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PRIMARY SCHOOL BUILDINGS REQUIREMENTS AND DESIGN

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ABSTRACT

The paper describes the requirements and designs of primary schools for various regions of Pakistan. Different types of school buildings have been suggested considering the primary school curriculum, expected enrolment and climatic conditions. Using locally available materials, permanent type of construction has been recommended for such buildings. These design would provide schools which are economical to build and maintain.

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1.0 INTRODUCTION

It is planned to have universal primary education in Pakistan, by 1978 and therefore, thousands of new schools have to be opened to enrol some 15 million children throughout the country. Thus a large portion of the estimated expenditure on primary education will be utilized on the construction of school buildings.

This paper deals with the requirements of primary education and describes the designs of primary school buildings for various regions of Pakistan. General climatic conditions, expected student enrolment and availability of materials of construction are some of the factors which have been considered while preparing these standard designs. Standardization of building plans, optimum utilization of space and the use of improved methods of design and construction shall lead to the accomplishment of "low cost" buildings for primary schools.

2.0 PRIMARY SCHOOL CURRICULUM

Primary school curriculum is designed to enable the children to read, communicate, think and solve problems of daily life. Other objectives are to understand the physical and social environments and also to learn personal hygiene in order to take care of their health. Primary school is, therefore, one of the basic services to be provided for any housing colony in rural or urban areas. Most developing countries are over populated and unfortunately the rate of growth of population in such areas is also among the highest in the world. Consequently there is a greater need for providing facilities for primary education as compared to some of the developed countries.

Primary education in Pakistan spans over a period of five years (five classes or grades) for an average child. The primary school are attended by children of 5 to 10 years of age. The primary school curriculum is aimed at teaching of languages, mathematics, elementary science, social studies, religion, practical arts and

physical and health education. The teaching and learning are carried out and assessed in the form of individual work as well as group activity.

A minimum of two qualified teachers is provided to a small primary school in Pakistan. These two teachers are supposed to be teaching all the subjects to class I to V. As such, each one of the two teachers has to handle at least two classes at a time. However, in large primary schools more than two teachers, including a headmaster, are provided.

3.0 REQUIREMENTS OF A PRIMARY SCHOOL

A primary school building may be divided into three main sections:-

i) Class room space, which includes regular class rooms, special purpose teaching space (e.g. visual aid room) and recreation space (assembly hall, gymnasium),

ii) Administrative space (headmaster's office teachers room, health and first-aid rooms); and

iii) Utility space (toilets, drinking water stand etc.).

Science laboratories are not supposed to be the part of a primary school, as sophisticated and extensive equipment is not used for teaching elementary science to small children. Similarly, assembly hall and gymnasium are usually not provided for primary schools. Open spaces around the school building are used for physical education and other recreational activities.

Keeping in view the minimum teaching facilities available and the above-mentioned spaces a small primary school may consist of the following:

i) Two class rooms.
ii) A teacher's room.
iii) A verandah, which can also be used for educational activities and
iv) A toilet.

The size of class rooms will depend on the expected enrolment at the school. The class room should be designed to ensure proper use of teaching aids. It should have a built-in black-board and display boards.

The school buildings should be properly oriented to provide thermal comforts and permit enough natural light in the class rooms. It should be aimed that the school buildings blend with the environment instead of providing a shocking contrast to the other buildings in the area. The primary school buildings should preferably be of single storey constructions, as these have to be used by small children. In the case of double storey or multi-storey buildings there will be some danger of the children getting themselves hurt while using the stairs.

The school buildings should provide safe and weather-proof shelter. It has also been experienced that local people take refuge in school buildings during natural calamities, e.g. rain storms and floods. Safe shelter can only be guaranteed when school buildings are of a permanent type and have been designed and constructed according to the recognised methods. Special considerations should, therefore, be given to the primary schools to be located in areas prone to floods or in seismic zones.

To keep the cost of construction low, locally available materials and labour should be used as far as possible. However, the selection of material of construction should be made to produce permanent type of buildings requiring minimum maintenance.

Another requirement of a primary school is the proper selection of site. It may be possible to

provide a suitable site in a planned housing colony or small village. However, the choice for a school site will be restricted in congested areas, towns and big cities.

The school should have clean, quiet and healthy surroundings conducive to teaching and learning process. It should be easily accessible and the children may not have to cross major highways or busy roads to reach the school.

The school site should be of adequate size to fulfil immediate needs as well as to allow future expansion. Sufficient open area should be available at the site to organize outdoor activities and physical education.

4.0 DESIGNS OF PRIMARY SCHOOL BUILDINGS

As mentioned earlier, a number of primary schools are to be opened in Pakistan to make education within the reach of every child. To provide an open forum for exchange of ideas on the primary school requirements and the materials and methods of construction, a national seminar on "Low Cost Buildings for Primary Schools" was held at Karachi in December 1975*. In the concluding session of the seminar, a number of recommendations were put forward and four provincial committees and a National Standing Committee** were formed to prepare detailed designs of primary school buildings for various regions of Pakistan. The architectural plans, structural details, materials of construction and cost estimates of different types of primary schools for each province are described in the report of the National Standing Committee (1).

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* Civil Engineering Department, University of Engineering and Technology, Lahore, jointly with the Education Department, Government of Sind, organized the seminar. The authors worked as secretary and chairman, respectively, of the organizing committee for the seminar.

** The authors are also the members of the National Standing Committee on Low Cost Buildings for Primary Schools.

Pakistan is divided into four provinces-Baluchistan, North West Frontier Province, Punjab and Sind. Education is a provincial matter and, therefore, it was thought that the preparation of separate plans for each province would help in designing schools according to the requirements, climate, topography and availability of materials of construction.

4.1 Climate and Topography

There is a considerable variation in the climate, topography and population density of the four provinces.

Punjab, the land of five rivers, is the most densely populated province. It is hot in summer and mild in winter in most of the areas. In late summer monsoon affects the region with heavy rains which cause the rivers to rise, flooding the plains of Punjab and Sind.

Sind, the second largest populated province is an arid plain. Summer temperatures are high and combine with high humidity. For the areas along the Arabian Sea, strong westerly winds provide some cooling effect.

The southern parts of North West Frontier Province are quite densely populated and have climate similar to that of Punjab. However, the northern part is a sparsely populated, snow covered mountainous region having temperatures below freezing point in winter.

Most of Baluchistan is a mountainous plateau having active seismic areas. The population is sparse and widely distributed. Winter is severe with snow falls at higher elevations. Rainfall is slight in Baluchistan and Sind.

For primary schools of various regions, the two class rooms and one verandah were combined in a number of arrangements (Fig.1). Primary schools of

Fig.1(a) have been recommended for Baluchistan and Sind. School plans of Figs 1(b) and 1(c) have been recommended for Punjab and North West Frontier Province,respectively.

To provide thermal comforts, the orientation of school buildings in various regions was decided keeping in view the climatic conditions. Also, a minimum ceiling height of 9 ft. 6 in. has been recommended for the class rooms. Sufficient number of windows and ventilators were provided to allow natural light and circulation of fresh air in the class rooms.

4.2 Types of Schools according to class room size

Depending on the expected enrolment, three different types of schools having various sizes of class rooms were designed. The details are given below:-

Type A: Two class rooms of 16 ft x 25 ft each-For 75-100 students.

Type B: Two class rooms of 15 ft x 20 ft each-For 45-80 students.

Type C: Two class rooms of 14 ft x 16 ft each-For 35-50 students.

The sizes of class room have been fixed allowing an average of 8 sq. ft. per student alongwith adequate space for separating different groups sitting in the same room.

The proposed width of verandah is between 7 ft and 8 ft. The verandah may also be used for educational activities.

The primary schools of type A,B and C would serve the needs of a small housing colony or village, where the total enrolment is expected to be less than 100 students. However, primary schools having more than two class rooms and additional facilities will be required for bigger colonies, towns and cities. For such areas, it is proposed to construct schools on "block system".

Each of the three above-mentioned types of schools can be considered as one "block". Depending on the total intake of students, 2-block or 3-block primary school can be built. These blocks may be linked together by extending their verandahs to make covered walkways.

The planning and construction on "block" system will permit the school to grow with the needs of the community and within the budget limitations. A small primary school may, therefore, grow eventually into a secondary school. Fig. 2 shows a typical growth pattern of a school.

4.3 Material of Construction

Permanent type of construction has been mainly recommended for the schools to be constructed in rural as well as urban areas. Depending on availability, burnt brick, stone or soil stabilized block construction has been recommended for walls, and, reinforced concrete or pre-cast concrete has been suggested for roof construction.

A wall thickness of 9 in. has been suggested for brick masonry, while a thickness of 12 in. has been used for soil stabilized construction. However, external walls of 13½ in. thickness (brick masonry) have been proposed in schools for Sind to further reduce the solar heat.

For proper construction and quality of reinforced concrete members, design and construction specifications have been outlined in the report (1).

A booklet (2) on soil stabilized blocks is available in English and Urdu which provides guide lines for the proper manufacture of blocks and the wall construction. The use of locally available timber has been recommended for making windows and doors.

For the primary schools to be constructed in flood-affected areas of Punjab and Sind plinth pro-

tection arrangement have been suggested. Fig.3 shows typical details of plinth protection arrangements.

Earthquake resistant constructions has been proposed for schools in seismic zones of Baluchistan. Reinforcement bands are provided at foundation,plinth and lintel levels. Masonry walls are also reinforced horizontally as well as vertically.

In the regions where more than one materials of construction are available, alternate designs of school buildings have been prepared using different combinations of materials. A comparative study of such designs for Punjab indicates that for a particular type of school building 9 in, thick brick walls and cast-in-sity roof gives the highest cost, while, 12 in. thick soil stabilized block walls and pre-cast roof gives the lowest cost.

5.0 CONCLUSIONS

1. Primary school is one of the important services to be provided for any housing colony.
2. The minimum requirements of a small primary school building are two class rooms, a teaching room and a verandah.
3. The planning and design of school building should be carried out keeping in view the climate, topography expected student enrolment and materials of construction of the area.
4. School buildings should provide a weather-proof and safe shelter for educational activities. Special consideration should be given to the buildings to be constructed in seismic zones and flood affected areas.
5. Future expansion of school should be kept in mind while selecting the site and making plans.

6.0 ACKNOWLEDGEMENT

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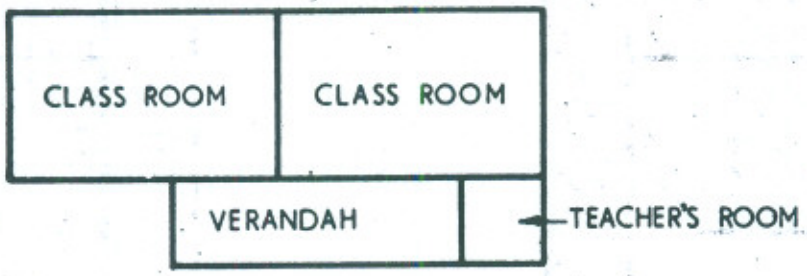
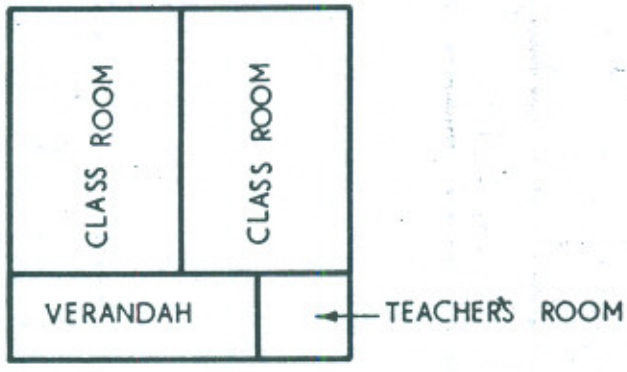


(a)



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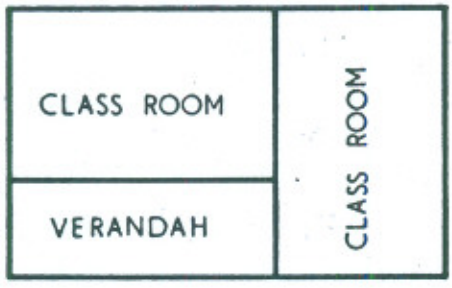


(c)

FIG: 1. VARIOUS ARRANGEMENTS OF CLASS ROOMS IN PRIMARY SCHOOLS

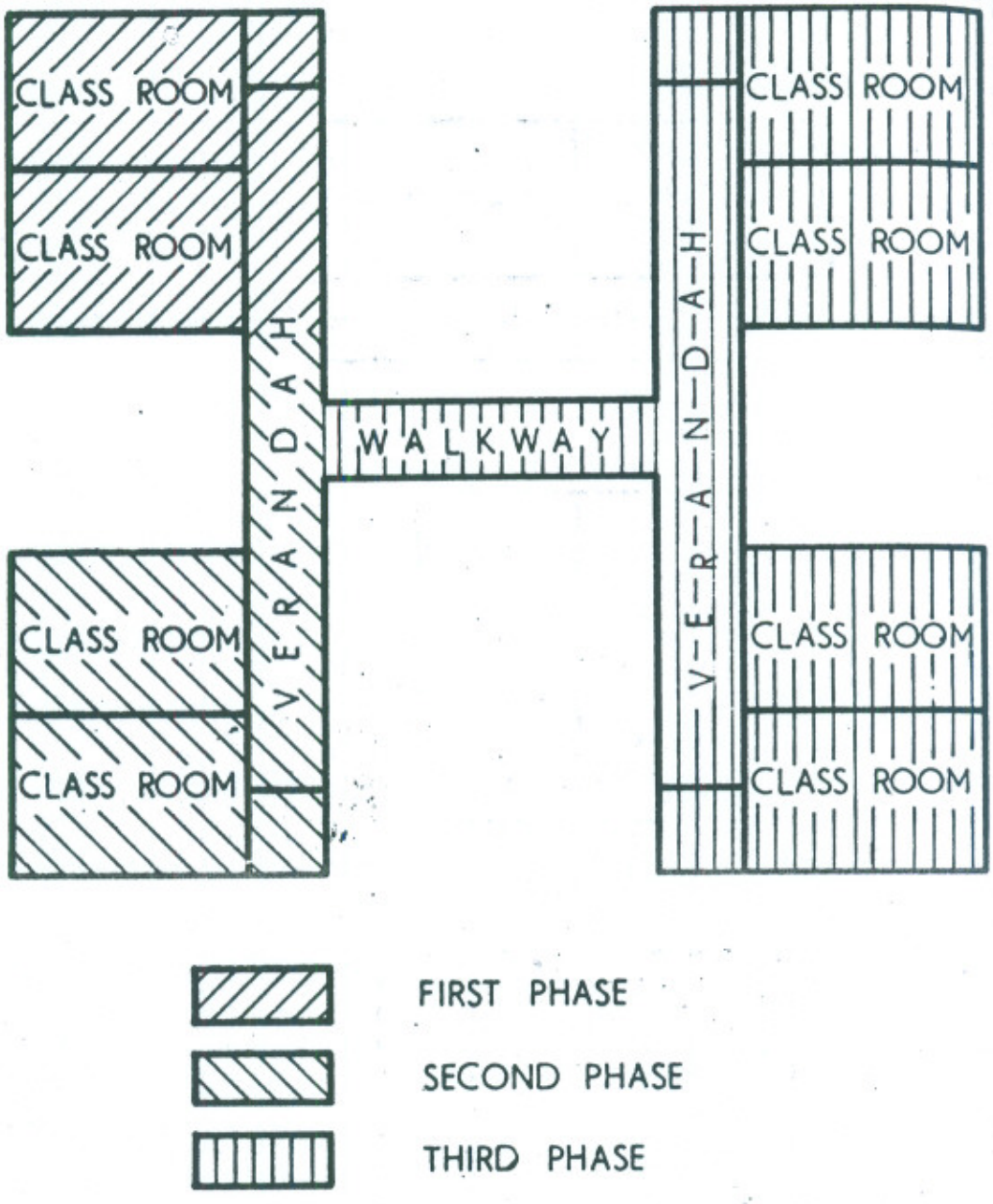
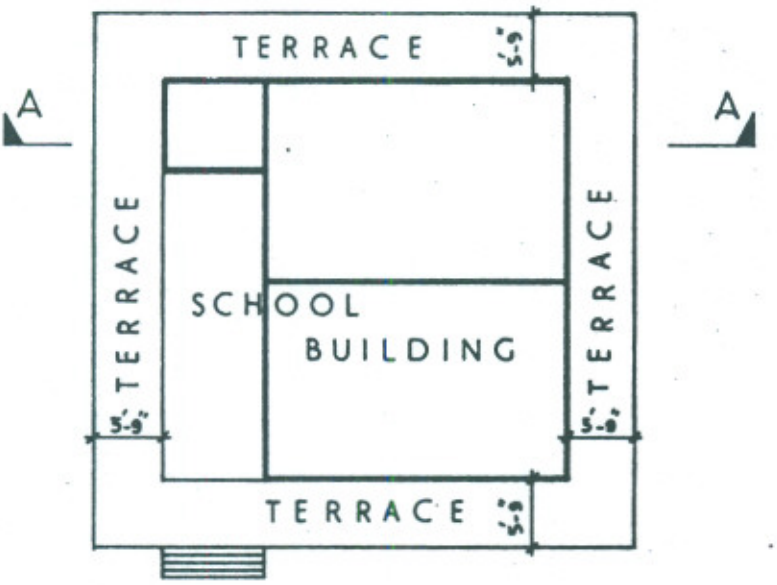
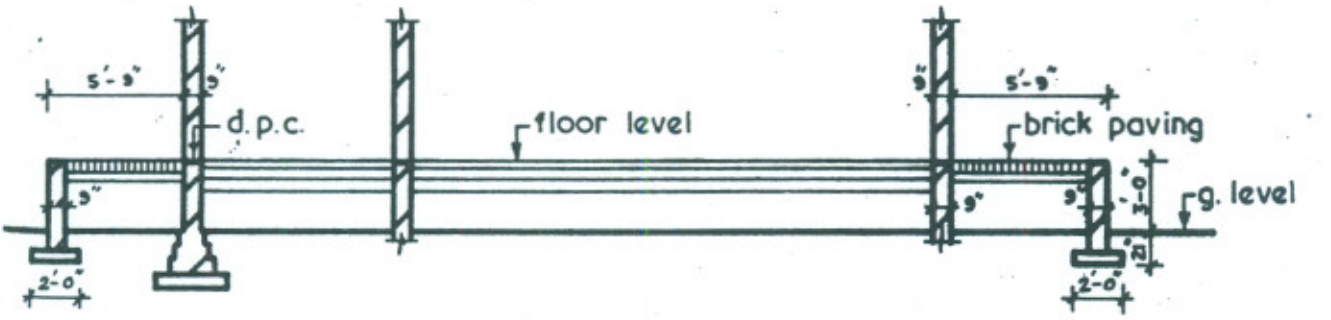


FIG: 2. TYPICAL GROWTH PATTERN OF A PRIMARY SCHOOL



PLAN



SECTION - A

FIG: 3. PLINTH PROTECTION FOR SCHOOL BUILDINGS IN FLOOD AFFECTED AREAS