE, NATORE.
 - Pucca construction.
 - Urban School.
 - Visited 10th April, 1990.
6. HOISSOINIGONS GOVT. GIRLS' PRIMARY SCHOOL, RAJSHAHI.
 - Pucca construction.
 - Urban School.
 - Visited 11th April, 1990.
7. UPSHAR GOVT. GIRLS' PRIMARY SCHOOL, RAJSHAHI.
 - Pucca construction.
 - Urban School.
 - Visited 11th April, 1990.
8. NAODOPARA GOVT. PRIMARY SCHOOL, RAJSHAHI.
 - Pucca construction.
 - Urban School.
 - Visited 11th April, 1990.
9. NAOHATA GOVT. PRIMARY SCHOOL, RAJSHAHI AREA.
 - Semi-Pucca construction.
 - Rural School.
 - Visited 11th April, 1990.
10. POSTARPAR GOVT. GIRLS' PRIMARY SCHOOL, CHITTAGONG.
 - Pucca construction.
 - Urban School.
 - Visited 13th April, 1990.

5.00 RECOMMENDATIONS FOR FUTURE DEVELOPMENT

In order to develop the national expertise in the design of low rise buildings to resist the wind loads imposed by cyclones the following actions are recommended:

5.01 Wind Code

Develop a Bangladesh Wind Code (for low rise buildings).

** A draft of a suggested wind code is attached in Part B of this report.

The draft shows proposed wind zones, design wind speeds and dynamic pressures and co-efficients for converting wind pressures to actual forces on the various elements of a building.

5.02 Training Schools

Develop, possibly in conjunction with UNESCO/PROAP, an internal education system to provide training schools in cyclone resistant construction in all districts of Bangladesh.

It is recommended that:

- a) Engineers and architects meet in seminar/workshop mode over 6-9 months to prepare material and a data source for the training schools.
- b) Engineers and architects present courses to Contractors in each district.
- c) Contractors, who could receive a fee of Taka 500 to attend the training school then be responsible to pass on the information to the tradesmen.

The above could be a joint UNESCO/BANGLADESH project with UNESCO funding Part a) and Bangladesh funding parts b) and c).

The project to be completed within three (3) years.

5.03 Course Subject Matter

The course material should include the following:

- a) Wind action on approach to land fall and wind zone in Bangladesh.
- b) Design wind and dynamic pressure.
- c) Co-efficients to convert wind pressure for height of building.
- d) Co-efficients to convert wind pressure for site/terrain categories.
- e) Application of internal pressure.
- f) Co-efficients for structural loads on walls and roof.
- g) Co-efficients for cladding loads on walls and roof.
- h) Construction details for purlins, battens, trusses.
- i) Short term loading (3-5) seconds) and overload factors for timber and steel members and connectors.
- j) Resistance capacity of nails, screws, bolts and metal plate connectors (1-1.5mm thick).
- k) Holding down of trusses, and bond or ring beams.
- l) Spacing of purlins, roof sheet fixings and flashings.

5.00 RECOMMENDATIONS FOR FUTURE DEVELOPMENT (cont'd)

5.03 Course Subject Matter (cont'd)

- m) Bracing in roof plane and in wall plane.
- n) Gable end walls, and alternate details, hip roofs.
- o) Protection by good barge, ridge and valley flashings or cappings.
- p) Fixing of door and window frames and glass thickness.

5.04 Research on Materials and Methods

Request the Housing and Building Research Institute attend the training school and subsequently become involved in the testing of building components, materials and methods of construction. From this development they should be able to disseminate the knowledge learned to the building industry and to the professional architects and engineers.

The institute should develop tables of capacities of nails, screws and nail plates and bolts and holding capacities in both timber and other materials.

5.05 Documentation

- a) Ensure that all documentation of plans for each school includes a site and landscape plan prepared by the architect to indicate orientation of the buildings proposed.
- b) Include more details of desired construction details, both from a security and from a design point of view e.g. chalkboards, pinboards, structural fixings, purlin truss fixings etc.

** See check list attached.

5.06 Costings

Check quantities and costings of new designs, fully detailed, for cyclone resistant schools, for pucca, semi pucca and kutcha schools.

Check also costs of concrete roof and tiles against truss, purlin and sheeted roof.

It is noted that schools in Bangladesh are:

70% semi-pucca
20% kutcha
10% pucca

and that therefore, semi-pucca schools require a system of structural integrity.

5.07 Balancing Wind Load on Roof

Develop rational approach to adjustment of purlin centres so that the actual cladding loads on the roof are evenly distributed so that a single style of roof fixing can be specified for the whole roof.

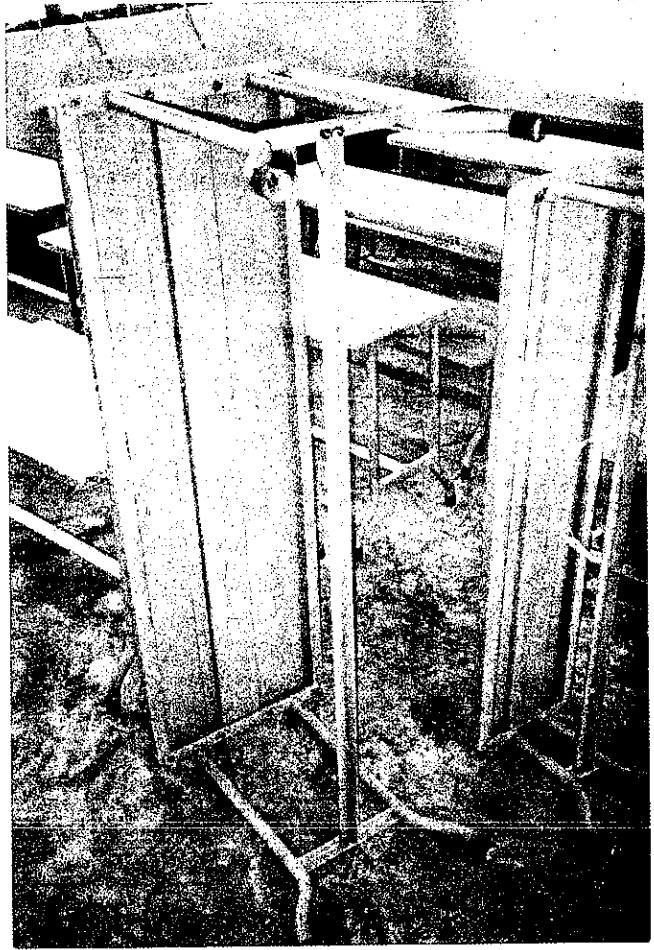
5.08 Wind History - Meteorological Information

Collect and collate a history of wind speeds and barometric pressures of all cyclones crossing the Bangladesh coast over the past 100 years so that design wind speeds can be determined for 25 years, 50 years and 100 years return periods.

5.09 Damage Surveys

Initiate a single page damage survey sheet so that a national survey and report on damages to school buildings is carried out after each destructive cyclone.

CONSTRUCTION DETAILS
OF STANDARD FURNITURE

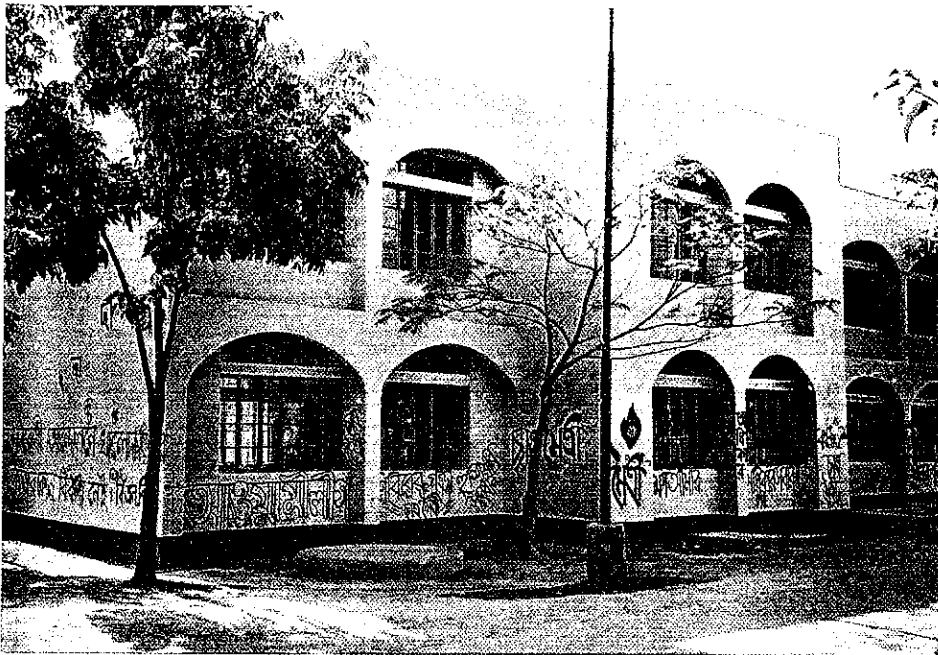


SUPERINTENDING
ENGINEERS
P.K. BISWAS (LEFT)
&
A.B.M. ABDUL MOMIN





PUCCA SCHOOL
AT RAJSHAH I



PUCCA SCHOOL
AT RAJSHAH I

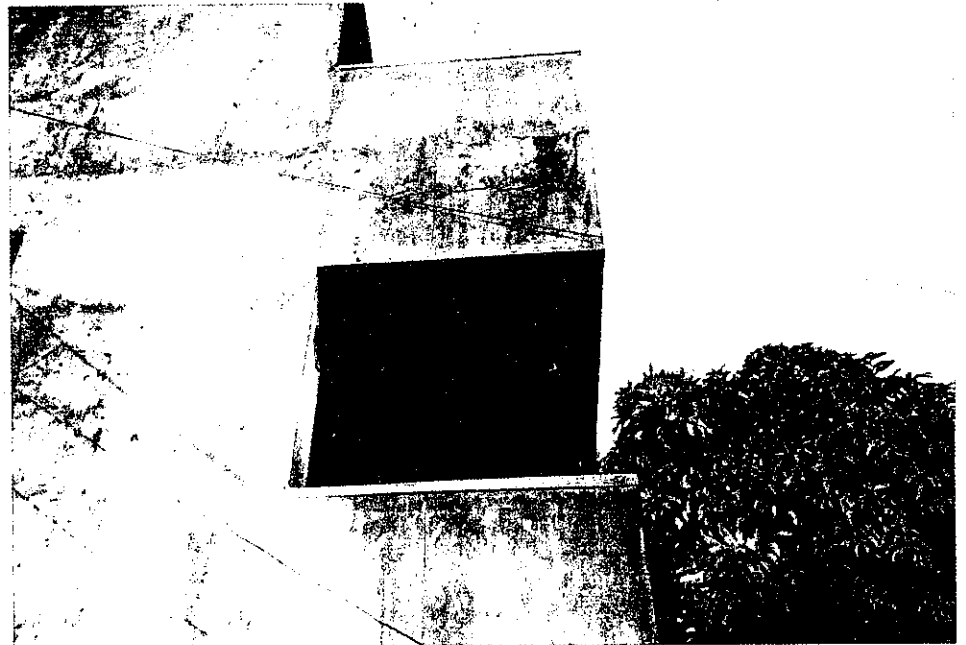
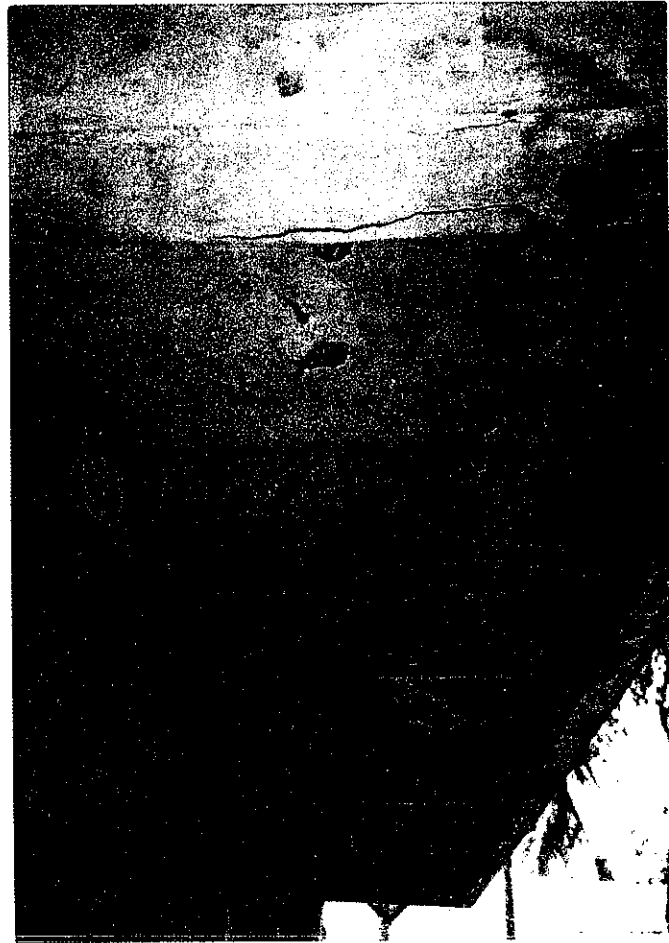


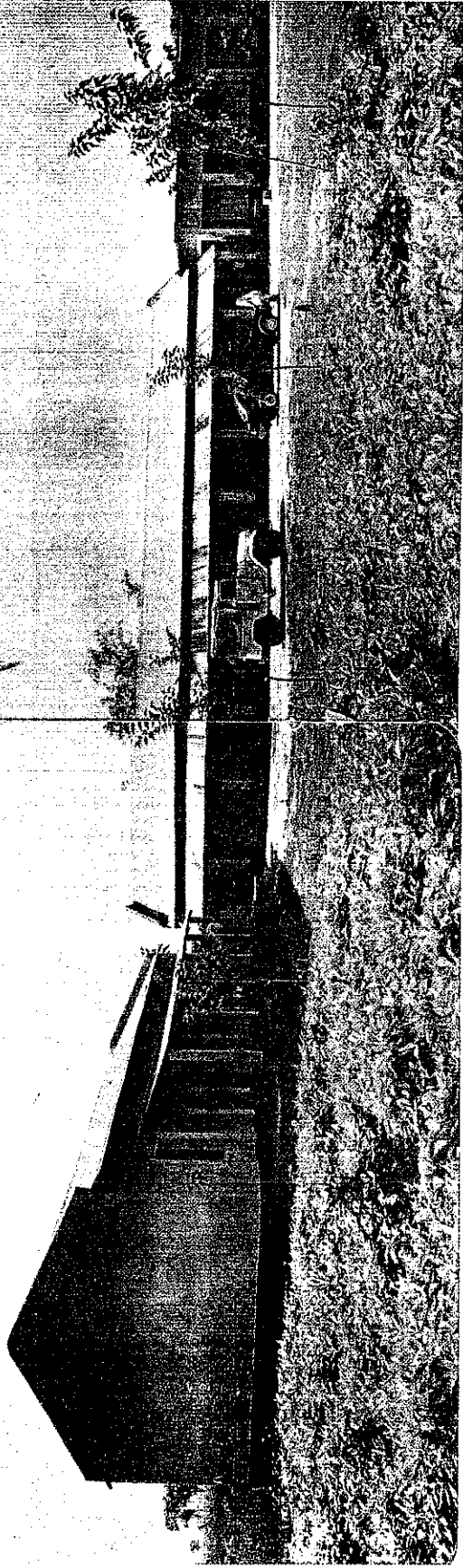
PUCCA SCHOOL
AT RAJSHAH I

POSTARPAR GOVT. GIRLS
PRIMARY SCHOOL,
CHITTAGONG

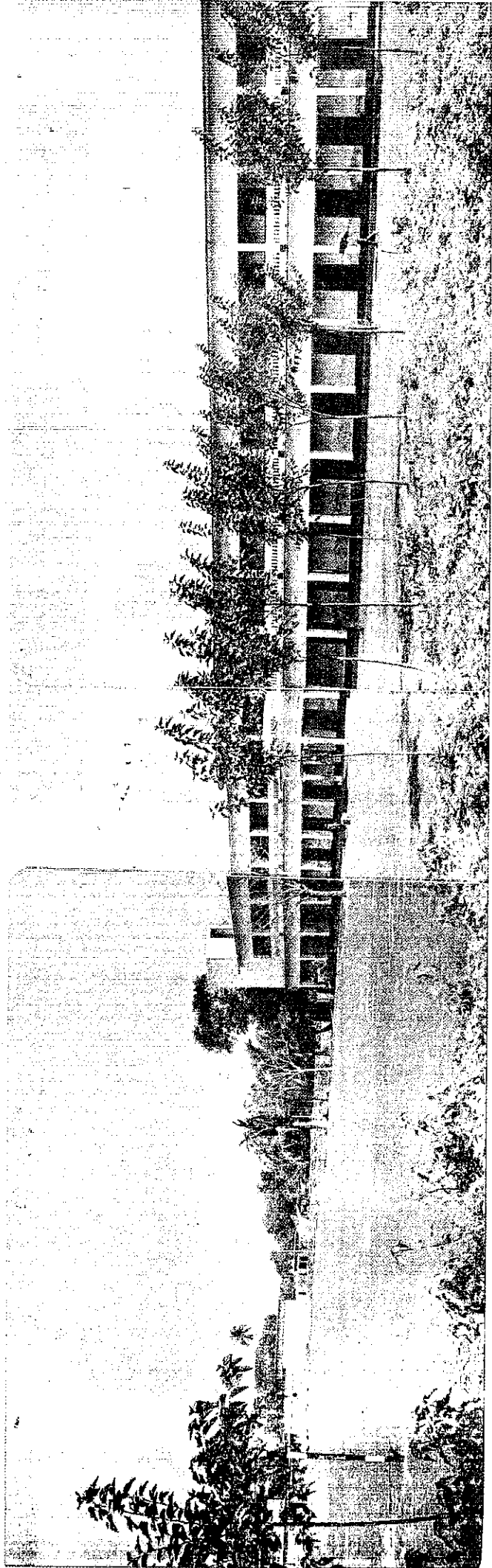
PHOTOS SHOW DETERIORATION
OF CONCRETE DUE TO SALT
AND INDUSTRIAL POLLUTION
ATTACK COMBINED WITH
LACK OF COVER TO STEEL
REINFORCEMENT &
POSSIBLE INADEQUATE
PLACEMENT & VIBRATION
OF CONCRETE

CRACKS & SPALLING
& OTHER DEFECTS ARE
EVIDENT IN CONCRETE
BEAMS, SLABS &
CONCRETE WALLS





NEW SEMI PUCCA - OLD SEMI PUCCA AND PUCCA WINGS AT NAQIATA GOVT. PRIMARY SCHOOL



NAQIATA GOVT. PRIMARY SCHOOL, RAJSHAHI DISTRICT - TEACHERS TRAINING COLLEGE WING

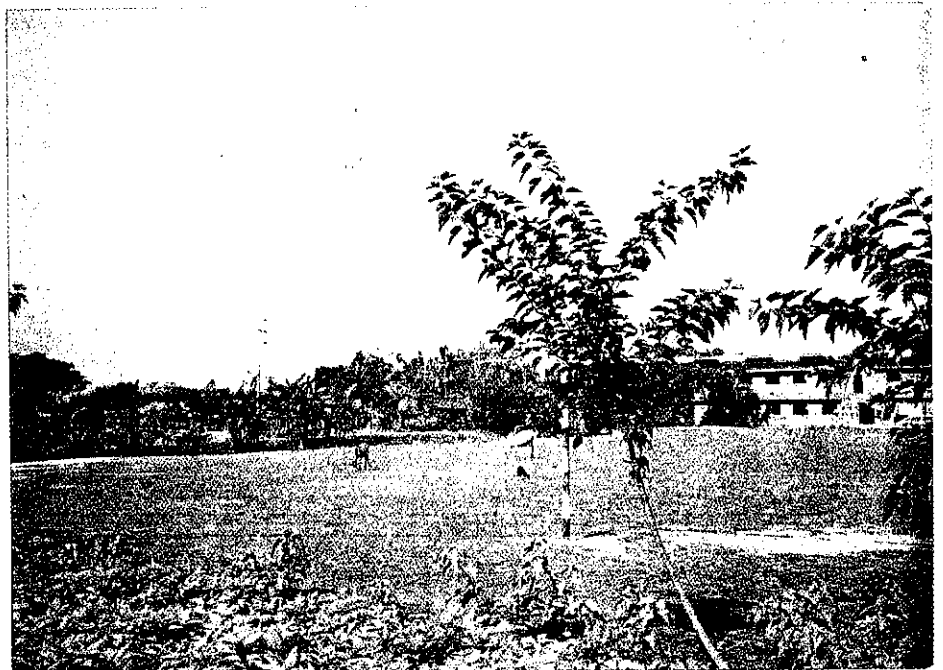
PARTICIPANTS AT
TRAINING SCHOOL
DHAKA



UNESCO TEAM AT
DHAKA TRAINING
SCHOOL



NAOHATA GOVT.
SECONDARY SCHOOL
RAJSHAHI



5.00 RECOMMENDATIONS FOR FUTURE DEVELOPMENT (cont'd)**5.09 Damage Surveys (cont'd)**

The summary should indicate:

Red	Destroyed) - pucca - semi pucca - kutcha
Brown	Badly damaged) - pucca - semi pucca - kutcha
Yellow	Moderate damage) - pucca - semi pucca - kutcha
Green	Little or NO damage)

The results should be marked on a national map to reinforce the knowledge of boundaries of wind zones, to check damage zones at risk and to monitor damages to the various types of school designs.

5.10 Research Group

Establish a small research group of say 4 Engineers, 2 Architects and 2 Contractors who should meet 3-4 times a year to monitor progress on the above programs and who make recommendations for upgrading of existing buildings to resist cyclones and who can present lectures to industry.

It may be called "Cyclone Building Research Group" (CBRG).

Some modest funding from the Government should enable the group to operate and publish material from time to time.

50% of the group should be Government personnel and 50% from private industry to ensure that communication to all personnel is possible to maximize the experience and benefits of the groups work.

5.11 Structural Analyses

It is recommended that once the current school designs are approved, that a full structural analysis be prepared for each of the selected designs for:

- a) pucca schools
- b) semi-pucca schools
- c) kutcha schools

Drawings and calculations to include details of each structural joint or connection transforming load.

Include roof and wall bracing details.

Include ring beam and hold down details.

5.12 Semi-Pucca Schools

Since 70% of the schools are semi-pucca, that is, masonry walls with framed and sheeted or tiled roof, it is important to give earnest consideration to the security of the roof framing and trusses, tie down principles, bracing, claddings and fixings, protection and security of edges of roofs and detailed design of this class of building.