



Government of Nepal
Ministry of Urban Development
Department of Urban Development and Building Construction
Babarmahal, Kathmandu

The Building Design Guidelines

(Draft)



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Introduction

BACKGROUND

Nepal is endowed with a diverse natural and cultural heritage. Equally diverse is the architecture of the country with buildings that range from stone huts in the mountains to brick buildings embellished with intricate wooden carvings to mud buildings with thatched roofs in the hills and the plains. Architectural marvels of Nepal and the urban settlements, created in different periods of history are lauded as clue for profound civilization that is so vernacular as well as full of spirit. Some of those master pieces have even been declared as world heritage sites by UNESCO.



Bird's eye view of Patan Durbar Square; listed by UNESCO as a World Heritage Site

In the present scenario, there is an ongoing debate about the sort of built environment that we would be leaving behind for future generations and the kind of contributions that the current building practices is making towards the society and towards improving the quality of life of the Nepalese people.



The present state of built environment in Kathmandu Valley

Contemporary architectural practice in Nepal is a relatively new profession with a short history of only five decades. Including the graduates from Nepal and foreign countries, an ample size of fraternity of architects has been formed. Building design professionals are still struggling for getting the profession established. Professional bodies such as NEA, SCAEF and SONA have been playing important roles in forming code of conduct, institutional arrangements such as Nepal Engineering Council, Council of Architecture; participating and collaborating with public bodies in preparing policies and codes. Despite of all these remarkable efforts, Building design practice has not been fully established and is yet to gain full recognition. This recognition would be realized from the combined impact of education, ethical practice and advancement in standard of performance. All of these must ultimately manifest into visible production of efficient and habitable spaces that enhance the sense of place.

With the intention of formally guiding the framework of ideal building design practice, the Government of Nepal has prepared the Building Design Guidelines with the following objectives:

1. To provide broad guideline to the designers, builders and general public regarding contemporary building design.
2. To facilitate architects, engineers and general public to respond to the local context (climatic, topographic and socio-cultural and religious context)
3. To share ideas, experiences of architects and engineers on their current practices in documented form.

RATIONALE OF THE BUILDING DESIGN GUIDELINES

The purpose of the guidelines is to promote high quality building design that will enhance the quality of life of residents and users alike. The guidelines will shape future built environments that respond well to the topography, local climate, socio-cultural, historical and architectural character which will ensure compatible, sustainable and quality development.

APPLICABILITY OF THIS DOCUMENT

This document is meant as a reference document to guide designers and general public who intends to construct buildings in Nepal. The guideline is generally applicable to all building types including residential as well as nonresidential public buildings such as commercial, offices and institutional buildings.



Residential Housing Complex in Kathmandu Valley

Building Design Guidelines

This guideline gives a broad idea on the primary virtues that a building must possess. It identifies six such areas which a designer must consider while designing. Context-fit, functionality, visual impression, sustainability, user- friendliness and safety are such aspects of quality of building, if achieved, the buildings become more meaningful, thus resulting in an efficient, comfortable and spiritual space.



Taragaon Museum in Kathmandu

1. CONTEXT FIT

Context fit is a virtue in architectural design in which the designer attempts to design buildings in context with the time and place. Buildings should not be mere 'environmental sculpture' but has to relate to the surrounding area and should be true to the internal functions or purpose of the building. Analysis of context is also done in terms of constraints and possibilities. Rather than a stubborn intervention, the design process should be guided by the constraints which can help in shaping the design to result in a contextual architecture.

"Architecture in context is neither a cursory attention nor a radical innovation; it is a strong and eloquent visual relationship to the surrounding. Individual building is always seen first as a part of the whole. Creating Places and Spaces that enrich the lives of the people who use them is the foundation of Architects work. Every building can and should engage in a dialog with the history, beliefs and needs of a particular place and time. Identification of place lies as a generative core of architecture. Place is to architecture as meaning is to language. Recognition, memory, choice, sharing with others, the acquisition of significance; all these contribute to the process of architecture." (Unwin, 2009)

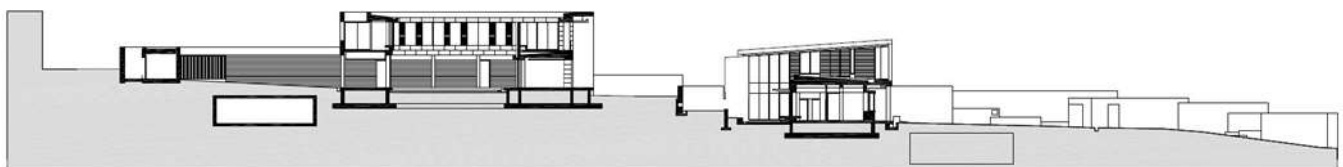
Context for architecture can be defined by these terms: Natural setting (landform, flora and fauna); Climate; Local Material and technology; Historic and cultural setting (styles, antiquity, knowledge, beliefs and landmarks etc) and Social Setting (community, inclusion, stratification, status etc). Following approaches are recommended for achieving contextual blend in architecture.

1.1 FIT TO NATURAL AND PHYSICAL SETTING

Design as per topography:The building should be so designed as to make minimum intervention to the natural vegetation and landforms. In case of a sloping site, designers must attempt to design according to that terrain rather than cutting the earth to make flat land whilst providing massive retaining structure. This interventionist approach is not only costly in financial term but also is vulnerable to landslide hazards. Wherever possible, Designing buildings in smaller blocks with good efficient connections rather than designing massive area building could be an alternative approach that helps saving land cutting cost. Other approach could be a split level design. Besides, if the site topography consists of rivers, streams and vegetation, design should be in blend with this physical setting incorporating those elements as part of the design.



Norwegian Embassy and Ambassador's Residence in Nepal designed as per site topography



Sectional view of the Norwegian Embassy Complex illustrating the design consideration to site topography

Save flora and fauna: It takes minimum twenty to thirty years to grow a tree. To cut trees in the name of development has tremendous environmental cost. Hence, site should be chosen where only few or no trees are required to be cut. Or, designer can design building keeping the tree as a part of built environment. Or, plan a replantation scheme from the beginning of the design process so that in case of evitable loss, trees and natural setting can be restored during and after the project completion.

Besides trees and vegetation, when we locate any settlement which cuts apart a forest in fragments, the movement of the animals from one section to other section for food and mating is disturbed and may cause serious decline of that species. For example, Char kosheJhadi has broken in several places due to urbanization which have serious implication for the fauna. Glazed facades of high rise building are being criticized by ecologists for killing birds as reflections on glass walls makes it appear like real sky to birds flying in the sky.

Views and Vista:A building site is never limited to its site boundary. Site boundary is only a legal definition of land ownership or territory but the extent of spatial experience surpasses these site boundaries. Surrounding of a site may have a beautiful building or an ugly structure or a natural fresh stream or a stingy drain or a range of Himalayas in horizon or the unobstructed view of the terrain etc. Avoidance or encouragement of those views and vista must be deliberately planned so that these constraints and potentials get well addressed in design. This factor may suggest a preference to decide the orientation of the buildings whether to orient it towards public street or square;or towards mountains. This factor affect very much in designing fenestrations i.e. size, shape, detailing and location of the window and door openings. In this way the context around the site becomes a part of the spatial experience of the user.



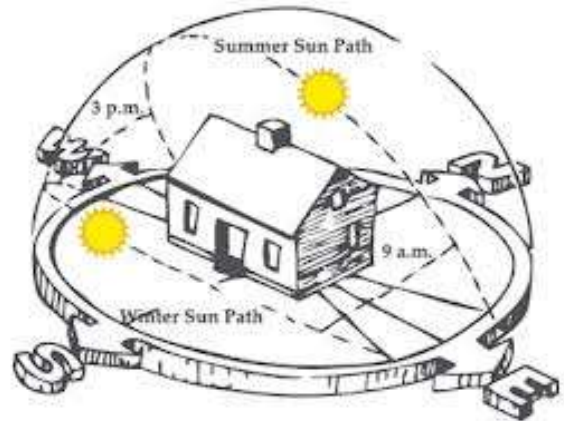
The Pavilions Himalaya, Pokhara: fenestrations designed to frame the views & vista

1.2 FIT TO CLIMATE

Climate is defined as the composite or generally prevailing weather conditions of a region, as temperature, air pressure, humidity, precipitation, sunshine, cloudiness, and winds, throughout the year, averaged over a series of years. Any region can be labeled as warm or cold climate, arid or humid climate or composite climate.

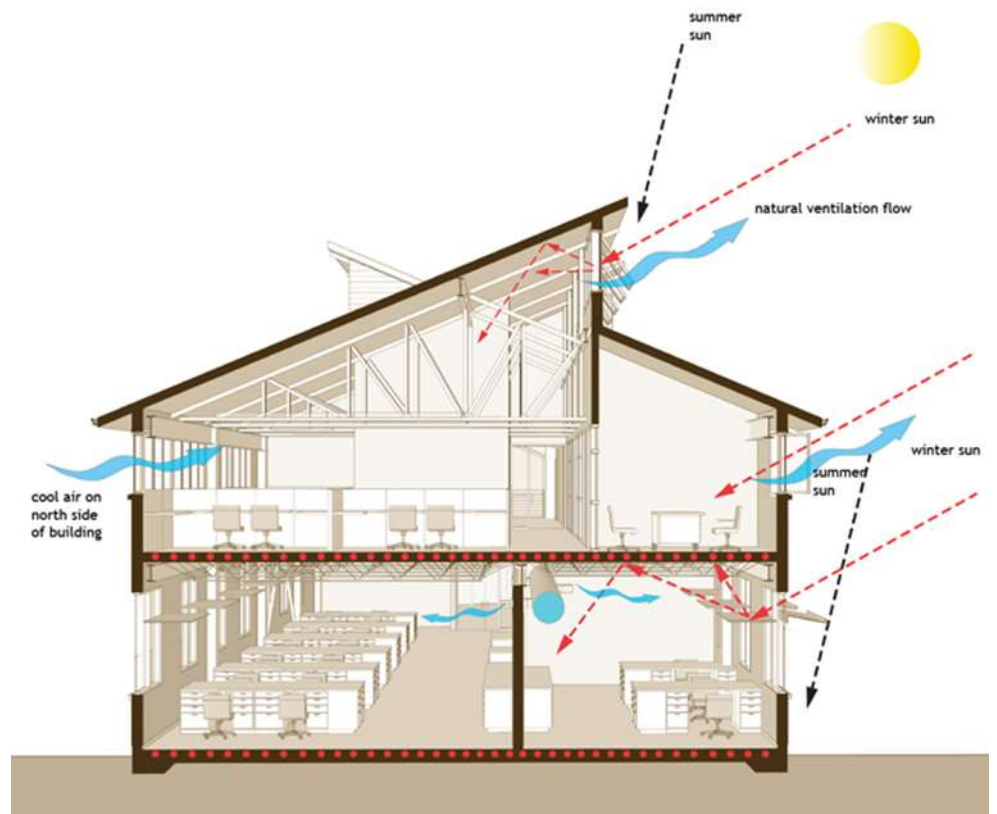
Building Design should respond to the local climate that contributes in comfort level of the building. This is to suggest devising passive methods to control heat, air and humidity so that comfort level can be achieved through no use of any appliance or minimal use. It will affect in choice of orientation, building material, design of building envelopes (walls as well as roof), designing fenestration, space planning, landscape design and designing air flow or other passive systems. Following approaches are recommended for achieving climate sensitivity in architecture.

Building orientation: Solar path and position must be well informed while designing a building. An East-west alignment of rectangular building is desirable in both hot and cold climate regions so that the long walls face south and north direction. Then control of sun is done through the design of openings.



Fenestrations: For hot climate, larger opening in the south side should be avoided whereas daylight from northward would be desirable. Or, opening towards south should be protected by vegetation to shield the harsh sun. Provision of vertical (roof overhangs, chhajjas) and horizontal shading device can be designed using solar data that optimizes the solar heat gain. Use of chhajjas on the immediate top of window or placing windows in deeper recesses can control solar heat such that in summer it block solar rays when solar altitude is higher and it allows sun to enter in winter when solar altitude is lower.

Building material: Choice of building material with varying thermal resistance can affect the thermal comfort inside a building. Mud walls, sun dried brick walls, Styrofoam walls, foam concrete wall, cavity walls in brick, Brick wall more than 9" thick are recommended as walling material with higher time lag value. These materials can be incorporated in design of roof for improved thermal insulation.



Space planning: While site planning and space planning within a building, spaces should be thought of considering climatic conditions. For example, in cold climatic zones, living spaces are preferred to be located in south whereas non-living spaces such as staircases, toilets, store etc are kept in north sides.

Landscape design: Design of landscape involves deciding hard and soft surfaces, providing water bodies and creating variety of outdoor enclosures.

Passive system: Climate sensitive design can also be made using passive systems such as cross ventilation, solar tower, trombe wall, E A T (Earth air Tunnel), Solarium etc.

1.3 USE OF LOCAL MATERIAL AND TECHNOLOGY

Local Materials and technology: Locally available materials and technology should be used as far as possible. This approach is not only cost effective but also convenient for maintenance and also employs local labor. The design should explore the strength of material and avoid its limitations. For e.g., stone is abundant in mountainous region. The design in such areas should be in stone while considering the span limitation and height constraints. Seismic detailing should be introduced while using local building material. Treatment of bamboo in bamboo construction should be done as improvements in conventional technology.

Exposed natural building material facades: It is advisable to have exposed brick or stone façade instead of plastered surface to resemble the local character as vernacular building design do not encourage camouflaging the building facades by plasters. It not only saves the cost of plastering and coloring, but it gives opportunities to play with textures. Natural colors does not fade away hence regular maintenance cost is also reduced. In such facades with textures, visible minor hair cracks get hidden in those textures. In plastered facade, however, these hair cracks have known to cause disputes between client, contractor and consultants.



Use of exposed local stone in the Norwegian Embassy

1.4 FIT TO HISTORIC AND CULTURAL SETTING

Places have many stories. They are complex material objects wherein we live, work, worship, socialize, and play. They serve basic functions but also embody culture and express the dynamics of its social, economic, and political fortunes. Buildings also communicate their messages by their forms, scale, or dramatic settings. Buildings have life cycles. Most buildings have brief tenures before they are destroyed or fall into ruin. Only a very small number of them survive for long periods to give a historical dimension to the landscape. These settings could be studied through analyzing the prevalent styles, antiquity, knowledge, beliefs and landmarks. Hence, historic and cultural setting is an important aspect of context which must be considered during designing. In order to respond to these settings, following approaches can be applied.

Congruence with historic streetscape: While designing a building in a historic street scape, use of elements from prevailing styles contributes in making the new building in congruence with the existing cityscape. Principles of contextual regionalism (Critical Regionalism, 2014) would be relevant here while talking about congruence with existing city space. It suggests that designers should make a critical response, rather than a sentimental or copyist response, to local design traditions.



Proposal for addition of modern buildings in an old district in Berlin that has been designed to fit into the historic setting

Build on Sense of Place: Even if a building is to be designed in a newer space, designer must scrutinize historical and cultural setting of the locality. Design solutions that come out of assimilation of these studies can contribute to add onto the spirit of the place. Cumulating actions of designer's community will result in a space with a strong sense of place. Some approaches for this are listed below:

- Buildings blocks should be arranged so as to create variety of identified open spaces in city space such as linear open space systems like streets and boulevards; nodes and squares, public courtyards, parks and gardens. This solid and void relationship can become a character of that place in the long run.
- If allowed by the site condition, the plinth level and floor level or cornice level should be in line with the neighboring building.
- The building should not be too tall or too dwarf in relation to its adjacent building.
- Optimal scale, shape, size of building and composition of the building elements could be derived from the study of vernacular architecture of that place.



Rosenthal Center for Contemporary Art in Cincinnati USA by ZahaHadid where a strong relation with the scale, shape and size of neighboring buildings has resulted in a strong sense of place

1.5 FIT TO SOCIAL SETTING

Society is a sum of human parts (individuals) and way those parts are put together through status, roles, groups, organization and institutions. These are building blocks of society whereas culture binds them as mortar. Because of these structures, social relations and interactions among peoples and different social groups exists in form of inclusion, cohesion and unification; or exclusion, stratification, stigmatization, marginalization. These modes of relationship are influential factors for maintaining social harmony, conflict and injustice. As architecture is a social product, society and architecture also influence each other. Hence, designer must take consideration for the social setting so as to fit in such that the new building reinforce existing social harmony whereas discouraging the conflict and injustice if prevailed. Following approaches can be taken in consideration to assure the design fit with the social setting.

Encourage or discourage social interaction: During the design process sociological inquiry such as what kinds of social interaction existed and which one to encourage and discourage must be done. Trends of social transformation should be studied so that the spaces could be estimated in line with the contemporary requirement. If social interaction is to be encouraged, spaces such as balcony, terrace, semi-covered terraces, and gardens should be planned for effective and efficient interaction.

Inquiry on what the user performs: People need space to perform. Hence, a serious inquiry must be made as to how users perform in a building. Computation of room sizes and areas must be as per use and function and its relation with other functions.

Privacy requirement: A person is surrounded by a personal bubble of space to carry out life where s/he doesn't feel comfortable if encroached. Personal bubble attempts to form a territory. Size of that bubble is in form of 'Intimate distance' (Up to 150mm), 'Personal distance' (450mm-760mm), 'Social distance' (1200mm-2200mm) and 'Public distance' (3650mm-7300m). Hence space should be planned as per the requirement of the privacy level.

User's participation in design decision: User must be allowed to get involved throughout design process. Major design decision should be made together with the user. In public facilities, consultation should be done with all stakeholders including marginalized groups.

Encourage Inclusiveness: A socially inclusive society is defined as one where all people feel valued, their differences are respected, and their basic needs are met so they can live in dignity (Cappo, 2002 cited in anon.,2014). Designing building facilities that encourage meeting, gathering and social interaction could improve mental health and increase social networks. Providing good access to the services and facilities required for daily living creates a sense of place and belongingness. Some approaches that encourages inclusiveness in building are recommended as below:

- **To know diversity and composition:** to have well understanding on demographic and cultural composition and needs of existing and future residents
- **Accessibility and inclusivity in common services:** Providing efficiently accessible, well integrated and flexible common services and social infrastructures. Space of these common services should be designed to have an inclusive environment. For e.g. either no use sign/symbol pertaining to any particular religion/social group should be used or use of sign/symbol of various groups should be sensibly thought to create inclusive environment.
- **Well-located and integrated activity:** Planning well-located and integrated activity in a precinct that respond to the diverse needs of new and existing residents.

- **Accessible to variety of modes of transport:** Providing access to public infrastructure by a variety of transport modes, including pedestrians, wheel chair users or baby stroller users, cyclists and public transport.



complete streets are for everyone

- **Pedestrian pathways:** Providing an interconnected network of pedestrian paths (covered or open as per condition) and convenient access to key locations and destinations.
- **Surveillance and security:** Ensuring that there is active and passive surveillance over the public realm.
- **Public space for multiple users:** creating public open space that caters for multiple users (sports people through to walkers; children through to older adults)
- **Anticipating and avoiding conflicts between user groups** through good design, such as between older adults and skate board users and cyclists and pedestrians
- **Encourage Mixed use:** Providing a mix of housing types, tenures and densities as well as a mixture of land uses to encourage a diverse population.

2. FUNCTIONALITY

Functionality in architecture is one the virtue which is being talked since from Vitruvian Era (40 BCE) as 'utilitas', as one of the three classic goals of architecture. However in modern times, Functionalism movement begun in 1896 when Chicago architect Louis Sullivan coined the phrase 'form ever follows function' to capture his belief that a building's size, massing, spatial grammar and other characteristics should be driven solely by the function of the building. The implication is that if the functional aspects are satisfied, architectural beauty would naturally and necessarily follow. Based on this principle, architects should design a building based on the purpose of that building.

Functional building would be used by user until that function lasts. Some functions may be part of everyday life of people which hardly changes in long span of time. Use of building for long time and used by large number of people gives that building a meaning. Meaningful buildings add sense to that place. To design a functional building, design should adopt following suggestions:

2.1 KNOW WHAT TO BUILD

Designer's initial and primary job should be devising different methods and skills to understand design goals and outcomes of the intended project. In addition, knowing the user through knowing their intentions and socio-cultural background becomes crucial to move towards the functional solutions.

2.2 ASSURE THAT USERS KNOW HOW TO USE IT

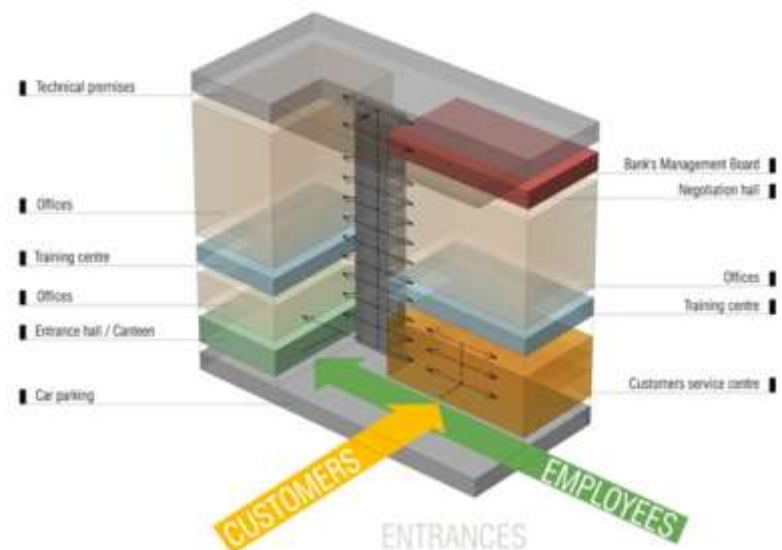
Designer should be communicating his/her design to the users. In many instances, despite of being a good design, due to lack of knowledge of the function of the building, user can't take advantage of that building fully. For this following suggestion can help to some extent:

- Make labels of the room before it is handed over.
- Prepare user's manual that clearly guides the use, functions and maintenance.
- Arrange trainings on use and maintenance of the building.
- Prepare concept note on design of the building and as built drawing
- These documentations on design and their changes must be recorded properly and handed over to the new users.

2.3 RESEARCH ON THE ASPECTS OF FUNCTIONALITY

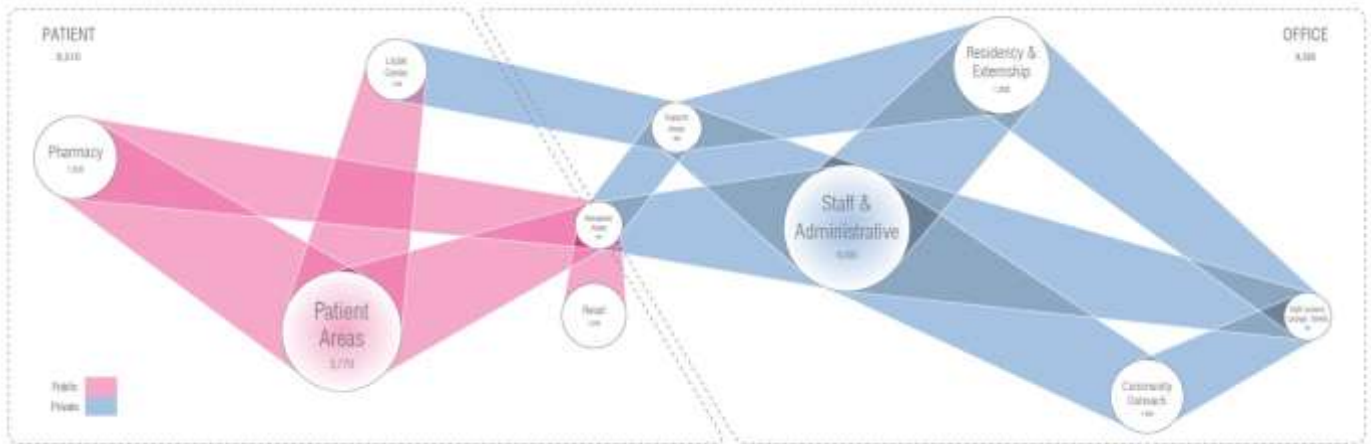
Before designing, designer should study and gain full understanding on the following aspects:

Use and function of that building type: Designer should be doing research and getting updated regarding different building types and their use and function. For example, if that place is for shelter, designer should know how homes around the world support daily routines. Similarly in case of hospital, designer should study how hospitals work, what are trends of hospital designs etc. These kinds of knowledge can be obtained from case studies, literature studies, meeting people from related field and other methods of inquiry.



Functional Scheme of DnB Nord Bank Building in Latvia

Distinction of spaces: Spaces within the building envelop must be analyzed and classified according to its privacy level. Then private and public spaces should be arranged so that the activities in public space don't interfere on privacy of private spaces and similarly access to the public space would not be hindered. These distinct private and public spaces should be connected through transitional spaces or thresholds or filters.



Distinction of public and private spaces for conceptual design of a hospital

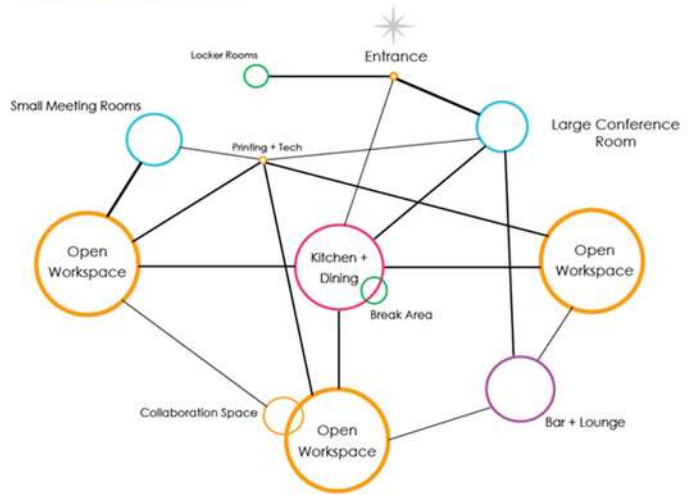
Topology: It is a term borrowed from mathematics which is at its core a generalization of the concept of distance. Topology generalizes many distance-related concepts, such as continuity, compactness, and convergence, proximity, adjacency and separation etc. After classifying the spaces as public or private and identifying the position of that space in hierarchical order, in many instances the topological relationships emerges itself. For example, private spaces demands adjacency without continuity whereas private and public spaces may demand separation. Dichotomous concepts such as sacred and profane; senior and junior; male and female, adult and child, rich and poor have to be well understood in that particular context and designer have to handle them with due care using this topological relationship. For example, it might be advisable to provide toilet facility attached to the main building, but open to and accessed from outside. Emergency department and diagnostic department must be adjacent to each other whereas adjacency between emergency department and OPD is not necessary. Hence some spaces demand strongly for adjacency while others only require proximity. While planning spaces, much effort is spent in deciding these topological relationships between spaces. The decision of this relationship has much effect on the performance of the building and its proper functioning.

Hierarchy: Hierarchy of spaces is an important aspect to be considered while designing. It governs design of workflow, placement of spaces, and choice of means of control. Hierarchy of the position/post of personnel in an office reflects his/her scope of responsibility and control. For example, a section officer has certain assigned responsibilities whereas a joint secretary (II class officer) supervises work and responsibility of several section officers. Similarly, under- secretary (1st Class officer) supervises work and responsibility of several under-secretaries and so does by secretary and chief secretary in a hierarchical order. Design of his office in terms of space requirement, organization of the space and location of the office should be done according to his/her position and responsibility. It suggests designing the working space in accordance with the workflow, maintaining hierarchy at the same time. If we are designing a hospital, examination room may be a part of surgical clinic whereas surgical clinic is a part of another whole i.e. OPD. OPD is again could be a part of whole of higher hierarchy i.e. Maternity Hospital, again Maternity hospital could a part of a central hospital compound accommodating several specialized hospitals such Cardiac hospital, Children hospital or Cancer hospital etc. Hierarchy of the spaces can be also be reflected in positioning the spaces such as central circulation core (central main lobby) could be bigger in size and must be accessible from all the sections. Secondary lobby could be smaller in size and shall be connected with the main lobby but the connection with parallel hierarchy may not need to be connected. These kinds of hierarchical order must be clearly reflected in the planning and designing of that building.

Control: Good functional design is attributed with clarity of territories and appropriate level and method of control for the movement across the territories. These methods could be ranging from provision of bullet proof vault door to drawing of thin demarcation line. Other methods of control system could be a written notice plate and signage plates, use of different colors in flooring, fencing, doors or gate, solid walls etc. Objectives of control could be barring the circulation, or filtering the movement, or just visual barrier.

Flow and circulation: Sequence of work flow and relationship between spaces must be clearly understood before even drawing the first line in the design process. Building types such as hospitals, airport terminal buildings, factories etc. are based on specific work flows. Designer should understand how the design of airports and stations, churches and shopping malls either compel us to move swiftly or encourage us to linger. How senior personnel of an office can walk through and around the area of his/her jurisdiction and supervise and coordinate his/her sub-ordinates. Sometimes the relationships of those functions are so complicated that designer finds it difficult to comprehend. There are several methods of simplifying the complicated entity such as mapping the hierarchy, working out one level at a time and afterwards work in whole, study through bubble diagrams and flow charts.

SPATIAL RELATIONSHIPS



Study of spatial relationships in an office

Connectors: Connectors are the means through which one or more functions get connected for movement. These connectors could be covered pathways, pavements (vehicular or pedestrian), approach roads, tunnels, and conveyors which facilitate horizontal movement of people and goods. Similarly staircases, lifts, ramps, dumb waiters are vertical connectors which connect spaces in different levels stacked vertically. Connectors should be chosen wisely while taking in consideration of safety and security; rain and sun; and efficient movement.



Paved walkways facilitate pedestrian movement within the Agricultural Development Bank Central Training Center at Madhyapur, Thimi

Services and Comfort: List down what sort of means can be devised to assure comfort. For e.g. see how the problems of heating, cooling and ventilation have been resolved over the centuries and how they are tackled today. Decide what sort of building services and systems would be appropriate for that particular climate setting.

Meaning and Symbolism: Functionalist view argues that architecture is not made to communicate (symbolize) but rather to function. Yet an examination of people's relationship with architectural objects suggests that architecture is experienced as communication, even though we recognize its functionality. As often treated that meaning and symbolism as opposed to functionality it is now argued that meaning and symbolism should be considered while designing since it may enhance or disturb the proper functioning of the building.

One of the tasks of architect is to create a physical environment that is readily identifiable by members of a society as their own. Meaningfulness enables them to comprehend that environment. Hence, meaningfulness of building is related to the appropriate architectural language used in design of building. Meaning of a phrase varies in different languages so does the meaning of buildings in different contexts. The meaning of architecture can only exist within its cultural specificity of time and place. People interpret meaning of architectural objects in two levels: Denotation and Connotation.

At First level, 'Denotation' is primary meaning when a form refers basically to the function it is assigned or capable of performing. Primarily function has been held to give meaning to form, while form has been held to "function". Let's take an example: a building was planned in a cross shape and was meant for treating illness. By which it got its meaning, denoted as 'Hospital'.

At second level, 'Connotation' is secondary meaning when a form stipulates other associations in the user's mind related to an ideology about its actual function or beyond the functions assigned. These connotations are most relevant to a society and its culture. Looking at the same example of hospital building, the cross shape of the building plan symbolizes Christian church and Christian community took it as sacred. The designer may have done that plan form to symbolize the donors who were Christian missionaries. Hence 'Sacredness' is the secondary meaning i.e. connotation.

Architecture is a cultural product, and its meaning is understood when we study architecture as a cultural system, a system of signs and symbols. People identify themselves with their environment through meanings and symbol that is they perceive their environment meaningful. Geometric forms and numbers are not just what they appear to be quantitatively; they have a qualitative and symbolic aspect. For e.g. Square plan is used by Hindu temple as a symbol of perfection. They intended to build an abode of god so perfect that it can symbolize god's quality of perfection i.e. omnipresence, omnipotence and omniscience. In most instances, through abstraction, architecture in its representational aspect, there is a non-descriptive sign-system; which provides not knowledge, but experience and direction to our own behavior.

Hence, designers ought to be conscious about the expression and impression that an architecture can leave behind which is beyond the physical appearance and reality. Any distinct modes or languages of expression are called styles. Formation of styles and use of prevailing styles can affect the expression and impression of architecture. Hence, inquiry has to be made on this abstract dimension of architecture as for e.g. how public buildings affect our movements and influence our emotions, how places of work are designed to increase efficiency and impress the business community, how to make an institutional building appear institutional.

2.4 STANDARDIZATION

Standardization has always been a subject of debate in the field of architecture. Some argue that it inhibits the creativity, aesthetics and originality. With the advent of industrialization and so called modern architecture, level of detailing has been reduced to such extent that it has cast doubt as to whether architecture is heading towards boredom. Here the concept of standardization would be discussed so that with the theoretical understanding of it, a designer becomes able to choose to what extent s/he can allow to submit himself to standards.

Here for the purpose of this guideline, standardization refers to the practice of using modular elements or factory made mass produced elements in design of building, use of typical designs to replicate, to assign standards of dimension of the solid or void spaces.

This section discusses standardization in the following terms suggesting middle path and pragmatic path between two extremes: blind faith and submission to standards on one side and anarchical freedom and play with resources in the name of creativity on the other side.

Codes, Regulation and Standards: Government (GoN) bears its obligation to ensure certain level of safety and quality of life. Hence, GoN has legislative arrangement to enforce Building Code and other standards. Standardization in form of codal requirements for structural safety, specific requirement for the specialized functions is not a part of that debate. It is mandatory to follow those safety and functional standards. Building act 2055, Building regulation, Building Codes (NNBC), Space standards for government officials, standard requirement for hospital and health institution (MoHP), Standards for cinema halls, Standards for apartment buildings, Standards for School design, bye-laws etc. are some of the prevailing legal arrangements, regulations and standard documents in Nepal.

Uniformity to functional requirement: One of the purposes of standardization is to replicate the modules which have been tested and proven to be a functional one. Hence typical modules should be prepared with due care to make it functional and set it as a standard only after adequate tests through pilot acts and demonstrations. Especially in large scale public facility projects such as construction of primary schools and health posts, an ample number of buildings of identical functions are constructed in different regions. Here, if different designers are designing the same identical function, then there could be a chance of occurrence of non-uniformity of the functional requirements. Hence, in such cases, it is advisable to hold control from one point. Developing standard modules with some alternative choices can be issued so that the functional requirement remains uniform and accountability for that assurance remains in the higher authority.

Economic price: Detailing and uniqueness in design comes with an economic price. The amount of detailing to be undertaken would depend on the kind of project that one is dealing with. An architect may choose a greater degree of standardization for an apartment building, while choosing to go in for a higher degree of detailing for a high-end resort. The reason behind doing so is that, in the case of a resort, the equation between his remuneration and time is balanced, even with the time allotted for detailing, while it is not so in the case of an apartment.

In case of a private house, designer can go on enjoying this privilege for designing each and every element; but in the case of mass construction the growth of industrial methods demands that the conventional practices be set aside and standardization be sought.

Blind faith on standards: In many instances, there have been cases where designers rely overly on the standards while neglecting the context. Let's take an example of time saver standards, which is framed in American context, but some of the dimension, may need to be modified for the Nepalese context because of difference in anthropometrics (height and size) of Nepalese people. Similarly if any type of design is issued for a building type, the implementer or designer must be very conscious about localizing that type design into that context. Due to existing constraints, type design might need to be modified retaining its essence of design and requirements. During practice, standards should also be critically reviewed so that potential improvements can be made timely. Standard designs cannot take precedence over convenience and contextual demand.

Aesthetics within standardization: Modern architecture is the product of functionalism, industrial mass production and changing needs of the society. In the modern age, the concept of aesthetics has changed. In the earlier days, detailing, beautification with symmetry and orders were devised to make a building design beautiful whereas now beauty is seen on balanced formal composition combined with utilitarian perfection. Hence, one thing is for certain; the aesthetics of modern buildings are not based on the buildings of the past: they are shaped by the essential characteristics of modern society and technology, and are therefore completely different from those of any previous period. So the modern demand is to seek beauty out of standardization.

3. VISUAL AESTHETICS

Visual aesthetics is all about the visual perception of a building design and its beauty. It is one of the aspects that is covered by Vitruvian triad as 'Venustas'. Architect must be conscious about visual image of the building itself and visual image of the building together with the existing physical setting.

From the classical times, beauty has been sought among the concepts of proportion, harmony, unity, order, symmetry, and definiteness. Western aesthetics are based more on human physical forms and derivatives whereas eastern aesthetics are based on representation and symbolization of special spiritual or philosophical ideas.

Beauty is subjective yet attempts to get accepted by the masses. "If he proclaims something to be beautiful, then he requires the same liking from others; he then judges not just for himself but for everyone, and speaks of beauty as if it were a property of things." According to Kant, beauty is subjective and universal; thus certain things are beautiful to everyone. The contemporary view does not believe that beauty is based on innate qualities, but rather on cultural specifics and individual interpretations. Beautiful buildings must hold other virtues such as context-fit and functionality besides the balanced composition of the building form. Hence, while designing a building, designers must consider visual image of the built environment so that the users and beholders can experience its visual pleasure and poise. Some recommendations for better visual images are listed as follows:

3.1 MASS COMPOSITION

Composition is the organization of the whole out of its parts-the conception of single elements, the interrelating of these elements, and the relating of them to the total form. Architectural composition is the art of arranging and combining distinct parts or elements of a building to form an ordered expression of architectural form.

Balance: Design of building should be done to achieve visual balance between mass and void, between volumes and dimensions of masses, between rough and smooth textures. In other words, the process of creating beautiful design involves trying out all possible combinations and picking the optimal solution which would be the middle path which is neither too heavy nor too light, neither too rough nor too smooth, neither too big nor too small and so on. Balance could be obtained from both symmetrical and asymmetrical composition.

Architectural Illusionism is also used for manipulating the visual perception of scale. If the building is intended to appear shorter, horizontal elements (such as bands, fins, openings with horizontal orientations etc.) should be used predominantly and vice versa for creating taller image.



Symmetrical composition of Auditorium building in Agricultural Development Bank Central Training Center Complex in Madhyapur, Thimi

Proportion and rhythm: Proportion is the relationship between the elements or dimensions of the elements such as height and width of a rectangle, building mass, openings and false openings. Some commonly used proportions that have been found to be pleasing to the eye are "golden section" (approx. 8:5), 2:1, 1.5:1 and 1: These proportions can be used for window openings and for visually established architectural elements. Repetitive use of similar proportions creates regular rhythm that helps tie a building together. The proportion of openings or other visually established architectural elements should be generally consistent throughout a development to create a sense of unity on building façades.

Articulation and Modulation: Building articulation and modulation help to create an intermediate level framework on the exterior of buildings, providing visual relief for large wall areas. All building walls should have consistent horizontal and vertical articulation to form a grid framework on four sides of the building exterior. This framework should serve to break down the overall scale of a building into intermediate scale parts. Building walls should include materials and design characteristics consistent with those on the front. The effect of a single, long or massive wall with no relation to human scale is not acceptable.

- **Horizontal articulation:** Horizontal articulation is created by use of materials such as stone or special masonry patterns (e.g. soldier coursing) that run along the façade of a building and tie the building together. Cornices and parapets play special roles in visually unifying the top of a building.
- **Vertical articulation:** Vertical articulation is created by regular spacing of vertical elements such as piers, pilasters, columns and/or fenestration at regular intervals to visually transfer building weight to the ground and tie the base of a building to its top.
- **Building modulation:** Building modulation is a measured and proportioned inflection or setback in a building's face. Modulation may be achieved through recessed or projecting wall offsets, entryways, porch or canopy structures, columns, piers or other features.



Cornices run along the façade and tie the building together in Indreni Apartments, Bhatbhateni, Kathmandu



Vertical articulation in NABIL House at Kamaladi, Kathmandu

Visual message: Mass composition should be worked out so that the intended function of a building is clear. An institutional building might need to have a formal look whereas a recreation function will be more effective with an informal look. The Supreme Court demands grandeur whereas staff quarters will be better with modesty. Financial institutions might need to look ostentatious whereas public offices will be better with a humble look. Similarly other visual message such as Masculine or Feminine, Modern or classical/traditional, Human scale or super-human scale, exotic or vernacular, hi-tech or simple, Solid or loose/transparent should be chosen while designing and proper mass composition techniques should be devised to make these visual messages very clear and distinct.

Legibility: Mass composition of the building form should be such that the masses as parts can be recognized and organized into a coherent pattern. This formal clarity enables an individual or group to relate the image closer to its reality. This can be done through the composition of varying the textures, color and masses.

Visual Blend: Building volumes must be in blend with the existing landscape i.e. contours of the site and existing built environment of the site. Consider building as an entity that should exhibit a sufficient degree of cohesiveness. It should be integrated with interior design and landscape design.

Completeness: There have been tendencies to leave buildings unfinished for several years which have resulted in undesirable visual image of the cityscape. Buildings should look complete even if there are future plans for additions, extensions or constructions.



Kathmandu Business Park in Boudhabari, Teku, Kathmandu where building volumes blend with the landscape and contours of the site

3.2 COLOR AND MATERIAL COMBINATION

Building material provide strong visual impression besides its structural implication.

Use of exposed natural material facades: It is advisable to use natural materials exposed surface as primary surface (that covers 75% to 90% of the building façade) however accent material (that covers 10% to 25% of the building façade) can be used with different materials, colors and textures or plaster and paint.

Local materials: It is advisable to use exposed local materials in facades with less use of plaster and paint. This would enable a building to fit into the context. If using plasters and colors, the color scheme for a building should unify the building image and complement the building context.

Color codes: Government has issued color codes for public building, which should be followed.



Exposed brick has been used in combination with plaster and textured surfaces in B & B Hospital, Gwarko, Lalitpur

Climate responsive color schemes: The color combination can be climate sensitive and vary with geographical location. For instance in hot regions, light-colors are more preferable to reduce the heat load and bring visual consistency. Similarly in cold regions, warm colors are more desirable to absorb heat.

Use of Artwork: Building design should incorporate the use of artworks (painting, sculptures and collages etc.) to enhance the beauty and add meaning to the space. Use of local art work, modern art, graphic art, dramatic art etc. can greatly influence the visual aesthetics of a space.



Artwork used in the façade of Bir Hospital, Kathmandu

3.3 SECONDARY BUILDING ELEMENTS

Due care for visual aesthetics should be consistent throughout a building complex.

Four-sided Architecture: Blank, massive building faces are to be avoided as far as possible. Secondary building façades (back or side facades which are not fronting to the street or public space) should also be treated with surface treatment (articulation and modulation) consistent with the treatment done for the street-fronting visible facades.

In the case of buildings that are attached to the property line and having no openings on that side, tendencies are seen to leave that face unfinished and devoid of any plaster or color. This attitude of neglecting the secondary facades has resulted in ugly streetscapes lacking formal clarity. There is a serious need for creating four-sided architecture and to be consistent with the primary building faces. There are several techniques to treat blank walls such as drawing wall murals and thin sculptures. For example, in KrishiBikas Bank, Singh durbar, the blank wall facing Main Street has been decorated with sculptures depicting the purpose of the building.



Mural painted on a blank wall of a building in Tehran, Iran

Boundary walls: Boundary walls are other secondary elements which have been found to be neglected while designing. Boundary walls also form an important part of visual image. Tall blank boundary walls should be avoided. Instead, well-articulated and modulated short walls with grill fencing should be built which can provide both safety and visual comfort. In public buildings, the boundary wall should be 80% transparent, using vertical fencing to connect outside environment with inside and vice versa. However, this is not applicable in special structures such as prisons.

Parapets and coping: Parapets must be designed and constructed with copings and drip details. These can contribute not only to the visual image of completeness but will also lessen maintenance.

Minor structures: Minor structures such as guard houses, other service blocks etc. which are seen when navigating around the precinct should be designed as an integral part of the main building and should be constructed of the material, style, and architectural detailing that blends with the main building.



Boundary wall designed as transparent elements with short walls and grill fencing inside a housing complex in Kathmandu

4. SUSTAINABLE DESIGN

Sustainable or “Green” building design concerns with economy, utility, durability, and pleasure. Sustainable building design, construction and renovation can help to create healthier environments; reduce operating costs and conserve energy and resources. Benefits of Sustainable buildings designs can be categorized in the following terms:

Economic benefits: It includes reduction in operating costs (i.e., energy and water efficiency, waste management, repair and improvement) and optimization of life cycle economic performance.

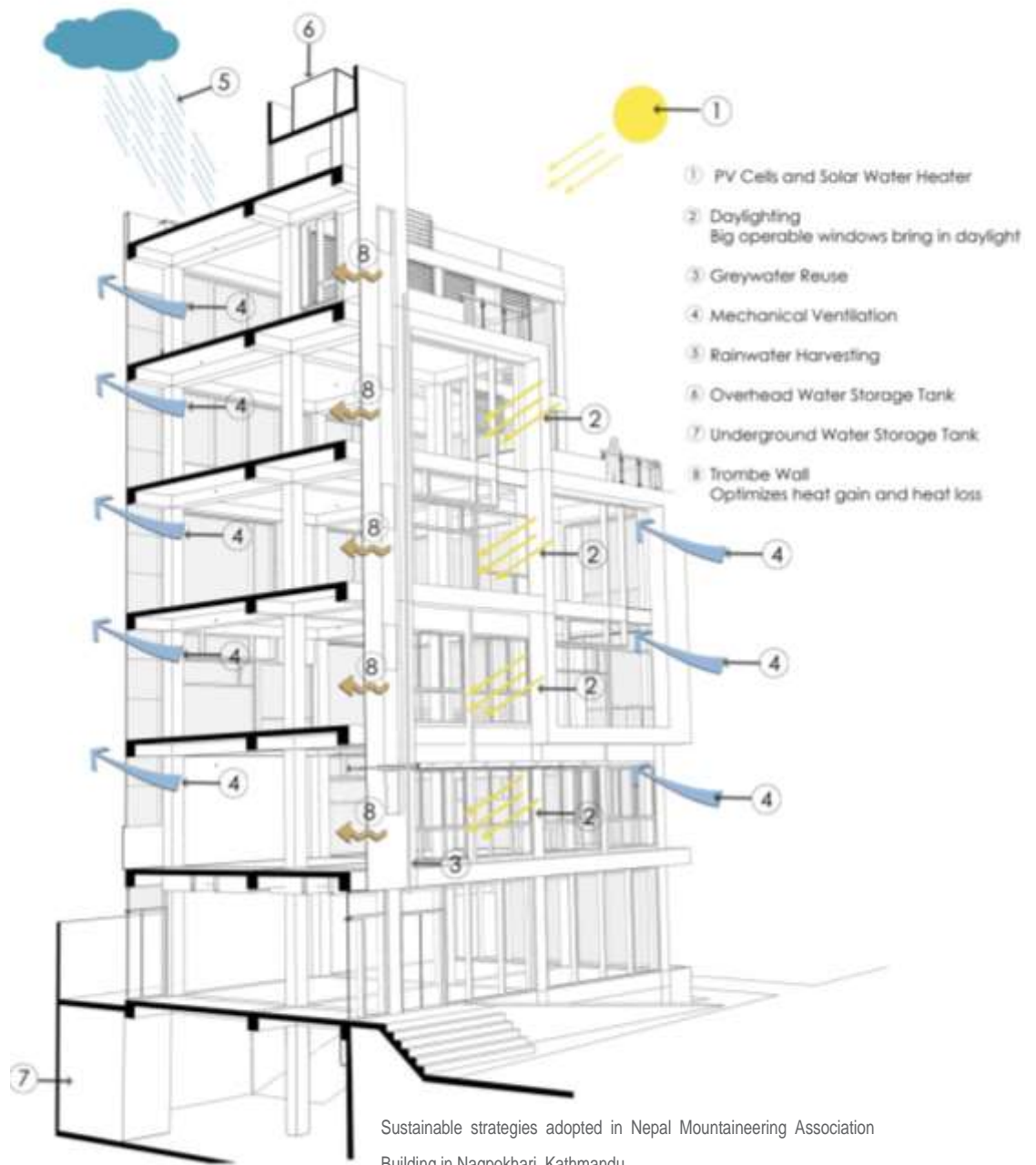
Environmental benefits: It includes conservation of natural resources, use of renewable energy sources, improvements in air and water quality, reduction in solid waste generation.

Social benefits: It includes benefits such as inclusiveness; health; functionality, convenience and harmony.

Despite of benefits, the feasibility of implementing sustainable design guidelines should be evaluated on a case-by-case basis. Following issues of sustainability are primary in case of building design which a designer must consider while designing.

4.1 EFFICIENCY IN RESOURCE USE

Resources, here, refers to energy, water and diminishing natural resources (trees, animal products etc.). Efficiency in resource use denotes reduction in consumption, use of renewable source; maximize use of clean resource and reuse/recycle of the resources. Holistic approach to building design is needed to achieve resource use efficiency. Following approaches are some of the recommendation that a designer can adopt: (DUDBC, 2013)



Passive techniques: The term 'passive' refers to achieve enhancement of thermal comfort using building design and detailing techniques without using active methods (using machines). It is climate sensitive design technique that suggests utilizing the favorable and minimizing the unfavorable elements of the local climate.

- **Building orientation and window design:** It includes designing building orientation based on solar path and position. Similarly, glazing design and their placement effect on the solar heating remarkably. For instance, in hot regions it is preferable to have larger openings in north side and small openings towards south or incorporate large shading devices over the openings to shield the harsh sun. Similarly, in cold regions the buildings should orient south to capture sun rays.
- **Natural Ventilation:** It includes natural ventilation and air movement system using simple natural convection and radiation (Solar tower, wind tower), to use material, and their color and texture that possess heat absorbing and retaining property. In humid climates, there should be provision for proper cross ventilation, i.e. provision of openings on the opposite walls. But in arid windy area inward looking courtyards devoid of windows in outer walls are recommended.
- **Insulation:** Materials should be chosen with adequate time lag so that the entry of heat is prevented in summer day time and heat inside the room to be retained in winter time. Roof and walls can be further improved by using insulation layer or slope roof out of C.G.I. sheets or slates with proper insulated false ceiling and air ventilation in inner roof space. Green roofs and roof gardens are other techniques to reduce roof heating. Green roofs also contribute in reduction of formation of urban heat island.

Renewable source: Renewable sources of energy are sun and wind. Timber from forest also could be a renewable source if replantation scheme and its effective implementation can compensate the timber used. It suggests promotion of use of solar and wind energy, use of resource along with its compulsory replenishment.

Low embodied energy: Embodied energy is the total sum of energy that has been spent for a building material from start of obtaining raw material from mine initially, processing and production to delivery to the site. Designer should be selecting the building materials with low embodied Energy. E.g., local mud, sun dried bricks are the materials with lowest embodied material whereas Aluminum and steel has higher value. Selection of local products will save the energy cost of transportation.

Water management and conservation: Fresh water is a depleting resource which needs to be conserved. In the Nepalese context, urban water supply system has been unable to meet household water demands. Also, over-extraction of ground water has also become a major issue. To respond to these issues, following approaches are suggested:

- **Preserve sources:** Preserve and enhance existing natural areas such as prairie, wetland, floodplain and woodland areas as essential components of site planning.
- **Reduce consumption:** Encourage water efficiency in order to reduce building water consumption by encouraging the use of water efficient sanitary appliances, grey water recycle and reuse system, drought tolerant plants, drip irrigation, etc.
- **Rainwater harvesting:** Rainwater harvesting consists of collecting fresh water from precipitation and using it for drinking and other household purposes. The excess water after storage should be allowed to percolate into the ground for recharge. (DUDBC, 2012) For this, designers can do the following things in his/her design:
 - Provide gutters as architectural detailing which can be integrated with sanitary design to collect it into first flush tank and then to collection tank.
 - Avoid land sealing pavements such as concrete flooring, bitumen pitch etc. Instead apply perforated concrete tiles, dry stone paving etc.
 - Provide recharge pits, that is a pit of size 1.2mX1.2mX1.5m filled with stone aggregates.
 - In larger scale building types, provide water bodies as integral parts of landscape design.

Use of energy efficient appliances: It is to promote use of energy saving appliances such as LED lamps, energy rated pumps and AC units etc.

Use of Natural Daylight: Designer should consider using optimal level of daylight. For this, following design techniques can be applied:

- provide adequate window openings in appropriate locations.
- not to use more than double bay of grid with 7m grid.
- If more than two bay grids are needed, light well and atriums could be used to get light in the inner bays.
- Adequate setbacks, use of light reflective colors also help in maximizing daylight.

4.2 SUSTAINABILITY

Building design should not only be limited to its construction. Instead, sustainable practices on construction waste/ debris management, solid waste and waste water management should also be taken into consideration.

Re-usable and perishable building materials: Re-usable and perishable building materials should be promoted wherever possible. Materials like plastic and concrete take thousands of years to decay. Hence, over use of these materials will cause accumulation of the waste. Instead, sun-dried bricks, stabilized mud bricks should be used since these materials possess good insulation properties and can also be reused if the building is dismantled.

3R strategies in waste management: Design with 3R strategies in waste management that is reduce, recycle and reuse should be promoted. Providing kitchen gardens, roof gardens, and providing composting place are some 3R strategies that can be implemented in building design. Kitchen waste or other bio degradable waste can be converted into organic manure which can become a good resource for growing healthy organic food. Similarly, waste separation features can be incorporated in the design so that users get inspired to separate the waste. After Bio-degradable waste are taken to compost or bio-gas plant, rest of the non-bio degradable waste can be sold and converted into money. Other methods such as Eco-San toilets, urine collecting system, bio-gas plant, reed-bed treatment plant etc. can also be considered in the planning and design of a building project.

Adaptive reuse of the building: One of the major sources of demolition waste is from buildings that have become obsolete in the course of time and are thus dismantled. Hence, a designer should think about adaptive re-use of buildings and building materials which can be done in different phases of the design process as explained below:

- **Planning phase:** In the planning phase of any building project, designers should consider adopting flexible plans so that it can adapt for multiple use. Open plan concepts with light partitions are one way to achieve adaptable spaces. If the current function a building is rendered obsolete, then the space should be able to be changed for another function without making much intervention in the structure.
- **Use phase:** If the existing tenant of a building finds it impossible to use the space by simply changing the internal partitions, then change of tenant should be thought of before making decisions. Also, if the structure is found to be weak, then retrofitting techniques should be sought before considering dismantling.
- **Dismantled phase:** If demolition becomes inevitable, the construction waste can be separated and planned for reusing the debris. Building designs using the demolition waste is also practiced as sustainable approach in building design.

5. USER – FRIENDLINESS

User-friendliness refers to the holistic approach in building design to create an environment addressing the needs of all age groups and people of different abilities. The design of buildings can directly impact the user-friendliness of a place by creating a setting that is comfortable and accessible to everyone. Those who are responsible for designing buildings or planning the external environment should accommodate the requirements of everyone as an integral unit from the very beginning of the design process. Apart from addressing the needs of all age groups and people of different abilities, it is equally essential to create functionally sound design to attract people and make the design familiar to them because an unsuccessful design can create an environment that people seek to avoid. Following approaches are recommended to meet the needs and comfort of a wide range of people.

5.1 PEOPLE MOVEMENT

Spatial Memory and orientation: The building layout or planning of a complex must be such that the user can orient oneself in that space. Disorientation may result in chaos in people's movement. It should be such that establishing a mental map is easy so that the user find it comfortable to navigate the space and find his/her location of interest. This mental map is built upon layout, landmark orientation and contrasting boundaries. Lack of those elements can disorientate one's mental layout, especially in a large and unfamiliar place. Thus large buildings should incorporate landmark, contrasting colors and even signage so that user identifies those locations and stores them in memory. For instance, the Schiphol airport at Amsterdam is considered as the Europe's 4th busiest and the world's 14th busiest by total passenger traffic in 2013. However, the passengers can easily walk around with the help of various way finding signs, landmarks and orientation maps.



Orienting landmarks for ease of navigation in Schiphol airport, Amsterdam, Netherlands



The central courtyard is an orienting space in LABIM Mall in Lalitpur



Well-designed way-finding signage in Schiphol airport, Amsterdam, Netherlands

5.2 UNIVERSAL DESIGN

Universal design refers to the creation of built environment usable to the greatest extent possible by everyone, regardless of their age, sex, size and ability. Universal design is a comprehensive concept that improves usability and livability for everyone. It considers all possible obstacles that may exist in buildings, sidewalks, paths, roads. Universal design could be accomplished through creating an accessible and comfortable environment for the independent living of people of varying abilities. Following approaches are recommended to meet the needs and comfort of people of different abilities.



Elderly friendly: The main concern of elderly people is their reduced mobility, limited strength, range of reach, poor eyesight and hearing. Considering these inabilities some recommendations are listed below:

- Walking may no longer be easy for the elderly. So public buildings should make corridor lengths as short as possible. If lengthy corridors are unavoidable then appropriate resting facilities like seats with armrests should be provided at frequent intervals. The corridors should be slip resistant and unobstructed for easy mobility.
- Changes in levels may not be easily recognized by older persons. It is recommended to design barrier free access without steps, thresholds, small ramps or kerbs wherever possible. Where level changes are unavoidable, handrails or grab bars should be provided.
- Older persons may have difficulties in way finding. So different floor surfaces should be considered for tactile cues for navigation.

Disable Friendly: The main concern of disable people is accessibility. Barrier Free Environment is one which enables people with disabilities to move about safely and freely and to use the facilities within the built environment. There are people of different disabilities such as wheelchair users, physically injured persons, sightless or partially sighted persons and hearing impaired persons. Considering these disabilities some recommendations are categorically listed below.

- **Wheelchair Users:** They should be able to access all public places. A wheelchair may be operated by the user alone or with a helper's assistance. However, design must assume that the user should be able to operate the wheelchair without help. For independent wheelchair user-friendly design, some recommendations are listed below:
 - In the design of public buildings like hospital, offices, etc there should be the provision of gentler ramps and more easily operated doors and equipment to ease their mobility. The required size of ramp can be obtained by referring to Nepal National Building Code, NBC 206:2003 architectural design requirements.
 - The areas accessible by wheelchair should have a flush threshold or where the provision of raised threshold is unavoidable; it should be chamfered or rounded and not more than 15mm.
 - It is advisable to provide separate toilet for wheelchair users with a sufficient room to allow easy maneuverability.

- **Physically Injured Persons:** A physical injury could be temporary or permanent and in most instances, likely to result in unstable and slow movement. The physically injured person may need crutches or other aids. Considering these disabilities some recommendations are listed below:
 - Handrails and/or trailing bars should be provided whenever possible, on at least one side of a corridor.
 - Corridors should be wide enough to move for crutch users.
 - To prevent a cane or crutch tip from slipping off the side of the stairs or ramp, the exposed edge should be raised by 20 mm to create a lip.
- **Sightless or Partially Sighted Persons:** All people with vision impairment will rely on whatever vision they have as well as other senses to find their way around. Provision of physical and other sensory cues such as touch, sound, smell as well as tactile or audible information is therefore important aids for them to move independently. Considering these disabilities some recommendations are listed below, especially meant to adopt in public buildings.
 - Where possible, tactile warnings in contrasting colors should be provided at doors, ramps and changes in direction. These are especially meant for easy navigation by people with vision impairment.
 - Any protruding objects from the side wall should not obstruct people walking along the passageway.
 - Signs that are readable in Braille should be provided where possible.
- **Hearing Impaired Persons:** It is important to understand the unique needs of the deaf or hearing impaired. Since they are unable to receive audio information, all information should be transmitted through other means. They especially use their sight to gather information in public places. Considering their inability some recommendations are listed below.
 - Information boards should be provided and should be easy to understand.
 - Illuminated signage, layout diagrams should be provided to assist hearing impaired persons.

Child friendly: In public buildings, particularly shopping centers and recreation centers, facilities should be “family friendly”. Provision of play equipment and nursing spaces is highly recommended. Consideration should also be given to the special needs of and the appropriate scale for children. Considering the children size and needs, some recommendations are listed below:

- Children sized height for furniture, sanitary equipment, grab bars and drinking fountains should be provided in public buildings.
- It is advisable to provide a child sized water closet within both the female and male toilet.

Gender friendly: In public buildings, mainly shopping centers, hospitals, airport, etc, consideration should be given to the sanitary facilities. It is strongly recommended to provide a separate baby changing facilities accessible by either parent in conspicuous locations with more prominent signage. Furthermore, a separate and adequate toilet for male and female is highly recommendable.

Illiterate people friendly: Building design must seek objectives of friendliness to illiterate population. People who cannot read or write are considered here as illiterate. This group of people also includes those who do not understand the local language. Providing clear hierarchy of space, and their rendering and use of universal signs and images are some of the ways to make the building illiterate people friendly.

6. SAFETY AND SECURITY

Safety, security and maintenance are design considerations that concerns with disaster resilience, crime prevention and detailing that facilitates ease of maintenance. These aspects are explained in following sub-titles.

6.1 SAFETY

Nepal National Building Code, NBC 1994 has been issued by GoN as a legal provision to assure the safety measures in buildings. This code is prepared under the provision of Building Act 2055 which categorized buildings in four categories. NNBC details out the design parameters and standards for each of those categories. This code covers safety standards of building in following dimensions.

Structural Safety: NNBC has standardized the parameters that are used in structural design of the buildings. e.g. live load, dead loads, wind loads, snow loads, material specification and strength of material and appropriate structural design methods etc.

Seismic Design: NNBC has clearly mentioned the following for seismic design:

- Demarcation of seismic zones
- Formula for computing base shear and lateral forces
- the value of the parameters of the formula
- Load combinations
- Shapes and sizes of the building, their configuration
- Seismic joints
- Curtailing details and fixing details of the rebars.
- Mandatory thumb rules

Demolition safety: see NNBC 114 : 1994

Construction Safety: see NNBC 114 : 1994

Building Safety: NNBC has standardized the parapet heights, staircase design details, lift, exit provisions, glazing in hazardous locations and requirement and safety measure for people with disability.

Electrical hazard safety: NBC 207 : 2003 has specified electrical hazard safety measure such as earthing provision, ratings of cable and other equipment etc.

Fire Safety

- Terai plains are particularly susceptible to fire hazards due to the heat, the style of house construction and frequent lightning strikes and windstorms. Similarly, human negligence and lack of adequate fire safety measures are also factors contributing to the outbreak of fires. Nepal National Building Code NBC 107:1994 provisional recommendations on fire safety should be followed to mitigate fire risks.

Lightening hazard safety: NBC 207 : 2003 has outlined provisions for lightening hazard safety. Besides these codal provisions, designers should consider the following:

- All regions of Nepal are prone to lightning strikes resulting in loss of lives and properties. Installation of lightning arresters, earthing and conductors is therefore important.
- A lightning arrester shall be located in the highest part of every building and it should be connected by a conductor to an earth rod buried in the earth.
- The lightning arrester should be so located that so most of the building portion lies inside the surface of an imaginary cone having a vertex angle of 45 degrees and its apex at the top of the arrester.

6.2 DEFENSIBLE SPACES

Defensible space concept deals with building design measure which can contribute in crime prevention and social control in the neighborhood. Many case studies and researches has been done in American cities which has come to the findings that there are more chances of higher crime rates in high-rise apartment buildings and in some cases in low rise housing neighborhoods. This kind of research should be conducted in Nepalese context too. These prevalent research findings have mentioned that the major causes for crimes in neighborhoods are: (Newman, 1996)

- Lack of feeling of control or personal responsibility for an area occupied by many people.
- Isolation of low income groups have created perceived differences which have led to stigmatization, apathy and neglect.

Strategies for creating defensible space

In order to create safer environments, designers should consider the following four elements of defensible space:

- the capacity of the physical environment to create perceived zones of territorial influence;
- the capacity of physical design to provide surveillance opportunities for residents and their agents
- the capacity of design to influence the perception of a project's uniqueness, isolation, and stigma
- the influence of geographical juxtaposition with safe zones on the security of adjacent areas

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