Aspects of design in developing countries

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Aspects du projet dans les pays en développement

Spezielle Probleme beim Entwerfen von Bauten in Entwicklungsländern

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SUMMARY
While it is understood that development is a comprehensive process, involving the satisfaction of many basic requirements, certain aspects of design in developing countries can be pinpointed. Local conditions, social traditions, architecture, materials and methods of construction are some of the aspects to be considered for preparing codes and specifications and for establishing design procedures. These items are discussed in the paper and it is suggested that genuine cooperation between local and foreign experts can be helpful in solving design problems.

RESUME
Il est clair que le développement est un processus global, impliquant la satisfaction de beaucoup de besoins fondamentaux; néanmoins certains aspects du projet dans les pays en voie de développement peuvent être précisés. Les conditions locales, les traditions sociales, l'architecture, les matériaux et méthodes de construction sont certains des aspects à considérer pour les normes de construction et pour les méthodes de travail. Ces éléments sont exposés dans l'article et il est suggéré qu'une coopération authentique entre experts locaux et étrangers se réalise, afin de résoudre les problèmes du projet et de la construction.

ZUSAMMENFASSUNG
Auch wenn man Entwicklung als einen Verständigungsprozess betrachtet, der die Befriedigung vieler fundamentaler Forderungen einbezieht, können doch gewisse Gesichtspunkte der Planung in Entwicklungsgebieten festgehalten werden. Örtliche Verhältnisse, soziale Traditionen, Architektur, Baumaterial und -methoden sind solche Gesichtspunkte, die für die Ausarbeitung von Kodexen und Spezifikationen sowie für die Festlegung von Planungsvorgängen in Betracht gezogen werden müssen. Diese Punkte werden im folgenden Aufsatz besprochen und es wird vorgeschlagen, dass eine echte Zusammenarbeit von einheimischen mit ausländischen Experten helfen würde, Planungsprobleme zu lösen.

1. INTRODUCTION

Every country has a social, cultural and religious heritage which conditions its approach to all aspects of national development. Building traditions also form part of the collective consciousness, and the architecture, methods of construction and materials of buildings and structures reflect the aesthetic sense as well as the technological attainments of the society that produces them. In the development of a country new structures should not provide a shocking contrast to the existing environment. Planning and design should therefore be carried out keeping in view both the analytical and functional requirements of modern design as well as the needs, traditions and local conditions of developing countries.

2. ARCHITECTURAL ASPECTS

Contemporary planning and architecture of industrialized countries may not be suitable for most developing countries particularly in the design of houses, schools and office buildings. For such projects, cooperation with local architects becomes very essential.

Local architecture has been successfully blended with modern architecture in the design of a number of buildings in several developing countries. These buildings coalesce with the environment in all respects.

In most countries of Southern Asia, people live and work in single or double storeyed buildings which have flat roofs. These roofs are used for enjoying the sunshine in winter and for comfortable night sleep during summer, as most people cannot afford heating and air-conditioning equipment. The roof tops are also used as open-air stores and for drying of washed linen and clothes. People who have been recently housed in multi-storeyed flats feel themselves to be in a congested and difficult condition due to the lack of open spaces and inadequate facilities for garbage disposal, laundry, mail collection and parking.

In rural areas of most developing countries electricity is not presently available. The planning and design of buildings in rural areas should therefore be carried out in such a manner that the optimum use of natural day-light and thermal comforts is made.

3. MATERIALS AND METHODS OF CONSTRUCTION

Concrete is considered an indispensable material for design and construction in developing countries. On important projects computerized batching and mixing of concrete materials are sometimes employed, and on major projects, site investigations are carried out and quality control measures enforced. However, on small projects and on private construction sites, poor quality concrete with low strength and durability is often employed. Structural failures which occur at such sites are sometimes covered up by demolishing and reconstructing the affected parts or by making architectural changes in the basic structure. Therefore, there is a need for improved design and construction techniques and proper quality control measures in developing countries. The use of pre-cast concrete and ready-mixed concrete for in-situ construction should also be encouraged.

4. INTERNATIONALIZATION OF BASIC CODES

Most developing countries do not have their own specifications and codes of practice for the design and construction of concrete structures. Confusion is often caused by the fact that even if the host country has its own codes, foreign companies working abroad insist on employing their national codes and specifications.

The codes of developed countries differ from each other in philosophy as well as detail. For example, the American and British codes adopt two different types of specimens (cylinder and cube) for specifying concrete strength and carrying out calculations. The design of slab systems in the current American code ACI 318-71 is different in approach to the method advocated in the British code CP 110. The method of ACI 318-71 cannot be applied for the design of a slab system supported on masonry which is a common method of construction in developing countries. The minimum area of main reinforcement in beams is 0.25 percent for mild steel (yield strength = 250 N/mm2) in CP 110, whereas this figure works out to be about 0.56 percent for the same value of yield stress in ACI 318-71.

The above discussion indicates that there is an urgent need for the internationalization of engineering codes at least in basic calculations and formulae. For concrete structures, the Comité Européen du Béton standard (1) can form the basis.

5. PREPARATION OF LOCAL CODES AND SPECIFICATIONS

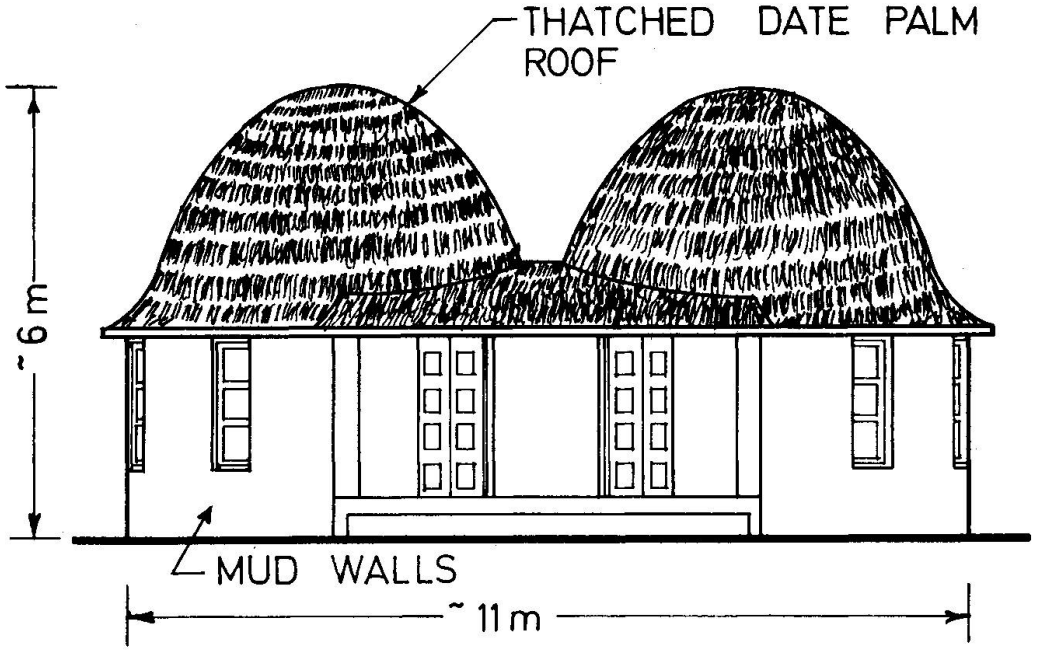
There is considerable difference in the topography, climate and socio-economic conditions of various developing countries. This certainly calls for separate codes and specifications for each region for loading, materials, quality control, construction techniques, seismic design and flood protection. Local engineers as well as foreign experts can work together to prepare these codes. Local technical institutions can undertake work on the properties of construction materials and the development of new materials and techniques. It should be ensured that all such coordinated efforts aim at the establishment of uniform international specifications and norms.

6. SAFETY FACTORS

Safety factors form an important part of codes for reliable, safe and economical designing. The current codes of practice of the developed countries advocate safety factors lower than their previous versions. The decrease in safety factors has resulted due to the availability of improved analysis and design techniques, computer applications, better construction methods and strict quality control procedures (2).

However, most of these improved and sophisticated techniques are not, at present, available in developing countries. The use of safety factors adopted in the current codes of industrialized countries is, therefore, often not justified for design in developing countries.

The codes should provide limiting values of safety factors to include the degree of quality control, construction techniques and design approximations.



7. STANDARDIZED DESIGNS

Structural designs in developing countries should be flexible as well as standardized as much as possible. The flexibility in design should be considered not only with respect to the future expansion of the utility, but also with regard to the use of different available materials of construction.

Standardization of plans and details of low-income dwellings, apartment houses, school buildings and industrial plants for each developing region can lead to economical designs. Standard designs of primary school buildings for various regions of Pakistan have been prepared (3) taking into account expected student enrolment, teaching facilities, climatic conditions and the availability of materials of construction. Fig. 1 shows a primary school suggested for a remote area of Pakistan where means of transportation and skilled labour are not available. "Semi-permanent" construction has been suggested using mud walls and date-palm trees which are abundantly available in that region. With further development of the area, these schools may be replaced in future by permanent type of buildings which have been recommended for the relatively developed regions of the country.

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