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BUILDING CONSTRUCTION TECHNOLOGY

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INTRODUCTION TO BUILDING CONSTRUCTION TECHNOLOGY

The design, construction and use of buildings has a massive effect upon the ability of nations across the globe to achieve the targets for human development. The building sector, worldwide, is responsible for a convenient settlement of all mankind. Building construction is the art and science of putting in place a structure. construction is an ancient human activity which began with the purely functional need of the controlled environment to moderate the effect of climate. Constructed shelter were one means by which human beings were able to adapt themselves to a wide variety of climates and become a global species. In this course, we study how construction work is being done in the tropical region of the world, we look at the techniques of building construction, the organization of a building team, the importance of construction for our society, construction and the developing world, some building construction codes and how site work is carried out. In the first part which is construction in the tropical regions, we recognize the geographical positioning of areas considered to be ‘tropical, we willbe aware of the factors that impact upon the design, construction and use of buildings in tropical climates, understand the importance of considering buildings in tropical climates discretely from those in other climatic zones, understand the construction technology for tropical regions. In the topic of understanding building construction, we find the phases of construction project and what is being done to realize a building project. With the organization of a building team, we see the personnel and the stake holders involve in a building project. We also look at the importance of the construction industry which is the change from local management to smart ways of constructing buildings.

BUILDINGS IN TROPICAL AREAS

The tropical regions of the World are typically characterized by climatic conditions that are hot, humid and lacking in great thermal variability between seasons. The areas that fall within what are referred to as 'the tropics' are located close to the equator, between the Tropic of Cancer to the North and the Tropic of Capricorn to the south. The warm, moist conditions of these areas create a distinctive environment for the creation and use of buildings. By nature the environment would be lush and potentially dense with vegetation as a result of the favourable conditions for growth of flora and fauna. These same conditions provide potential challenges to the creators and users of buildings as the control of unwanted natural agencies can require high levels of consideration. The belt of land and sea that forms the tropics includes many variants of local climate and geography. Similarly it provides home to a multitude of nations and communities. As such it is impossible to generalize about the design, construction and use of buildings in such regions. Similarly, in a text such as this it is impossible to make specific reference to all. However, across these areas there are similarities that are consequent to their positioning within a tropical context. Whether considering sub-Saharan Africa, Central and South America, India or South East Asia, all share common elements in the ways in which creators and users of buildings have responded to the challenges and the opportunities created by their tropical positioning. This text seeks to highlight some of these broad themes with reference to the context of tropical buildings. The case studies within the final chapter provide some specific examples of buildings and the use of materials in some of the regions that we include in our consideration of the tropics. Historically the buildings in such regions would have been developed using local materials and vernacular design and construction principles. However, as industrial, commercial and residential building forms have become more homogenous across World regions, the specificity of design and construction features has been altered.

The creation and use of buildings in tropical climates pose specific challenges to designers, surveyors, constructors, facilities managers and occupiers. Traditional approaches to dealing with the challenges of tropical climates exploited natural materials and vernacular design approaches. However, as the nature of buildings and their construction form have become more internationally uniform, different approaches and design features have evolved to allow buildings to perform in different climatic conditions. Designers must recognize the specific functional and environmental requirements of buildings in such situations. Similarly, the impact of potentially hostile tropical conditions upon building pathology and the durability of components, structure and fabric can be significant. Building maintenance and management must take into account these issues in order to diagnose and develop solutions to building defects. At the same time the use and occupation of these buildings must be approached in a

manner that ensures appropriate functionality and achievement of performance expectations on the part of developers and occupiers. Challenges associated with the sustainability of the built environment have become widely recognized in terms of urban development, building form and whole life performance. The context of these issues in a tropical setting presents unique demands on built environment professionals as they seek to respond to these challenges. Alongside the increasingly rapid pace of development in many tropical countries there is the will to conserve the heritage that is manifested within the existing and historic built environment. The technology of such buildings ranges immensely and the task which faces those responsible for appraising their design, condition, maintenance, conservation and use differs fundamentally from that faced by those developing contemporary urban environments capable of delivering the needs of modern commerce and society. Innovative approaches to surveying, building pathology, design, refurbishment, project management, property management, and maintenance and facilities management afford the opportunity to conserve and enhance existing buildings and to create new buildings and facilities that are fit for purpose and sustainable in a tropical setting. It is important to recognize that the nature of property as a global asset has the potential to result in a degree of homogeneity in the form and function of modern real estate. It is essential that buildings are considered in terms of their local context with reference to the impact of challenging climates. Many of the features that are expected by building occupiers in terms of comfort and internal environmental quality are directly opposed to the natural principles of sustainable design and construction. Evaluative mechanisms such as post-occupancy evaluation need to be cautious of this. The perspectives and skills sets of professionals seeking to recognize and address such challenges must be informed by in-depth understanding of the underlying principles of building pathology and performance. Approaches to meeting these challenges need to be balanced against the economic constraints, competing priorities, cultural issues and aesthetic tastes of people and society in tropical environments.

Construction in tropical regions

there are several differing climatic conditions in tropical regions: Central South America has a hot and humid climate with seasonal differences; Central Africa a hot and wet climate; Asia and Australasia is hot, humid and seasonally wet. The microclimates in these broad ranging areas can differ in terms of nocturnal and diurnal temperatures and humidity. In general terms, the hot and humid tropical regions have little difference in temperature during the day in comparison to night, whereas hot and wet climates can cause a considerable drop in temperature during the night. These varieties of weather conditions and temperatures cause a variety of building typologies and form which differ from region to region. Hot dry tropical climates lying between the two annual isotherms of 20°C consist of areas where vapour pressures are below 25 millibars and the

temperature in the hot season may reach 43°C or more (Fry 1964; Breheny 1992). This can vary in highland areas where the temperature drops by approximately 2° per 1,000ft and humid areas where vapour pressure increases because the microclimate is closer to sources of water, wind variance and foliage. The description of the ‘hot, dry tropics’ is in itself misleading in terms of rainfall. These areas, although throughout most of the year they have deep blue skies and the sun-glare is blindingly overhead, do have a rainy season where for around 30 days the climate is susceptible to flash rainfalls where as much as 50 mm of rain can fall in one hour. This variance in climatic conditions has a direct influence on both building form and materials where shrinkage and contraction can produce pathological problems to the structure as well as the more direct effect to deal with in the shedding of large quantities of rain over a short period.

Historically shelter has provided humankind with protection from the elements such as cold, heat, rain and the sun. With the development of architecture and building physics, we have been more concerned with not only shelter but also human comfort. It is with this in mind that there needs to be an understanding of heat loss from the human skin. The human can lose heat by radiation, convection and evaporation. The first two conditions are dependent on the temperature of air around the skin, whereas evaporation happens when the surrounding air is dry enough to absorb further moisture. It is important therefore that in tropical regions where relative humidity is high, there should be an increase in airflow around the skin, which is essentially achieved by good ventilation. Passively this can be aided by the correct orientation of the building by building construction experts.

REALIZING A BUILDING CONSTRUCTION PROJECT

Building construction as earlier said is the science and are of infrastructure. Its requires much level of understanding the various stages for development of a building. To understand building construction, one need to follow both theory and practice of construction technology. The notion of Building Construction is a fairly expansive one; applicable laws, statutory legislation, legal requirements, and administrative institutions responsible for the oversight of construction range not only in accordance to jurisdiction, but also with regard to the standards and practices of operations. Within the realm of Building Construction, there exists a wide range of legal stipulations and statutory legislation; these ideologies and methodologies are required to be satisfied in order for the Building Construction to be determined as a legal and valid endeavor. It is important to understand the building design phases and the information required at each stage. The development and construction of buildings can be both a stressful and confusing process, as well as a rewarding one for clients and stakeholders. The first things of every construction project is to set up the phases of the project. The phases of a building project are as follows:

Planning:

The first stage involved in building construction is planning which can also be seen in three major steps. These steps include developing the building plan, analyzing the finance, and selecting the construction team.

Planning must be done by experts in the field to ensure errors are eliminated from the beginning of the project. Building plans are developed based on the owner's budget and requirement. Sometimes already prepared building layout is selected for a site. After the preparation of the site plan, the finance and total cost is estimated thereafter. Depending on the structural design details, the material estimation is prepared in order to get the project cost estimate. The cost to be calculated includes material cost, construction cost, labour cost, and miscellaneous cost.

Permits and insurance of the Site:

After the planning, the next step is the permits and insurance before starting the building construction. The owner must have the necessary permits so construction will not be delayed, demolished, or stopped by the government. Permits and insurance can be obtained from different sources in cities. Contractor and owner are saved when a site has the required permits and insurance.

Site Preparation:

From this stage, the construction process begins. Using the site and building plan, levelling, filling and excavations will be performed to know the next move. In this stage, most of the works needed for utilities are prepared same as the necessary excavation for utilities. These utilities include power, water and sanitation lines as well as temporary storage facilities.

Foundation or Substructure Construction:

As engineers will also say, a good foundation determines the quality of a building project. Foundation is one of the most important aspects of building construction. A concrete foundation is generally accepted for all kinds of building structures. But the soil type and water table level of the area, other types of foundation can be utilized.

Soil testing is sometimes performed to check the bearing capacity, although sometimes it's not necessary. For low-rise building, shallow foundations are performed. While for high-rise building, pile foundation is used. so, as a structural engineer, understanding the various types of the foundation is necessary.

So soon as the foundation to be employed is known, soil excavation begins to construct the foundation. The construction is made based on the foundation layout. Formworks are used in the foundation trenches and reinforcement is placed depending on the foundation detailing designed in the planning stage. Reinforcement works performed by the contractor is checked by the engineer in charge at regular interval.

Mixed concrete of the required proportion is then poured into the formwork which is cured to form the foundation.

Superstructure Construction:

The next step after the substructure is the superstructure construction. Typically, framed structures are produced which will later be finished with masonry walls. From the site plan, adequate windows and exterior doors are located.

At the stage, the construction of roof or siding, providing waterproofing to the walls, flooring works, installation of heating, ventilation and air conditioning must be considered. Plastering and finishing the walls and surfaces, as well as exterior and interior painting is also worked in this stage.

Punch List:

The punch list contains the list of things that have not being done or areas that are not properly constructed after the completion of the project. The punch list should be inspected by the contractor from the beginning to end one after the other and correction should be made by the contractor in charge.

Warranty Period:

After the succession of the project and it has to be handover to the owner. Warranty period must be specified to the owner by the contractor. Within the given period, any defect found in the constructed building must be fixed and replaced by the contractor in charge. Warranty for materials and appliances are obtained from manufacturers and suppliers.

In conclusion, building construction is an industry, field, hobby that involve various steps for its accomplishment. It is said to be the process of adding structures to real properties. We explained the three sectors of construction which include building, infrastructure and industrial. Buildings are divided into a residential and non-residential building. The heavy engineering is said to be infrastructures while industrial construction includes refineries, chemical processing, power generation, mills and offshore construction.

ORGANIZATION OF BUILDING CONSTRUCTION TEAM

In a project of building constructions project, we mostly find the following stake holders:

The Construction Client

The Client is the person/company for which the building is being built. The Client will define the aesthetic and functional needs for their building. They usually rely on experts to select products, Clients only get involved because of special requirements such as sustainability or life time value/costs. Traditionally it is the Architect that guides the Client when it comes to product selection. Yet Clients with large property portfolios will often indicate preferred products.

Specialist Consultants

There are Specialist Consultants for an array of subjects; sustainability, acoustics, fire, security to name just a few. Most will not get involved in product selection, but do write the overall performance specification, which indicates the performance criteria that must be attained by the chosen product. So Specialist Consultants indirectly influence product choice. It is usually the Architect who is responsible for interpreting these requirements. Requirements can present conflicting demands and the consultant may then advise on the best way to achieve a result – that is suggest products. So it's important that they know what benefits your products can deliver. Specialist Consultants will be interested in how your product meets performance and safety requirements.

Architect

The Architect develops the buildings' design, taking the Client's brief and combining it with the advice of the Specialist Consultants. This then has to be developed to meet the requirements of the Building Regulations and increasingly sustainability. Architects have significant involvement in product selection. Architects want to understand how your product contributes to their overall design and the building's performance. They are often short on time so it is important, when presenting your product, that the information is easy to understand and to the point. Provide tools, such as pre-written specification documents, to make it easy for the Architect to specify your product.

Engineer

Working with the architect will be a number of engineers that are responsible for structural, mechanical and electrical design. The Structural Engineer is a key member of the Project Team. Structural Engineers design the skeleton or structure of the building,

enabling Architects to focus their talents on creating a design that satisfies their client's demands. Structural Engineers will monitor the progress of an Architectural project. They create initial design models, using in-depth mathematical and scientific knowledge. When work has begun, they inspect the work and advise contractors. Structural Engineers must ensure their designs satisfy given criteria, that they are safe, serviceable and perform well. They will want to understand how your product meets their performance requirements.

Contractor

The Contractor oversees and manages the construction of the building for the Client, following the Architect and Engineers' designs. The work is delivered under a contractual agreement. The Main Contractor will select Sub-contractors based on the capability, availability and price. Sub-contractors include many specialist trades. The Contractor is looking for products that offer ease of installation, good availability & represent value. They want confidence that their Sub-contractors are familiar with installation, to avoid complications. They need to know that building work will not be delayed by lack of product availability and that product cost remains within the estimate, so they can remain profitable.

Conclusion

Understanding each member of the Construction Project Team is important when marketing building products. Tailoring marketing for each decision maker is important, to represent the key benefits that answer the issues that matter to them. Knowing who has the most influence on product selection, at what stage in the construction process, helps to target communications. This is where research can help. Construction markets present some unique challenges for the marketer. The Construct Project Team is a complex Decision Making Unit, one that comes together for a specific project and then is disbanded when construction is complete. The time from product selection to installation can be lengthy with many decision makers influencing product selection.

IMPORTANCE OF CONSTRUCTION INDUSTRY

A construction industry is a very important industry for our world today. It all began with small groups of people coming together to build shelters and comfortable places for mankind. But now we have sophisticated smart industries found in all regions of the world. Its importance is a subject to always review when we talk of construction technology. The industry is there to facilitate and organize and realizes construction works. Let's look how it works:

Facilitating construction works

When a building project has been conceived, the client will need to get the project realizer which is always term a contractor which is also an industry. This industry will study the plans of the client which is produced by an architect, and put in place the project execution techniques which requires much understanding of construction technology. In construction, we have light tasks and heavy tasks, the way at which the tasks is being done is very important because it's from little task that we meet the master design. For a construction work to be facilitated by an industry, it will make proper use of the material specification, equipment and personnel.

Organizing construction works.

The ease of organizing a construction work depend on what to be done and it is supposed to be done. The industry will always go to the site an do the feasibility before involving in the project. A mechanism for the running of things should always be put in place by the industry. The project team members will interact to make the execution plan which will always be used to check the project status.

Realizing a building construction project.

The steps of realizing building projects are similar for industries but differs depending the project. To realize a simple residential building, the industry will use this steps:

Site clearance

The foundation

The elevation

The roof

Drainages

Plastering

Sanitary fittings

Ceilings

Painting and tiling

This order of realization is mostly use for construction of buildings.

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