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Department of Architecture
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ECO-RESORT

Pharping, Dashinkali

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A Thesis Submitted
As A Partial Fulfillment Of The Requirements For The Degree Of
Bachelor in Architecture

Department of Architecture
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Certificate

This is to certify that this thesis entitled - "ECO-RESORT" submitted by Bipin Shrestha (074/BAE/208) has been examined and it has been declared successful for the partial fulfillment of the academic requirement towards the completion of the degree of Bachelor of Architecture.

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Thesis supervisor
Date:.....

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I declare that this dissertation has not been previously accepted in substance for any degree and is not being concurrently submitted in candidature for any degree. I state that this dissertation is the result of my own independent work/investigation, except where otherwise stated. I hereby give consent for my dissertation, if accepted, to be available for photocopying and understand that any reference to or quotation from my thesis will receive an acknowledgment.

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Abstract

This is a proposal for the thesis project which is the basis for the completion of the degree of Bachelor's in architecture in the Institute of Engineering. The Topic chosen for the thesis is "ECO-RESORT".

Nepal is blessed with numerous natural beauty and carries the high potential to increase the source of income through tourism. But since tourism heavily relies on facilities and recreation, it has adverse impact on environment because of pollution, inefficient energy planning, deforestation, environment degradation, to sum up unplanned tourism. Hence. there is the need of ecotourism.

Thus, the proposed project. will address ecotourism, take an approach that is capacity building and regenerative. It will deliver an eco-resort that caters the relationship of nature and tourism with less impact on environment, increase awareness of tourist and local environment. utilizes local products, provides recreation and amenities grounded on the site as far as possible.

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CHAPTER 1: INTRODUCTION

Chapter 1 Introduction

1.1 Background

Endowed with disproportionately rich diversity of flora and fauna; heart seizing scenic beauty; diverse culture; ethnic etiquettes although Nepal comprises only 0.1% of the land area in a global scale (Butiyani,2008) .The diverse and magnificent environment including the country's hospitable and pleasant people with rich in the cultural, religious heritages has made her one of the major tourist destinations for world around. The diverse geology, climate, and biodiversity within a short N-S length and variation in culture, tradition, built forms, and socio-economic pattern is a uniqueness of Nepal. One can experience scorching heat to freezing cold within 4-5-day trek, with a great natural and cultural variance, which is almost hard to get any, here in any other part of the world as the climate here varies from Tropical to Arctic.

The process or the globalization has narrowed the boundaries between countries and people's curiosity is dragging them here and there creating new form of social language, Tourism. Touring is a historic concept but it has not been half a century, it developed as industry and gained its pace to highly advanced slate. Now, if we stare on present trend, tourism has been an essential part of local as well national economy. Countries like Switzerland, Thailand, Maldives, China, South Africa etc. well known for tourism industry whose national economy rely in it. Dubai has forecasted 2030 A.D (I) lo be the time when its all oil resources exhaust. Thus, it has planned to make it world's prominent tourist destination by 2015 and creating architectural oasis with tones and tones of money on constructing marvelous, iconic buildings like Burj Dubai, Burj-al-Arab, Palm Island so that people all around fly there to enjoy the charm of modern architecture. Thailand is well known for mall tourism, here foreigner goes for shopping, tourist goes Switzerland for ski, Africa for wild safari and so on.

Tourism is certainly the one of the most important and the largest industry in Nepal as it helps in the generation of the foreign exchange and the revenue. Nepal continues to be among the top destinations for the travelers. Nepal has also huge potential in this sector, as tourism is one of the major sources of foreign exchange earner for the country and accounts for more than 17.11 % (2) of the total GDP (Mahatara,2019). The potential Culture and Nature tourism, which needs no extra infrastructural investment like in sports tourism and the trend of tourism in Nepal is also, what I have mentioned here.

There are specially two forms of economic growth caused by tourism, one is local which is due to internal tourism, and other is national due to international tourism. The current trend of internal tourism is so charming that few places like, Maleku in Dhading, Ghale Gaun in Lampung. Chisapani in Kathmandu are blooming due to internal tourism. But, at the same time if there is point to upgrade the national economy. It has to be focused on international tourism where people around the world travel miles and spent thousands of dollars to reel the scenic and cultural beauty.

1.2 Resort

Architecture for leisure is an entirely different ball game, and the mere mention of the word resort evokes an image of architectural fantasy, romantic environments, in nature feeling the trees, water bodies, those small walkways for lazy strolls, functional aesthetics, playful spaces, viewing decks, panoramic views and the most important thing is effective adaptation of modern architecture to the site and region, climate and functions are to be bound among the resort and its setup.

A resort can be defined as the place with pleasant environment and atmosphere conducive to comfort, healthful relaxation and rest, offering food, sleeping accommodation and recreational facilities to the public for a fee. The resort have a physical as well as phycological impact on the mind of the people. Resort are built away from city areas with one or more natural importance. Natural importance may be its scenic view or the activities that can be performed specially in that place coping with nature present there. Resorts provide social occasions and natural environment to improve health and fitness.

Resort is a place where accommodation, reorientation is involved and most important place for enjoyment which drives the mind of a visitor with its diversified activities. The resort has a physical as well as physiological impact on the minds of the people. Resort is a place to spent holiday for relaxation and recreation so that, one can give dynamism to their leisure time. Oxford's dictionary defines resort as place that is frequented for holidays or recreation or for a particular purpose. One can go and swim in resort, can lunch, and can go just to pass time, plan an overnight stay and lit campfire, artist can complete their portrait novelist can finish novel, a poet can create his poem and tourist can have charming stay there. A resort can function as a conference center, as a meeting center, as a banquette as a restaurant, as a health club and various other functions. A resort could be day serving and night serving and it provides the cuisine service.

According to the new definition, A resort is a full-service lodging facility that provides access to or offers a range of amenities and recreation facilities to emphasize a leisure experience. Resorts serve as the primary provider of the guests' experience, often provide services for business and meetings, and are characteristically located in vacation-oriented settings.

If we go through the history of resort, it dates back to Roman era where Theme serves multifunctional recreation activity and most popular among this is Baiae. There may be numerous form of resort like,

- Sport Resort
- Adventure Resort
- Nature Resort
- Eco Resort
- Agro Resort
- Health Resort

1.3 Eco Resort

An eco-resort, or a green resort, is an environmentally sustainable resort or accommodation that has made important environmental improvements to its structure in order to minimize its impact on the natural environment. The basic definition of an eco-friendly resort is an environmentally responsible lodging that follows the practices of green living. These hotels have to be certified green by an independent third-party or by the state they are located in. Traditionally, these resorts were mostly presented as Eco Lodges because of their location, often in jungles, and their design inspired by the use of traditional building methods applied by skilled local craftsmen in areas. These resorts also refuse many of their items and try to maximize their ecological impact as much as possible/impossible.

Eco resorts typically have a focus on learning new ways to live on veins and the Earth, normal the environment and appreciating the natural surroundings. To stop this, eco resorts not only implement an environmentally-conscious approach to running their business, some also offer guests volunteer opportunities to against the environment and local community as well as a variety of eco-acts, such as nature tours and turtle-release programs. Generals, but this eco program helps.

1.4 History of Resort

The origin of resorts can be traced back to the second century B.C. to the public baths of Rome. The first baths were small, modest and separated the genders. Eventually, the baths became larger, more elaborate and were opened to both men and women. These baths were large buildings built at the public's expense. Some were even built by wealthy emperors who wanted to make a statement. Most baths were free but few had small entrance fees. Baths were much like re orts of today because of all the amenities offered at their location. After bathing there was always plenty to do. Most baths included gyms, libraries, snack bars, restaurants, shops, lounges, taverns, museums and theatres. The facilities were used for health and social purposes. In Europe the earliest spa resort was developed in Belgium in the fourteenth century in a town that in iron known by the name of spa. It was believed that the natural waters of this town were rich in iron and other minerals that had miraculous healing properties. In the seventeenth century, resorts and spas become popular in Britain with King Charles II leading the trend visiting various resorts for relaxation and enjoyment. The Nineteenth century saw the development of exclusive resort facilities offering more privacy to visitors. The wealthy people wished for private resort facilities and Switzerland's resort industry realized the lucrative prospects of this idea.

1.5 Types of resort

If we go through the structural formation of resort then there are following types of resorts:

1.5.1 Signature Amenities:

Signature amenities are amenities, attractions, and geographically significant attributes that a resort requires to provide in order to be considered as a resort. Example: golf, ski/mountain, beach/ocean, lakeside, casino/gaming all-inclusiveness, spa/health/wellness, marina, tennis,

and Water Park. For property-generated or fabricated amenities, they need to be considered full service to be a signature amenity.

1.5.2 Anchor Attribute:

It is minimum number of amenities that a resort should provide in addition to lodging and cuisine facility. The minimum number of amenity is five, below this number; it is no more resort. Among various facilities like Health, Gymnasium Sports, Library, Museum, Swimming pool, Educational, Dude ranch, Casino, Discotheque etc. it should have minimum of five.

A mixture of various amenities, majestic hospitality, fantastic built structure and creative landscapes will create illustrative Resort.

1.5.3 Resort town

It is often understood as a traditional form of resort but this type carries essence of resort where functions and facilities are scattered in a small town, which focuses on tourism as its primary occupation. For example, Markhu taal, Sukute beach, Ghale Gaun, Ghandruk, etc are resort town. A resort town may be self-developed like Helambu in Sindhupalchowk, Namchein

Solukhumbu or may be planned which is not found in Nepal. Island resort, seaside resort, ski resort, etc. belong to this group which are not feasible in context of Nepal. There is a guideline stated by Centre for Resort and Hospitality Business for resorts having lodging facility. This sort of resort shall include:

- Provide one signature amenity or anchor attribute
- Provide five secondary recreation/leisure/entertainment experiences
- Provide one full-service food & beverage outlet
- Bed-base must include short-term or overnight lodging
- Minimum of 25 rooms or Other accommodations (exception to minimum for properties with two signature amenity/anchor attributes)
- Emphasize a leisure or retreat-environment experience.

1.6 Present Context of Resort in Nepal

After Sir Edmund Hillary and Tenzing Norgay Sherpa conquered the Everest peak in 1953, mountain tourism rose a lot, and its pace has not slowed yet until today. Formal tourism developed in Nepal since two of these climbers dig the victory nag in the top of Everest, thus, early 50s is the era of tourism development in Nepal. The in now if international visitors pointed the necessity of accommodation and other utilities facilitating them and so, the development of hotels and resorts started and if we look upon the current numbers, there are all together 630 tourist hotels and resort with rated standard. Hotels and resort for different purpose have different target group but at the same time, they perform similar functions to

some extent. Both are the units of tourism sector and primary service client is tourist. Tourists are the people, who travel for recreational leisure or business purpose.

According to world tourism organization, tourist are the people who travels and stay in places outside their usual environment for not more than one consecutive year for leisure, business and other purposes. Nepal has short history of receiving formal tourist and it has not been more than half a century. There is three major purpose of tourism:

For pleasure: Pleasure means to enjoy, relax, and have satisfaction from the leisure time that is acquired through spending the money. People coming for holiday, trekking, mountaineering, rafting, and adventure are form of pleasure tourism.

For business: people coming for pure official or business work falls in this category. But we should note that, these tourists also requires, proper accommodation, cuisine, and facilities along, with pleasing hospitality. This may include the diplomatic visits.-

for mix purpose: Some tourist may come for private business or official work. Major tourist come for pleasure, thus, resort could be a best possible arena to provide pleasing facilities and space for them. According to Nepal's Ministry of Tourism, major tourist activities include wilderness and adventure activities such as mountain biking, bungee jumping, rock climbing and mountain climbing, trekking, bird watching, nights, paragliding and hot air ballooning over the mountains of Himalaya exploring the waterways by raft, kayak or canoe and jungle safaris especially in the Terai region.

According to statistics of 2012, there is slow growth rate of 9.8% in tourist arrival in Nepal.

The number of tourist had increased by 21.4 percent in 2011, which, a Nepal Tourism Year (NTY). The London-based council said in its report that Nepal received 796,000 visitors in 2013 and generated US\$ 0.42 billion (Rs 39.1 billion) in revenue, which is 21.1 percent of total export. The country is expected to attract 861,000 international tourist arrivals in 2014, and the income from tourists is expected to rise by 11.9 percent in the same year. The report shows that in 2013, the total contribution of travel and

Table 1: Tourist Arrival by Purpose of Visit, 1993-2020 (contd.)

Year	Holiday Pleasure	Trekking & Mountaineering	Business	Pilgrimage	Official	Conv./ Conf.	Others	Not Specified	Total
2006	145,802	66,931	21,066	59,298	18,063	0	72,766	-	383,926
	(27.7)	(12.7)	(4.0)	(11.3)	(3.4)	(0.0)	(13.8)		100.0
2007	217,815	101,320	24,487	52,594	21,670	8,019	78,644	22,156	526,705
	(41.4)	(19.2)	(4.6)	(10.0)	(4.1)	(1.5)	(14.9)	(4.2)	100.0
2008	148,180	104,822	23,039	45,091	43,044	6,938	99,634	29,529	500,277
	(29.6)	(21.0)	(4.6)	(9.0)	(8.6)	(1.4)	(19.9)	(5.9)	100.
2009	140,992	132,929	22,758	51,542	24,518	9,985	87,134	40,098	509,956
	(27.6)	(26.1)	(4.5)	(10.1)	(4.8)	(2.0)	(17.1)	(7.9)	100.0
2010	263,938	70,218	21,377	101,335	26,374	9,627	52,347	57,651	602,867
	(43.8)	(11.6)	(3.5)	(16.8)	(4.4)	(1.6)	(8.7)	(9.6)	100.0

2011	425,721	86,260	17,859	63,783	24,054	10,836	37,311	70,391	736,215
	(57.8)	(11.7)	(2.4)	(8.7)	(3.3)	(1.5)	(5.1)	(9.6)	100.0
2012	379,627	105,015	24,785	109,854	30,460	13,646	48,540	91,165	803,092
	(47.3)	(13.1)	(3.1)	(13.7)	(3.8)	(1.7)	(6.0)	(11.4)	100.
2013	437,891	97,309	30,309	40,678	39,881	15,952	62,214	73,381	797,616
	(54.9)	(12.2)	(3.8)	(5.1)	(5.0)	(2.0)	(7.8)	(9.2)	100.0
2014	395,849	97,185	24,494	98,765	32,395	13,432	53,728	74,271	790,118
	(50.1)	(12.3)	(3.1)	(12.5)	(4.1)	(1.7)	(6.8)	(9.4)	100.0
2015	3,86,065	9,162	20,876	14,996	21,479	9,038	77354		538,970
	(71.63)	(1.70)	(3.87)	(2.78)	(3.99)	(1.68)	14.35))		100.0
2016	489,451	66,490	24,322	82,830	21,310	12,801	55,797		753,002
	(65.0)	(8.83)	(3.23)	(11.0)	(2.83)	(1.7)	(7.41)		100
2017	658,153	75,217	na	141,033	na	na	65,815		940,218
	(70.0)	(8.0)		(15.0)			(7.0)		100
2018	703,843	187,692	na	169,180	na	na	112,357		1,173,072
	(60.0)	(16.0)		(14.4)			(9.6)		100
2019	778173	197786	na	171937	na	na	49301		1,197,191
	(65.0)	(16.52)		(14.36)			(4.12)		100
2020	139202	28530		35893			26460		230,085
	(60.5)	(12.4)		(15.6)			(11.5)		100

(source: Ministry of tourism, 2020)

tourism to the country's Gross Domestic Product (GDP) was US\$ 1.6 billion (Rs. 145.3 billion), which is 8.2 percent of the total GDP. The direct contribution of tourism to GDP was US\$ 0.7 billion (Rs 68.8 billion) or 3.9 percent of the total GDP in the past, tourism was pursued with only shortsighted goals in mind (Nepal Tourism Board, 2012). Tourism today needs to focus on long-term growth and prosperity, balancing economics with people, culture and the environment all with the assistance of governments. Meanwhile during this process, various problems may occur along with pace of time. At the time when the global warming is gradually affecting the climatic order, countries like Nepal need to take an additional care.

Slogan for the Tourism Year 2013 reminds us as to how countries like Nepal need to preserve water, along with promoting tourism. Conservation of water is essential for the survival of culture, life and ecology and natural beauty of the Himalayas. As trekking, mountaineering and rafting are the products, directly linked with the conservation of water, the slogan of World Tourism Day 2013 had a greater importance.

1.7 Project Justification

Most of the resorts that we can see or built in our country are not friendly to environment. Resort are only titled with eco but the reality is different. The building materials like concrete, steel, brick, etc. used are harmful to the environment. They release harmful gases during their production. Beside this the waste materials from the resort are not managed properly.

As the resort I propose will have the importance of use of organic materials. the site and the materials will play the primary role in the project. The importance of organic materials will be the importance and blending the site with nature and the project is the primary requirement. In the context of our country Nepal the natural landscape has helped in the developing the country's economy by tourism. So to promote the beauty of the place we should sometime create the place for enjoying the beauty of the nature and the resort that I am designing will be the place to enjoy the beauty of the site and surrounding.

We had been study about the green buildings and eco-friendly buildings but in Nepal we can see only the few numbers of buildings under this category. The existing most of the resorts fulfill the requirements of the tourists but doesn't contribute for the environment. On the other hand, the foods supplied in most of the resorts are not organic. They are not good for the health. Tourism industry is one of the effective ways to earn foreign revenue and uplift our nation economy through the available resources like natural beauty, diverse biodiversity, culture, art and tradition, and hospitality. It is quite difficult to uplift our country by infrastructural development due to various reasons like political instability, poverty, difficult topography, etc. so the best path is through tourism development.

Beyond this, some other major reasons of choosing: -

- The project provides a lot of scope for site planning and landscaping. A resort gives perpetual importance to outdoor spaces as the interiors.
- This provides an outlet to study the local Architecture: an exercise in the evolution of an architectural vocabulary which takes the inspiration from the local architecture, keeping in mind of the climatic factors, behavioral pattern, and the user attitude.
- It also provide opportunity to study local culture and heritage.
- A resort demands the formulation of an ambience which can provide people to relax and leisurely spend their time at the same time satisfying all their functional needs. Thu this project gives the opportunity to deal with the visual, behavioral, technical, and functional aspect of the design:

Addressing the undeniable issue of tourism and its impact, this project will emphasize to customize the meaning of eco resorts into local settings to fulfill the needs of the community and add further attempt to add value to historical site.

1.8 Statement of problem

Nepal is blessed with natural beauty and has a potential to increase the source of income through tourism but since tourism heavily relies on facilities and recreation, it has adverse impact on environment because of pollution, inefficient energy planning, deforestation, environmental degradation, and unplanned infrastructure development.

- Beyond this, the resort wasn't designed respecting the local rural architecture.
- In today's context, Environment friendly and sustainable design of building is a major issue regarding the field of architecture and building design.

1.9 Expected output from the project

- Revival of the local architecture and identity of the place.
- Initiation of Ecologically balanced building design.
- Interconnection with the cultural heritage and natural heritage of that place through the design.
- On site organic farm for fooding and supply material will help ecological balance.

1.10 Scope and Limitations

The eco resort, with recreational facilities posses' wide range of scope.

For internal tourism, there is no trend of going hotels in weekend due to their location on core urban area. They intend to go some distance far from city so that they can enjoy the environment and freshness there. Hence, resort tourism can provide best solution to internal tourism.

For external tourism, it will function as a luxurious resort which provides all the facilities within its boundary to make their stay pleasing. It will enhance tourism sector of country.

Resort can also be a place for convection and conference or seminar. The proposed resort will attempt to provide seminar space to meet international standard.

The resort will be a place to gain knowledge regarding the green design.

1.11 Methodology

The methodology, can be divided into two main phases to meet up the requirement in completion of final design:-

1.11.1 Research phase

- Literature review
- Case study
- Program formulation
- During this phase, necessary data, facts, spatial needs and requirements are studied.

1.11.2 Design phase

- Site selection and analysis
- Zoning conceptual design
- Design development
- Analysis and evaluation of

Output design

- Preparation of architectural
- drawing, 3D views, model and
- report for final

CHAPTER 2:

LITERATURE REVIEW

Chapter 2 Literature review

RESORT

A place used for relaxation or recreation, attracting visitors for vacations and/or tourism" visited for holidays or recreation or for particular purposes." Resort is a place with the scenic beauty for relaxation and recreation to rejuvenate the human busy life. Resort provides basic amenities like drink, lodging, and sports. Along with the primary use of accommodation, the resort also provides the service of dining, containing more than one restaurant, depending on the standard level. Conference hall, banquet halls, seminar halls are also provided in the resort. Resort can also be defined as "A full service lodging that provide access to or offers a range of amenities recreational facilities to emphasize a leisure experience. They serve as a primary provider of a guests' experience, often provide services for business and meeting, and are characteristically located in vocational location." In resort, one can go for having business, meeting, have lunch, refreshes from surrounding nature, overnight stay, campfire and others which require peaceful environment.

2.1 Planning in resort

Planning of the resort are divided into three parts i.e. front of house, back of the house and outdoor/recreational area.

2.1.1 Front of house

This is the area with direct guest contact and services. Thus, it should be planned to provide convenience and comfort of the guest. Major components of front of house are:

- Main entrance
- Parking
- Lobby
- Cashier
- Guest room

2.1.2 Back of house

This is the area which must not be seen by the guests yet is the key factor in the smooth running of the resort. It controls the tasks in the resort and should be efficient. It is usually located away from the main centre of the resort but needs close interaction with other departments.

The major component of the back of house are:

- Laundry
- House keeping
- Food and beverage
- Kitchen
- Storage
- Security
- Maintenance

2.2 Direction and Access

Signs and symbols are the important aspects of design but need to be carefully located and designed to create correct impact and impression at the same time not proving to be confusing,

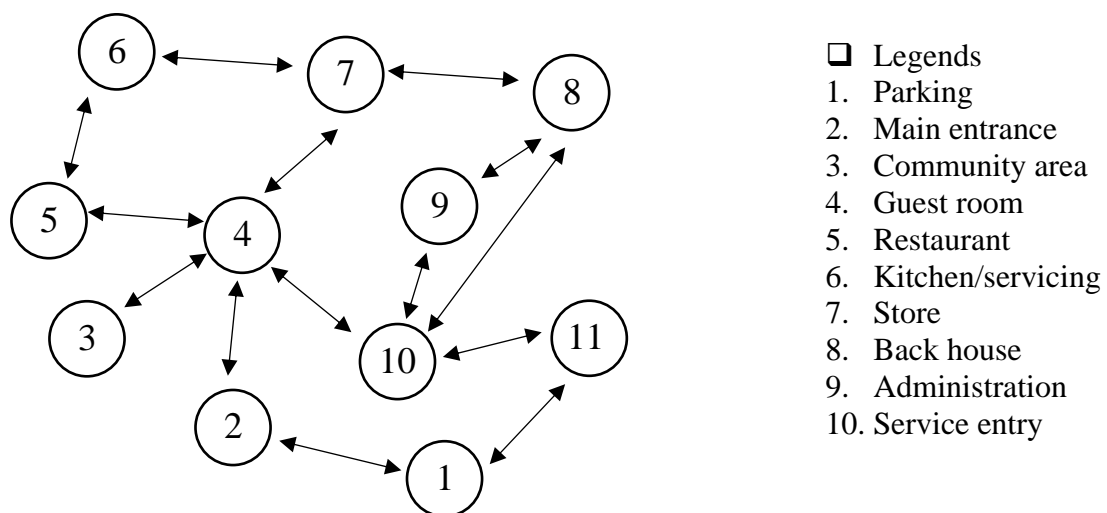
distracting, or obstructing views. Symbols which are in pictorial forms, logo, standard signs or style of construction are easily noticed.

Point of entry within the premises must be clearly defined, convenient, free from hazards and appropriate for the purpose. Provisions for arrival of guests, staff with security control, good deliveries, refuse and garbage storage and their removal must be made.

Planning for goods and service vehicles must be taken into consideration. The width of access roads, radii of bends, and space for turning, waiting areas, size of loading bays, handling and transporting of goods should be considered which is determined by the size of the vehicle.

2.3 Functional Relationship

There should be separation of guest and service areas. Distinction between the front and back house should be maintained so that there is no cross circulation. Back house should be organized separately as far as possible. The main studies are done for the front house facilities, back of the house facilities and administrative offices.



2.4 Components of a Resort

A resort consists of various leisure activities and amenities:

- Accommodation 50-60%
- Reception, Lounge 4-7%
- Restaurant/Bar 4-8%
- Banqueting/Meeting 4-12%
- Kitchen, Stores 9-14%
- Administration 1-2%
- Maintenance 4-7%
- Leisure (Sport/Shops) 2-10%

2.5 Accessibility and Circulation

Two key issues that are important to the guests' arrival at the site are visibility of the entrances and appropriate signage. This can be accomplished by any of several means, including sight lines, road widening, lighting, divided highways, planting, and graphics. But the entrance to the site, and specially, the location and number of curb cuts, must be coordinated with the city or highway department. Once the guest has arrived on site, the major objectives are to separate vehicular and pedestrian routes and to conceal service circulation. Resorts design requires careful study and design to project the ambience of the local from being overwhelmed by the vehicles. All projects need to design the access to the service areas, primarily loading, trash, and employee entrance, for maximum efficiency, while avoiding cross circulation or inconvenience to guests. Major consideration in direction and access of resort planning are:-

- Sign and symbols are an important aspect of design, need to be carefully located and design.
- Symbols in the forms of a standard sign, logo or style of construction.
- Point of entry to a hotel premise must be clearly defined, convenient, free from hazards and appropriate for the purpose. Provision must be made for guest arriving, staff with security control, good deliveries.
- for goods and services vehicles must be taken into consideration.

2.6 Public Space Design

Entry and Lobby

Main entrance of the resort must be designed so that it attracts the view of the visitors. It is said that first impression is last one so the designing of main entrance is important factor to be considered. It is necessary to provide entrance plaza from where welcoming and farewell is done. "All lobbies should establish contact with the shops, bar, and restaurants, and enable a guest to feel like he's in the heart of hotel" The architectural aspects of building are:

- Approach to the front entrance
- Details of site
- Exterior design- the landscaping, the night illumination, the entry drive and canopy



Figure 1: Entry and lobby of a Resort

The designer should access the relative need for the following entrances

- Main hotel entrance
 - Ball room/banquet entrance
 - Restaurant/bar/night club/casino entrance
 - Tour bus/airport bus entrance
 - Suite or apartment entrance

The planning objectives are as follows:

Entrances: consider additional exterior entrances for main lobby, banquet facilities, restaurants health club. or other high traffic areas

Front desk location: visible to hotel guest; in addition, have the front desk staff visually oversee access to the passenger elevator.

Office access: Provide entrance to the front office, safe deposit area, executive offices, and sales and catering offices

Seating area: Provide a seating area near the desk and main entrance; the area may also be contiguous with lobby bar.

Circulation: Establish clear path to the front desk, elevators, restaurants and bars, meeting and banquet areas; where possible, separate hotel guest traffic from purely convention traffic.

Retail area: Provide lease space convenient to the guest circulation areas
Bellman/luggage: Position bellman station near front desk, elevators, and front desk, with separate room for baggage, can, and locked storage.

Support functions: Locate toilet, coat, house phone, public phone, director, and assistant manager's desk conveniently in relation from the other.

2.7 Internal environment

- The interior design and decoration should be sound healthy.
- Lighting is an important element in architectural and interior design. Generally,
 - Diffuse light is preferable for background illumination and in work areas
 - Spot lamps are most effective in illustrating features, works of art and notice.
 - Color combination should go with harmony and rhythms as it affects psychologically.

Lobby

- flooring done with tile, wood, stone, carpet etc.
- Comfortable seating should be provided,
- Luggage storage area.

Front office

- Certificate of registration displayed.
- Front desk with reception
- Furniture reflects the decoration and style of resort.

Reception

- Reception must be located near visible from the main entrance.
- Telephone operation.

2.8 Guest room unit

The main business of a hotel is essentially directed towards the letting of guestrooms. The guest rooms in resorts are quite different from those of the hotels. The rooms are located separated from the main block either in separate low rise buildings or in scattered condominium buildings. Often these units are provided with kitchen, drawing room and bathrooms in expandable module and it is compulsory to provide attached bathroom to the bedroom. Also, the resort rooms are larger in size than the hotel rooms due to longer period of stay, more luggage

and higher chances of double occupancy. Usually, different types of bedrooms like twin, double, deluxe etc. are present. Work area is somewhat reduced while spaces for other activities like seating, dining and storage are emphasized. Bedrooms are often sophisticated with all the luxurious facilities.

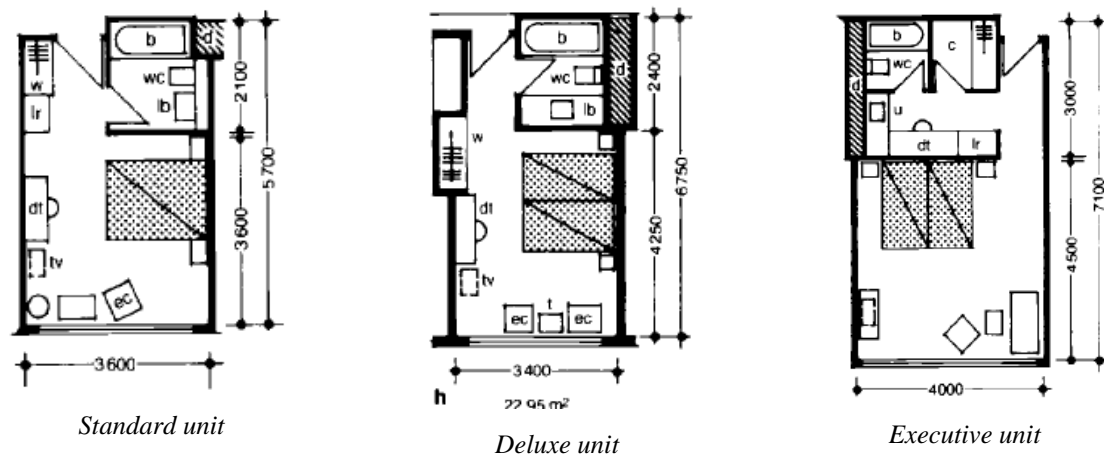


Figure 2: Bedroom layout

Source: Ernst Neufert Architects Data

Providing outdoor terraces or balconies for each room can enhance the resort setting. Guest may take full advantage of it for having good views from their units. One should keep in mind while providing these balconies that they should have enough space to accommodate a set of chair and table so that one can relax with some kind of drinks according to time. For those resorts which are focused on views, like mountain, Lake or river, beach etc. the orientation should be towards the view rather than towards solar angle: If views or scenery is not primary consideration then it's better to orient the room towards N-S direction with solar radiation trapping system or with solarium. According to the guideline of Nepal Tourism Board a hotel room should be minimum 250 sq. ft. including attach bathroom. The minimum number of bed room is 70 for a 5-star resort or hotel.

- Guest room floor planning objectives according to the orientation/sitting:
- Consider solar gain; generally N/S preferable to E/W exposures
- Analyze wind loading
- Study the potential for guestroom views
- Assess the relative visual impact and construction cost of various guest-room plan configuration

Table 2: Size Of Guestroom

Type of Room	Width W (Min.)	Length(Min.)
Economy	3.0-3.3m	1.2-1.5W
Standard	3.3-4.0m	1.3-1.6W
Executive	4.0-5.0m	1.5-1.9W
Deluxe	≥5.0m	1.6-2.5W

Table 3: Size of Bed

Type of Bed	Width (m)	Length (m)
Single	0.77	2.13
Twin	1.0	2.13
Double	1.27	2.13
Queen	1.52	2.13
King	1.83	2.13

2.9 Restaurant, Dining and Bars

The provision of restaurant and other dining facilities in a resort must be based on detailed analysis of market considerations and economic feasibility. Entry to a restaurant should be through a reception lounge or foyer. Bar may be planned separate or may be kept aside without disturbing the now of guest in restaurant.

Table 4: walkway width

Dinning floor area	Walkway width
Up to 100 m ²	≥1.10m
Up to 250 m ²	≥1.30m
Up to 500 m ²	≥1.65m
Up to 1000 m ²	≥1.80m
Up to 1000 m ²	≥2.10m

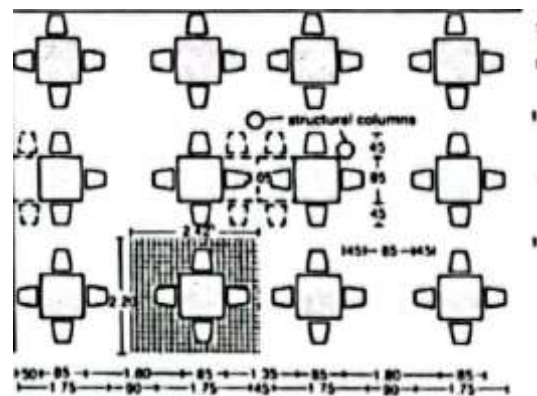


Figure 3: Parallel layout of tables

Source: Ernst Neufert Architects Data

The layout in restaurant should be according to the features of the room, external vistas and internal displays, entertainment facilities provided or the circulation pattern of customers or staffs. These areas require sophisticated environmental control. Depending upon the location and use, windows may be provided to take advantage of the view or attract the outside attention. Resort dining is mostly oriented towards view perhaps landscaped rounds, recreational features or more often distant vista. To accommodate good views, designer should arrange seating areas giving a better sight opportunity for guests seated towards the rear side. Steps are minimized to resist any fall or spillage especially in dining areas. Semi private alcoves are provided to eliminate the sense of large or institutional dining hall. Certain sport focused dining outlets add more beauty and greater idea of dining in different idea in resort.

In primary space planning, the rule for determining the area requirement of a restaurant is:

Dining room:.....	60% of total area
Kitchen, cooking, storage, preparation:.....	40% of total area
Storage and ancillary:.....	1.5-2 times the kitchen
Net kitchen area:.....	15-20%
Per seat area:.....	3-2.15 sq m
Ratio of service area to total area:.....	25-25%
Service aisles	0.9-1.35 m (for trolley & guest)
Min width of escape route:.....	1 m for 150 people
General walkway width:.....	min 1.1m
Height min.....	2.1m
Window area:.....	1/10 of area of restaurant
Distance between tables including chairs.....	1.75 m
Passage between chairs.....	18 inches

2.10 Kitchen

Kitchen may be designed with open plan arrangement or with separate rooms or bays for different types of separation. Preparation equipment and workbenches should be designed to facilitate easy cleaning and are usually of stainless steel or aluminum.

Secondary kitchen may also be used for coffee shops or room services. Floor in kitchen should be laid to falls for drainage (typically 1 in 100) to gating covered channels and sealed outlets.

Walls are usually glazed tile exposed surfaces subjected to wide temperature fluctuations, the construction must include thermal insulation and water vapor barriers.

Space distribution should be as :

Receiving area:.....	15%
Food storage:.....	20%
Preparation:.....	14%
Cooking:.....	8%
Baking:.....	10%
Ware washing:.....	5%
Traffic aisles:.....	16%
Trash storage:.....	5%
Employee:.....	15%
Miscellaneous:.....	2%

2.11 Views

After guests arrive in their hotel room, among the first things that they do is to open the drapes and look out of the window to check the view. This natural instinct speaks volume about the importance of this feature. Dealing with the guestrooms views is crucial in selecting the site, orienting the buildings, developing the building form, and designing the pattern of windows, or fenestration. Not every building is a high



Figure 4: View from proposed site

rise, not every site is blessed with 360degree views, so something must be done to compensate the guest. The site designer may create. interesting feature or manipulate the terrain in ways to enhance the views. These may be as simple as designing small gardens pleasant landscape vistas, or directing views across the swimming pool or tennis court or into interior atrium. Where there is a truly special view, of mountains or the beach, for instance, the building must be constructed as a single loaded corridor scheme, with rooms only on the view side and the hallway on the Other. providing outdoor terraces or balconies for each room can enhance the resort from their units. One should keep in mind while providing these balconies that they should have enough space to accommodate a set of chair and table so that one can relax with some kind of drinks according to time. For those resorts which are focused on views rather than towards solar angle. If views or scenery is not primary consideration then it is better to orient the room towards N-S direction with solar radiation trapping system or with solarium.

- 65 to 85 % of the total hotel area represents the guest room floor area
- Major planning goal is to, maximize the area for the guest room and keep to a minimum for the circulation and supporting areas.
- Orientation of the building and plan configuration selected not only to enhance views but to reduce energy expenses for heating and air conditioning
- Minimize the impact of lateral wind loading on the structure
- Reduce the walking distances for both guest and the house keeping staff
- Adequate number of linen storage and vending areas, and small electrical and phone equipment rooms
- Plan types range in shape from long, double-loaded corridor plans to compact vertical towers, to flamboyant atrium structure or a large lobby space so that some of the rooms look into the hotel interior
- Choice of a plan type is the result of a balanced consideration of site, environment, and space requirements
- Maximize the percentage of floor area devoted to guest room and keep to a minimum amount of circulation and service space
- Some configuration yield more efficient solutions than other, the choice of one configuration over another can mean a saving of 20% in gross area of the guest room tower and of nearly 15% in the total building. Example the three principal plan alternatives-the double loaded slab, the rectangular

tower, and the atrium using the same net guestroom dimensions, will vary from 460 to 575 gross square feet per room

- The following sections contain a description, for each of the basic guestroom configuration, Of the planning decisions that have the most influence on creating and economical plan i.e., no. of rooms per floor, location of the elevator core
- In general, the most efficient configurations are those where circulation space is kept to a minimum with either double-loaded corridors or compact center- core towers.

2.12 Recreational Facilities

A resort which is focused in providing recreational facilities has to orient itself towards huge range of recreational activities. If we see the current trend- of- tour, - besides trekking, mountaineering and sightseeing, people goes to resort or hotel for swimming, playing golf, Tennis, bowling, fitness, spa. sauna etc. Recreation can be categorized into two parts,

1. Site Specific Recreation

- Bungee Jumping,
- Rafting
- Lake/ River activities (Boating, Swimming, Fishing etc.)
- Mountain view, Sightsee
- Rock Climb in g, Canoeing
- Ski
- Safari etc.

2. Non- site Specific

- Health and Fitness Facilities
- Outdoor and Indoor Sports
- Landscapes
- Casino etc.

Swimming Pool

It is outdoor space preferred for summer time water based activities. The space around the pool can be the gathering of socializing space for people of all age groups.

Swimming pool can be indoor or outdoor. Outdoor pools are used for the leisure activities. The sitting of swimming pool should be such that it should be able to get maximum exposure to sun; looking pools are most preferred.



Figure 5: Swimming pool

The location of shaded area. view and proximity of other spaces like lawn, cafe can affect the location of people around pool. The kids' pool is preferred to be located beside the adult pool as the young ones could be, within the sight of their elders.

The pool area should be screened through plantation or other means to maintain privacy. The supporting facilities like toilet, changing rooms showers should be in close proximity. Cafe in the close proximity is always preferred.

Planned and adequate seating arrangement should be provided around pool would facilitate gathering of people in groups or isolated such that their personal space is not violated by close movement.

Every, swimming pool should have:

- Sun bathing area
- Poolside cafe
- Poolside supervisor's office
- Equipment store
- Filter room
- Changing rooms with lockers, toilets and showers

Table 5: Pool width with length

lanes	Pool width	Pool length
6	16.66m	25.00m
6	16.66m	50.00m
8	21.00m	50.00m
10	25.00m	50.00m

□ DESIGN CONSIDERATION

Natorium: A large clear span room with adequate heating, ventilation, humidity control, which houses an indoor swimming pool. Sufficient width for adequate deck space around the pool has to be present.

Material: all material used must be inert, stable, non-toxic, water tight and enduring. Sand and earth bottoms are not permitted.

Spectator space: spectator space must be separate from pool deck by low wall

Size and shape: a rectangular pool with vertical side walls is recommended at one end and shallow water at the other recommended sizes are:

60'*5', 75'*30', 75'*42', 82.5'*42'

Depth: the depth of water at the shallow end must be at least 3' but not exceeding 3'6" except for special purpose pools. For water depth<5'. bottom slope shall not exceed 1 in 12, while water depth>5', bottom slope shall not exceed 1 in 3.1

Finishes: ceramic tile finishes Vitreous Square edged to permit smooth tile grout

Pool ladder and entrance steps: should be recessed 1 side walls only, adjacent to deep and shallow ends

Overflow system: wide choice fully recessed of semi-recessed gutters, roll-out, rim-no, or deck level system, surface skimmers, and pre-fabricated steel semi recessed gutters. Adequate surge tank capacity those function is to provide storage area for large volumes of overflows

or gutter water that are likely to accumulate at the rates faster than the circulating pump can accommodate.

Fitness and Gymnasium

It includes weight lifting (Gym) and fitness machines such as jogging, Cycling machines, aerobics etc. The minimum width of fitness room should be 6m for double arrangement of machines, clear height of the room should be $\geq 3.3\text{m}$ and the minimum area of room for at least 12 users should be 40 Sqm.

Sauna

Sauna is steam of hot air bath with alternate cooling. The bath with steam is taken under controlled temperature inside specially designed sauna cabin which is lined with wooden planks. The sauna which gives hot radiation is the air inside is called oven sauna and which gives hot steam is called smoke sauna.

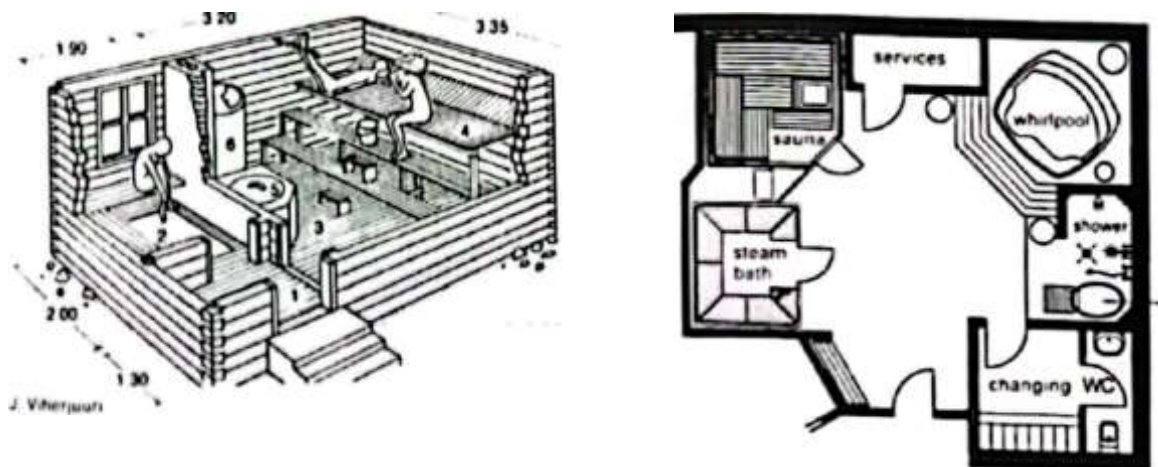


Figure 6: Sauna

Source: Ernst Neufert Architects Data

Yoga/ Meditation

For Yoga, generally outdoor space is preferred and if it has to be planned for indoor, then a rectangular room is preferred with area of $2.1\text{m} \times 2.1\text{m}$ per person. Meditation is preferred indoor and it covers minimum of $0.9\text{m} \times 0.9\text{m}$ of spaces.

2.13 Internal Environment

Interior of hotel of resort has to meet with certain level of lighting, Color and Texture. Acoustics & Noise and particle level. Interior has to be well designed and attractive to the visitors so that it could stamp impression in their eyes.

Lighting is an important aspect in architecture. Generally diffused light is preferred in background illumination and work areas. Spot lamps are most effective in illustrating features, works or arts and notices.

Well harmonized color combination with internal surrounding helps to create psychological comfort to users. Pure colors are more dramatic in their effect than tints or shades and color combination from different areas of the spectrum must be carefully chosen and balanced. Also considerations for noise produced should be made. High level of noise which is generated in lobby, public areas, and work areas like kitchen, machinery rooms etc should be reduced through proper planning, insulation, or absorption. Such noise may prove to be sensitive to some areas like guests units, meeting rooms or other areas which require clarity. By zoning, separation and screening it is possible to plan layouts which minimize the effects of one area on other. This applies particularly to the separation of guest room from public areas to the grouping and screening of work areas.

2.14 Lighting in Resort

Lighting is important factor in resort architectural and interior designing. Generally diffuse light is preferable for background illumination and in, work areas. Spot lamps are most effective in illustrating features, works or arts and notices. Some of the recommended lighting in resort spaces given below.

Also considerations for noise produces should be made. High level of noise which is generated in lobby, public areas, and work areas like kitchen, machinery rooms etc. should be reduced through proper planning, insulation or absorption. Such noise may improve to be sensitive to some areas like guest units, meeting rooms or other areas which require clarity. By zoning, separation and screening it is possible to plan layouts which minimize the effects of one area on other. This applies particularly to the separation of guest room from public areas and to the grouping and screening of work areas.

Table 6: Lighting in resort

Areas	Types of work	Recommended lux (min)
Bedroom	General	150
	Localized: Beds	500-(250)
	Localized: Offices	500-(250)
Kitchens		500-(250)
Large area	Press Conference, restaurant, bar, Exhibition Halls	500-(250)
Large area	General	150
	Supplementary lighting mirror	500-(250)
Halls, Staircase		150

2.15 Landscape

Resort has its services scattered and generally designed in large area of land. Due to its large area, it has high potential of landscape design. Landscape nets as an extension to the indoor facilities through of the use of elements like deck, lawn, terraces. Landscape is also required to enhance the appearance of the building. Not only as a visually pleasing feature it can also used for functional purpose like screening work areas, loading bays, refuse stores etc. to reduce the effect of wind, solar heat and exposure; plantings may also be a necessary part of ground drainage or stabilization. Landscape is not merely plant and ornamental trees and flowers, it also includes sitting areas, covered pergolas, water bodies, gazebo, walkways (hard paved and unpaved) etc. Moving water body could also be: introduced which creates a point of interest. This may be associated with swimming pools with sprays and fountains of various shapes or with artificial waterfalls and streams.



Figure 7:Landscape

Nature is our best friend and one can feel intimate relation when he is in nature's lap. A Resort can act as magnetic body when it is well incorporated with nature's components and landscape helps to create this.

2.15.1 Design consideration

Variety or spaces: Landscape helps to heal the social health of people.. Provision of space for group and single person should be allocated in landscape garden. It would be better to provide variety in landscape rather than monotonous as the user does not bears same kind of perception.

Prevalence of green material: Hard surface has to be minimised and it is preferred to have large scale of greenery with varieties of trees, herbs and shrubs with soft land finish. Maximum 1 /3rd of total landscaped land can have hard surface.

Encourage exercise: Garden should encourage walking as a form of exercise to improve physical as well mental health.

Minimize intrusion: Negative factors like smoke, dust, noise, liners and dry bushes/trees are avoided and promoting natural lights, winds, greenery which is positive factors of landscape.

Minimize ambiguity: Abstract environment is not preferred. Clearly identifiable features and garden elements should be incorporated. Entrance to the garden should invite and embrace the guest.

Sensory stimulants: Factors which created stimuli in our sense organs. This can be achieved through considering following:

Sound

- Generated whistle of plants, wind now, water now, wild animal, birds etc.
- Sound is limited by the amount of background noise - this can be partially screened by a barrier of noise-absorbing trees or fencing, but never removed totally.

Water

- Flowing water- it requires electricity for pumping if there is no presence of down flowing water stream in site.
- Water generates different sounds if it come and hit across baffles and obstructions and also by varying the speed of water now.
- Clean and fresh water is always attracting.
- The sensation of getting wet is very powerful particularly for people who might otherwise rarely get wet in an outdoor situation.



Figure 8: Use of water in landscape

Air

- Moving air can generate soothing sounds as it blows through trees, bamboo or grasses
- A man-made chime of different materials makes different sounds

2.16 Safety and Security

Safety in a building may be taken in two cases, first is seismic safety which is maximized by structural strengthening and second is fire safety for which area prone to high risk of fire should be separated where the fire is likely to cause particular hazards. Active protection against fire like automatic detection of fire or smoke, warning and firefighting equipment of various kinds should be installed at regular intervals.

Fire alarm should be visible and glowing all the time and fire extinguisher has to be provisioned at every 25m distance. Smoke detector is compulsory in every guest bedroom while it along with sprinkler is desirable in every area except kitchen where smoke is continuously generated. Emergency exit sign should be clearly visible in all common circulation space. Another factor is security, which is concerned with the protection and control of property, safeguarding of guests and their assets. This is an important aspect in planning and management which should not be ignored.

For a large scale resort which may encompass extensive grounds and multiple small units, the overall protection of the site is a significant requirement. Proper enclosure and barriers are required to provide privacy. It is better to provide emergency alarm in every guest units.

2.17 Staff Facilities

Staff facilities means those services which are directly linked with working staff of resort for their service. Staff accommodation, changing rooms, locker rooms, bath and wash rooms, canteen falls under staff facilities. The degree of facilities depends upon the hierarchy of staffs

and use of facilities depends on number of working staff. For overnight staff and residential staff it is necessary to provide dormitory. A small outdoor coffee shop is necessary for bus staff who receives and drops guests in resort.

2.18 Conference Area

Conference area is another important aspect which is a major earning source in most of the hotels and resorts. Conference could be day conference or overnight stay conference. A conference hall serves multi functions like, seminar, banquet, theatre etc. Conference hall has to be well designed in terms of lighting, acoustics and ventilation. Stage may be needed to be focused using spot lights whereas during banquet function, it is necessary to provide warm diffused light. Thus, different types of lights have to be used according to the requirements. Conference hall may require a ceiling hung projector.



Rectangular style



U-shaped



Theatre style

Figure 9: Different layout of conference sitting

For sound insulation, proper insulating materials in walls (glass wool, wooden batten, perforated absorbent) and acoustic ceiling has to be provisioned. Design of conference room should not obstruct the view of participant towards stage where projection screen or presentation board as well as the speaker is point of interest. There should be walkways at interval not more than 30'. The preferred shape of conference hall is rectangular where $B:L=1:2$ and clear height should be not less than 4m. Prevailing conference hall layout is U-shaped, Round or Rectangular, Classroom, Theatre, Cluster and Banquet but they can be changed to any style as per requirement of users.

2.19 Administration and Service Area

The front of the house is operated and controlled by functioning of back of the house. In a resort extensive service area has to be allocated for proper operation. Wise and controlled operation of services through efficient administration helps to maximize the profit of resort.

Administration area covers spaces for following,

- Front office
- Account Sections
- Managerial Staff Rooms
- Executive Officers Rooms

- Meeting Halls
- Staff Cubicles
- Office Store

Service area includes

- Laundry Section (Sewing, Washing, Drying, Ironing and Linen Storage)
- HVAC Control Room
- Generator Room
- Maintenance Department
- Storage
- Kitchen and supplementary areas
- Staff facilities, etc.

2.20 Environmental Requirements

Clean and pollution free environment is main requirement inside the resort. Sufficient recreational facilities help to provide choices to visitors and this ultimately provides a stress free environment as one can find whatever they need, Environment with charming landscape or amusement parks acts as an attractive feature. If one feels like never to leave the resort premises then we should understand that the resort environment is good.

2.21 Service Requirements

Parking area should be first serving area for the guests while entering the resort, which should be at least 25% of the bedroom. There should be a service road linked with back entry or service entry for easy access of goods and supplies. Area for water treatment and sewerage treatment has to be allocated within the resort boundary. Other services like electricity, drainage, waste disposal, Laundry, HVAC, Security has to be well provisioned.

2.22 Important Factors in Planning of the resort

- Visual linkage should be provided between indoor and outdoor spaces.
- Privacy should be maintained in the guest units.
- Outdoor spaces should be well planned incorporating natural elements circulation provided concerning the flow of people and services.
- Circulation pattern must be clear; it should not create confusion in the now of the people,
- Creation of a heathy environment within the resort is important.
- Facilities, services along with good quality of food are a must.
- Special concern should be provided for children, elderly people and disabled.
- Secured and fearless environment within a resort is necessary through a provision of tight security.
- Zoning of spaces to cut off the disturbances from the public areas and service areas to maintain a peaceful environment in the private areas.

2.23 Nepal Tourism Board Guideline

- Resort should control insects and pests and should possess creative and professional landscape.
- Architecture should be in harmony with local art, architecture, culture and building technology and safe from wind, storm and rain.
- All wooden members have to be well treated with chemicals and varnishes so that it is free from insect, termites, ant attacks and weathering effects.
- All rooms should have well ventilation either natural or artificial with standard carpets, curtains and fabrics.
- All rooms should be denoted with individual numbers
- Flag post for at least 24 countries.
- Safety deposit locker should be provisioned, etc.

CHAPTER 3:

ECO-SENSITIVE ARCHITECTURE

Chapter 3 Study of Eco-Sensitive Architecture

We no longer build buildings like we used to, nor do we pay for them in the same way. Buildings today are life support systems, communication terminals, data manufacturing centers, and much more. They are incredibly expensive tools that must be constantly adjusted to function efficiently. The economics of building has become as complex as its design." (Wilson, in foreword to Ruegg & Marshall, 1990)

Building plays a major role in environmental impact over their lifecycle. During the construction of building it consumes resources such as land, water, forest, mineral, and more important is energy. Though the construction energy of building may be less, the running of life cycle energy use of building is very high.

Resource intensive materials provide skin to the building whereas land scape adds beauty to it using up water and pesticides to maintain it. Energy consuming system lighting, space conditioning and water heating provides comfort to occupant. Several building process and occupant functions generally large amount of waste, which can be recycled for use or can be reused directly. Building are thus one of the major pollutant that affect urban air quality and contribute to climate change. Hence there is a need to design a green building, the essence of which would be to address all the issues in an integrated and scientific manner.

A sustainable building or green building is one which concentrates on increased efficiency of resource use- energy, water and materials also at the same time reducing impacts on human health and also on the built environment during its life cycle through better siting, design, construction, operation, maintenance and even removal. Though green building is interpreted in many different ways a common opinion is that they should be designed and operated to reduce overall impact of built environment on human health and natural environment by

- Efficiently using energy, water and other resources
- Protecting occupant's health and improving employee productivity
- Reducing waste, pollution and environmental degradation

Cost and environment is two dimension of green architecture. It is open understood that green buildings are expensive but this may not be totally true. A well designed eco-responsive building can cut-off running cost in its total life cycle and also leave far less impact on ecology. An architecture which can dissolve in nature after its successful demolition is true green architecture but in modern context, due to requirement of varieties of spaces, it is not possible in every case. So, attempts have been made to make building more energy efficient and eco-friendly by application of passive solar technologies and construction technologies.

It is not possible to have zero effect on nature so; the concept of zero carbon and zero energy is only virtually possible. We can reduce carbon emission to nearly zero, we can stop using

petroleum energy source to some extent and create our own needed amount of electricity through solar PV cells and wind turbines, we can bring waste output to near zero and so on. It's a virtual concept that we can stop environment pollution and depletion but it is possible to minimize impact so that we can be able to maximize the life span of our heavenly earth.

Some of the major issues addressed by Ecologically Sensitive design can be sum follows.

3.1 Site Responsive Design

This refers to the orientation, exposure and impact of natural forces. In the hot-arid zones of India orienting buildings with their longer faces to the north-south compared to the east-west can cut solar radiation and energy demands to nearly half. Also the site should promote efficient movement and network of traffic with reduced noise impact. It should optimize natural lighting and ventilation which will reduce the dependency on system for air conditioning. The site should have sufficient green space as landscapes. Such spaces will act as a buffer against heat and noise. It is also effective in diverting the flow of air. Hard landscaping should be kept to minimum since they act as heat island during daytime by absorbing the solar radiation.

3.2 Sustainability aspects

Through passive design we can minimize energy use by buildings and its life cycle costing. There are various technologies of passive design, among which few are discussed here.

3.2.1 Water Conservation

- landscaping

Priority: Use of local plants and trees for landscaping.

Reason: Plants and trees local to a certain region consume less water for landscaping purposes.

- fixtures and fittings

Priority: Water efficient low-flow fixtures should be used.

Reason: These help in conserving water. Water closets with dual-flush options help in saving water.

- Water recycling and reusing priority:

Facilities for recycling and reusing water should be provided. Waste water can be treated and used for activities like irrigating plants or used in WC's. Rainwater harvesting systems should be integrated into the building design so as to utilize maximum possible rain water.

- Rainwater harvesting:

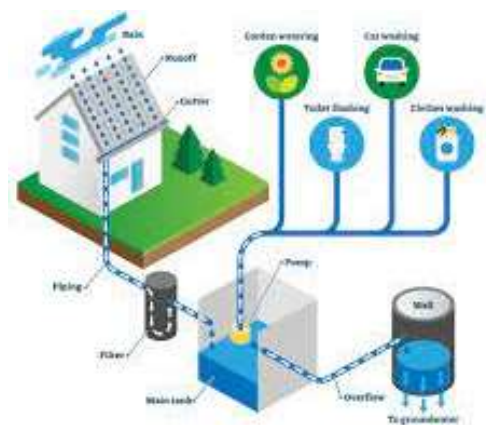


Figure 10: Rain water harvesting

Rainwater harvesting involves collection and storage of rainwater for future use. Rainwater can also be discharged into the ground without loss through evaporation or seepage. Rainwater harvesting has been used to provide drinking water, water for livestock, water for irrigation or to refill aquifers in a process called groundwater recharge. There are a number of types of systems to harvest rainwater ranging from very simple to the complex industrial systems. Generally, rainwater is either harvested from the ground or from a roof. The rate at which water can be collected from either system is dependent on the plan area of the system, its emergency, and the intensity of rainfall. Rainwater harvesting besides helping meet the ever-increasing demand for water, helps reduce run-off which is choking storm drains, reduce flood hazards, augment the groundwater storage and control the decline in the water level, improve quality of groundwater and reduce soil erosion.

- Recycling of water

Recycling of water is another important aspect of water conservation. Raw sewage can be recycled using aquatic plants like duckweed and water hyacinth to produce clean water suitable for re-use in irrigation and industry. The plants themselves can be harvested and used for producing biogas. In these systems natural processes are fully utilized, thus saving a lot of energy.

Reason: Reduce dependency on municipal water supply, conservation of water.

3.2.2 Indoor Air Quality

Control of indoor pollution becomes more important than outdoor because people coming in resort or hotel spend their major time inside the building. Pollutants and dirt particles may be built up in a closed space. It may cause adverse effect on health of the occupants and productivity of work at that place. One of the most common indoor pollutants is Formaldehyde a suspected human carcinogen. Kitchen cabinets, countertops, shelving and furniture are typically made from particleboard held together by formaldehyde-based adhesives. The formaldehyde is released into the home for years after these products have been installed.

The building products industry has responded to these indoor pollution problems by developing alternative paint, finish, and adhesive products. For example, solvent-free adhesives used in flooring and countertops can eliminate many of the suspected and known human carcinogens. Paint, varnishes, and cleaners that don't utilize volatile compounds are now commonly available.

Proper lighting and ventilation are inevitable in considering indoor air quality. Use of greeneries within the building can enhance the air quality of the air within the place as well as refresh the mood of the occupants.

3.2.3 Grey Water Re-cycling

All water except night soil is termed as grey water which includes wastes from bathroom sinks, baths, and showers and may also include wastes from laundry facilities and dishwashers. Some definitions include wastes from kitchen sinks although there is no consensus on this. Reuse of domestic grey water for non-potable purposes is emerging as an important approach to the management and conservation of water resources. Grey water gets its name from its cloudy appearance and from its status as being neither fresh (white water from groundwater or potable

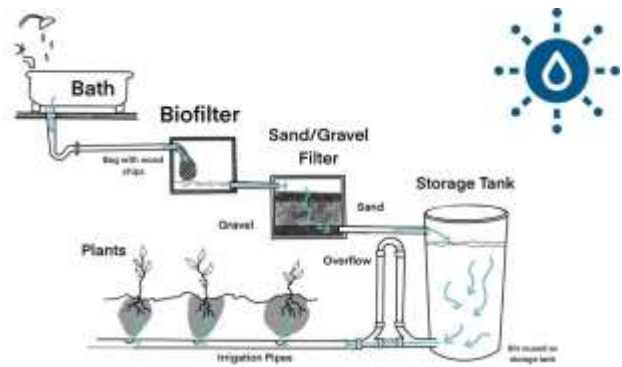


Figure 11: Grey Water Recycling

water), nor polluted (sewage). According to this definition, wastewater containing significant food residues or high concentrations of toxic chemicals from household cleaners, etc. may be considered "dark grey" or dirty water.

Ecological benefits of recycling grey water can be summarized in following points,

- Lower fresh water extraction from aquifers
- Less impact on septic tank and treatment plant infrastructures
- Topsoil nitrification
- Reduced energy use and chemical free pollution treatment
- Groundwater recharge
- Increased plant growth
- Reclamation of nutrients

Grey water can be treated through different methods

- Biological method: Through the action of bioremediation like bacteria, protozoa's, Algae etc. The toxic element of grey water is digested by these microorganisms.
- Botanical Methods: Use of reed plant to treat water. The root of reeds is a very good bio filter which separates harmful elements and chemicals from grey water and provides crystal clear water with very few microorganisms. This water can be used for all purposes except drinking.
- Chemical Method: Stable Bleaching Powder is generally used for water treatment which is a chlorine derivative $[Ca(ClO)_2]$.

3.3 Energy Consumption in a Typical Building

(HOTEL/RESORT)

Hotels and restaurants represent some 9% of total consumption in the utility buildings sector. Utility buildings are offices, shops, hotels, restaurants, educational establishments and care

institutions. Resort/Hotel has various utility sector having its own requirements and consumption of energy.

3.3.1 Eco-Friendly Characteristics

3.3.1.1 Cavity Wall

Cavity walls consist of two 'skins' separated by a hollow space (cavity). The skins are commonly masonry such as brick or concrete block. It provides the ability to more adequately insulate the building. Cavity wall insulation is used to reduce heat loss through a cavity wall by filling the air space with a porous material.

In hollow space, insulating materials can be used. Insulating materials like Styrofoam, mineral wool, cellulose, fiberglass-etc.

3.3.1.2 Photovoltaic cells

Photovoltaic (PV) covers the conversion of light into electricity using semiconducting material that exhibit the photovoltaic effect, a phenomenon studied in Physics, photochemistry, and electrochemistry. A typical photovoltaic system employs solar panels, each comprising a number of solar cell, which generate electrical power.

The may be mounted in a permanent orientation to maximize production and value or they may be mounted on trackers that flow the sun across value or they may be mounted on trackers that follow the sun across the sky. Solar PV generate no pollution. The direct conversion of sunlight lo electricity occurs without any moving parts. The standard solar panel has an inpute rate of around 1 000 Watts per square meter, how ever on the solar panels available at present you, ill only gain roughly 15-20% efficiency at best. Therefore if your solar panel was 1 square meter in size, then it would likely only produce around 150-200W in good sunlight.

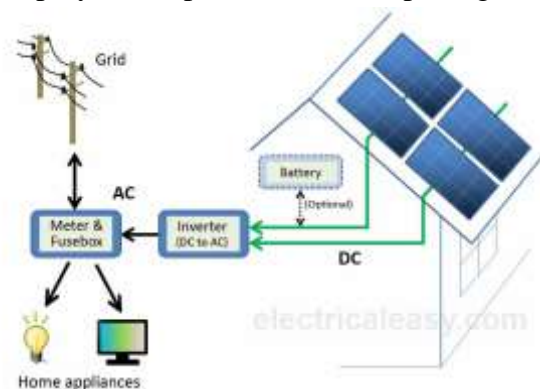


Figure 12: Working mechanism of solar panel

3.3.1.3 Solar Water Heater

Solar energy is used to heat water using solar water heater as it is a eco-friendly method to heat water .

3.3.1.4 Solar Operated AC Unit

Solar air conditioner can be used as alternative for conditioning rooms and buildings

3.3.1.5 Solar Pool Heater

Solar pool heater is used to heat up the pool water so that customer may feel free to use pool in any time and any sea on for their entertainment.

How it works,

1. Pool pump move theater to the solar collector
2. Cool water enter the solar collector from the bottom.
3. water is heated as it flows upward through the collector tubes to the top header pipe.

The warm water then returned to your pool. This process continues until the desired water temperature is reached.

3.3.1.6 Grey Water Treatment

Greywater can be defined as any domestic wastewater produced, excluding sewage. The main difference between greywater and sewage (or blackwater) is the organic loading. Sewage has a much larger organic loading compared to greywater. Some people also categories kitchen wastewater as black water because it has quite a high organic loading relative to other sources of wastewater such as bath water. With proper treatment grey water can be put to good use. These uses include water for laundry and toilet flushing, and also irrigation of plants. Treated grey water can be used to irrigate both food and nonfood producing plants. The nutrients in the grey water (such as phosphorus and nitrogen) provide an excellent food source for these plants. Two major benefits of grey water use are:

- Reducing the need for fresh water. Saving on fresh water use can significantly reduce household water bills, but also has a broader community benefit in reducing demands on public water supply.
- Reducing the amount of wastewater entering sewers or on-site treatment systems. Again, this can benefit the individual household, but also the broader community.

3.3.1.7 Bio Gas

Biogas typically refers to a mixture of different gases produced by the breakdown of organic matter in the absence of oxygen, Biogas can be produced from raw materials such as agricultural waste, manure, municipal waste, plant material, sewage, green waste or food waste, bio gas is a renewable energy source and in many cases exerts a very small carbon footprint.

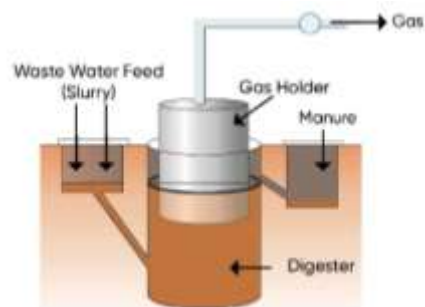


Figure 13: Bio Gas System

3.3.1.8 Recycling of Water

To fulfill the scarcity of water and to minimize the misuse of water, water can be recycled and reused. The waste water from washroom and kitchen can be reused after recycling

By treatment through treatment plant. The treated water can be used for landscape gardening, flushing in water closet, etc

3.3.1.9 Wind-solar energy harvesting

Wind energy is a pollution free source of energy to produce electricity in the place having high current of wind.

wind solar hybrid power system is for the intermittent supply of the energy .solar energy is used in day time whereas wind energy is used in night time to generate electricity to fulfill the demand of the energy.



Figure 14: wind solar hybrid power system

3.3.1.10 Passive Solar Design

DESIGNING WITH THE SUN

The first step in creating comfort and thermal delight in buildings is to understand the relationship between the climate and our need for shelter. There is an enormous variation in climates that building experience. These can be at the scale of global climates, from the Arctic to the Sahara. They can be regional climates in the center of a continent or on the seashore. They can be local climates on the sunny or the shady side of a hill or street. Everything will influence the way in which a object building should be designed in relation to the sun. The sun can be a friend or an enemy in buildings. Poor climatic design of buildings, all too often seen in 'modern' architecture, causes many buildings to overheat, even in temperate or cold climates where such problems traditionally never existed. The power of the sun should be understood and respected by good designers of well-designed, passive solar buildings in which the free energy of the sun is used to power the building but not allowed to interfere with the comfort and economy of the building's occupants. The five things a designer needs to know for a good passive design are:

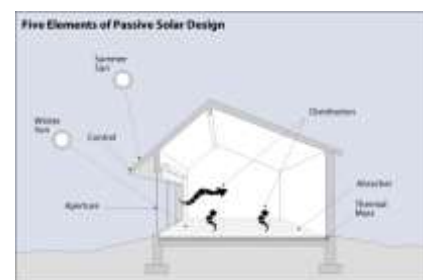


Figure 15: passive solar design

How strong the sun at the site is at different times of the year;

- Where the sun will be at different times of the year in relation to the site;
- How much of the sun's heat a building will need, or not need, at different times of the year to enable the building occupants to be comfortable;
- How much storage capacity the building should have in relation to the available solar gain at the site to meet those needs;
- What the additional requirements are for controlling the heat gain from direct solar radiation, convection or conduction ma design and how they can be met by envelope performance building form and ventilation.

CHAPTER 4:

CASE STUDIES

Chapter 4 Case studies

4.1 National case studies

4.1.1 The Pavilion Himalayas, Eco-Friendly Sustainable Luxury

ABSTRACT

Hotels and Resorts have an enormous appetite for resources in order for them to operate and function properly. A lot of electricity is required, either from the mains or from diesel generators; cooking gas and food is also required at mammoth scales. They consume huge amounts of water either from the municipal supply or extract from the ground, eventually depleting the water table. And in return they produce considerable amounts of wastes, pollutions and put a lot of pressure in commodities and resources.

In the contrary, the recently opened Pavilions Himalayas (www.pavilionshotels.com/himalayas) is a unique and first of its kind self-sustainable Eco Resort project in Nepal and probably one of the very few environments friendly resorts in Asia. The eco-friendly design sets an unprecedented new standard in the hospitality industry with many environment friendly features and will be an inspiration for future resorts. Here are a few of its salient features:

Architectural Design	It is based on a Republic contemporary design with Nepali Architecture, using local materials and craftsmen. The resort has a low carbon footprint, and is set in the natural landscape and a farm setting.
Water	Rainwater is collected, filtered naturally and re-used in all the villas and resorts requirement, including drinking, bathing, etc.
Waste water	Grey water from the showers and bathrooms are recycled using natural methods with plants, and used in the toilet flushing system and landscaping, thus saving huge quantities of water. Excess grey water is used for agriculture.
Cooking Gas	Biogas is produced from the manure from cattle's and human sewage from the villas. This gas is used for cooking food. The final compost is used as fertilizers in the fields to grow food.
Food	Produced within the resort itself, all staple crops, vegetables, fruits, meat and animal produce.
Solar electricity	100% of the electricity for the villas is internally produced by solar. Efficient LED lights, low energy consuming equipment's and motion sensor switches helps to keep the consumption low.
Hot water	A hybrid system of solar and heat pumps which extracts the energy in the air and transfers the energy to heat water. Reducing costs substantially.
Heating/cooling	The villas are extensively insulated on the ceiling, walls, floor and double glazed windows. Furthermore, Natural Cross Ventilation and

	passive solar design helps to provide a comfortable interior environment throughout the year without using electricity hungry air conditioners.
Paint	Low VOC lead free paint has been used so it does not effect to the people and environment.
Local Interprise	The villagers supply the resort with produce such as milk, cheese, honey, etc. local staffs are given preference to manage the resort.



INTRODUCTION

The Pavilions Himalayas Eco resort is located in a valley near Phewa Lake, Pokhara, Nepal. Surrounded by farmland, forested hills and a mountain fed stream, the 14 luxurious eco-friendly villas form the natural landscape. Spread over organic farmland, the resort respects the natural elements, showcasing village life in Nepal.

The resort has been conceptualized to be a part of the village and eco-friendly in every sense possible with minimal footprint to the environment from its early design stage to its construction and actual finishing. The use of local materials, workforce, indigenous technology and local architecture blended with the eco-friendly technologies and practices have been the guiding principles for the design.

SITE PLANNING

The site is part of small village and lies at the base of a hill, and spread over 2 hectares of gradually gradient farmland. To its South are steep hills with a dense forest, to its north are open farmlands which overlook the Himalayas. The villas and the clubhouse are placed close to the southern perimeter line and oriented north to maximize the visibility to the valley and Himalayas beyond. The site is home to majestic eagles and a multitude of birds, wildlife, flora and fauna.

The site is a farmland, the structure were placed strategically to not disturb the prime fields, but still give the best views. The structures were also placed away from each other to provide

privacy. The natural gradient of the land also allowed us to position our structures strategically to ensure that all the structures had a non-impeding rear view towards the Himalayas. The landscaping has also been designed to this effect to provide easy access to the various structures while maintaining privacy.

The villas, A1 to A5 are placed at the highest point on the site, 3 of them (A1 to A3) are split levels to maintain the natural contour. The clubhouse is placed at the mid-level and is centrally located so that it can be easily accessed, villas A6 and A7 are placed beside the Clubhouse. Towards the eastern side, a seasonal stream divides the property: here villas A8 and the interconnected family units of B1 and B2 are placed.

One notable feature of the resort is the lack of high property boundary walls, and instead very low stone walls have been built to demarcate and depict a traditional mountain village scenario, and integrate the surrounding village into the resort.

GENERAL ECO-FRIENDLY FEATURES



The structures are built on single and split level configurations, using the natural topography to minimize the disturbance to the flow of land. The villas are built spaciouly with the latest amenities to give a sense of comfort and luxury. Latest construction technology along with traditional architecture and local craftsmen also make the buildings safe, energy efficient and coherent to the local surroundings.

Ceiling:

XPS insulation has been laid on top of the roof slab and clad with natural stone slates in conformity of the local architecture. The interior side also has a gypsum board ceiling with air cavity, these measures substantially reduce energy transfer and keep the interior space comfortable during all seasons.



Walls:

XPS insulation was used in between the external cavity walls; this provides excellent thermal insulation and increases the energy efficiency of the villas. Natural stone have been used for the external walls to depict the local architecture and give a rustic look. The stone pieces were also carved individually into shape by hand.



Floor:

Natural hard and soft wood has been laid on top of XPS insulation, which again provides excellent thermal insulation and increases the energy efficiency of the villas. This saves as much as 15% of the heat in a room. The natural wood also gives a luxurious and warm feeling to the interior space.



Windows:

Large double galzed windows have been placed strategically to allow natural air flow into the rooms as well as to provide a clear and open view into the surrounding natural landscape.

The insulated windows also help minimizing noise and maintain a comfortable temperature side the room through all seasons without compromising the comfort. This also means that the costs of heating and cooling are substantially reduced.



Electricity:

The resort is run by solar electricity produced within the resort. Carefully selected electrical lights and appliances used in the villas are run by solar electricity produced within the resort itself. Efficient LED bulbs have an exceptionally long life time and give significant energy savings while enhancing the interior space, they are also controlled by infrared motion sensor switches which turn on the lights only when needed thus saving energy.



Heating and Cooling:

The resort does not use Air conditioners to heat or cool the rooms. The extensive use of insulation throughout the building, natural cross ventilation through windows and louvers and passive solar design helps keep the rooms temperature at around a comfortable 23°C throughout the year. Electric fans and a fireplace which burns natural briquettes are available if necessary.



Hot Water:

Each villa has two efficient flatbed solar panels to heat water for the majority of the year. This is a cost-effective way to generate hot water for and the fuel sunshine, is free.

If for any reason the water is not hot enough, due to overcast skies during the monsoon or winter seasons, then the centralized heat pumps automatically start to transfer the heat in the air to heat the water, thus ensuring hot water at any given time.



Water:

All the structures have large roofs which collect rain water, and are channelled by gutters to large underground tanks in every villa. This is filtered naturally and reused for all the guests needs, in the showers, tubs and sinks. This undoubtedly saves a lot of water.

Rainwater harvesting provides over 50 per cent of the resorts water needs. This not only saves water, but saves money and reduces our impact on the environment.



Waste Water:

The soapy 'grey water' produced from the shower, sinks and bath tubs are also treated using natural methods *by bio* sand filters and plants, and then reused for flushing the toilets and landscaping purpose reusing precious water.

Excess grey water is used for fishponds and farming, thereby reducing the chance that it will pollute local water bodies.

Black Water:

The sewage from the villas flows into a centralised bio gas plant, and along with the cattle manure from the farm, methane gas is produced. This gas flows into the main kitchen and is used as fuel to cook food for the resort. Currently 6-7 gas cylinders worth of cooking gas are produced from the waste.



Food:

Fresh organic food, staple crops, fruits, vegetables, milk and meat are farmed within the resort for the guests throughout the year. The villagers are also encouraged to supply local produce to the resort thereby supporting local economy.

The residue manure produced from the biogas plant is used as fertilisers in the fields to grow food. This not only saves money, but it allows the guest to comprehend the eco system in a practical way.



Swimming Pool:

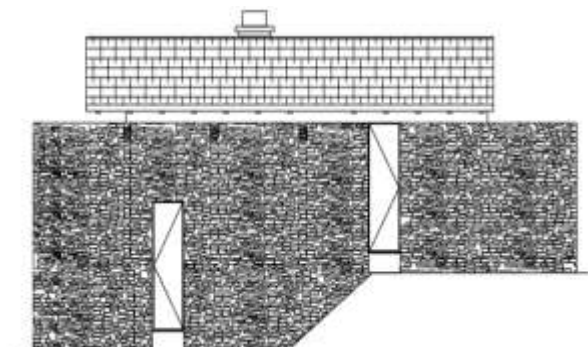
Rain water is integrated into the pool and regular salt along with a salt chlorinator is used to clean the pool water.

Chlorine generators eliminate the need for most swimming pool chemical maintenance, lowering maintenance costs. Other advantages include reduced skin and eye irritation, no harsh chemical odours, and swimmer safety.



VILLAS: TYPE A

This villa has been designed in a single level and split level configuration to suit the natural topography. A private portico leads into a pantry/bar where guests are greeted with strategically placed floor lights controlled automatically by motion sensor. This follows onto a spacious living room that has a large double glazed window in the front which opens into a private deck overlooking the fields and Himalayas, to its rear is a king size bed with a traditional back drop. The adjacent bathroom has a standalone Jacuzzi tub and flanked by a double counter top sink on one side and separate bathroom and shower glass cubicles on the other side.



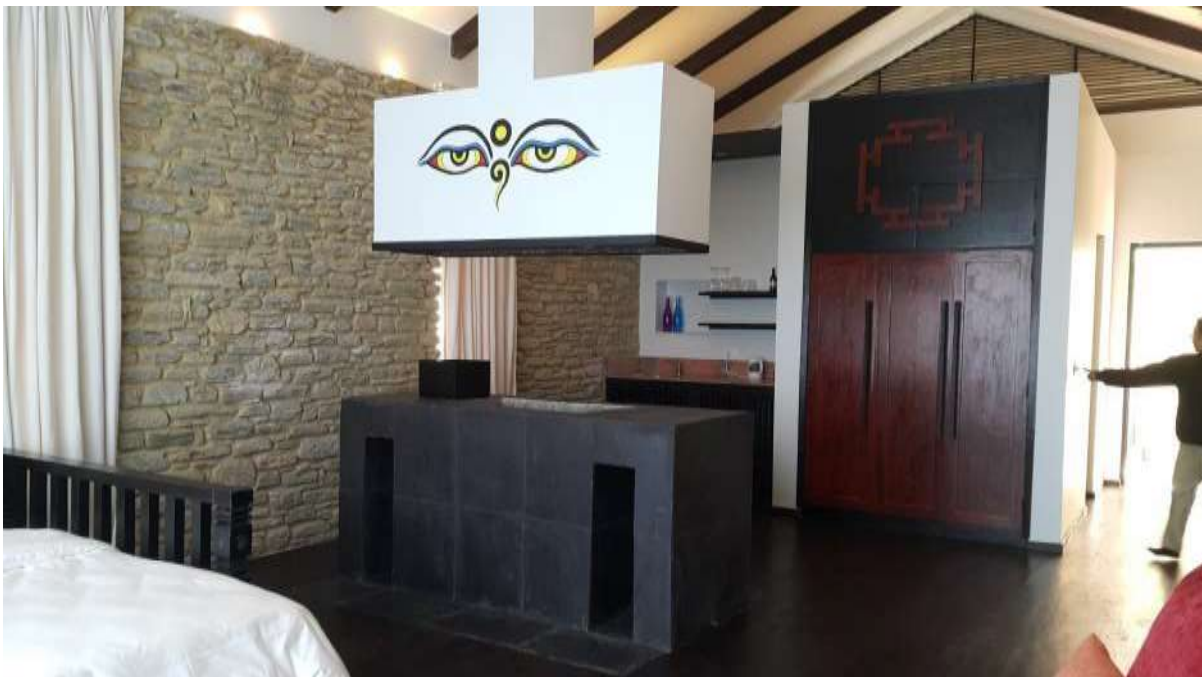
VILLAS: TYPEB

This villa is designed as a multifunctional unit with three interconnected rooms to accommodate a large family or as separate rooms. A rear garden path lined by rainwater filtration systems and a lush wetland for greywater leads to the individual rooms.

The first two rooms are identical in layout, however the third room is designed slightly different with a higher roof line to be playful and also depict the surrounding hills. This room also serves as a living space for the family with their own kitchen, a dining table and an open fireplace.



Each room also has a lavish bathroom with a tub, double countertop sinks, separate toilet and shower glass cubicles, a bar, living room and bedroom with fireplace and a private exterior deck.



CLUBHOUSE:

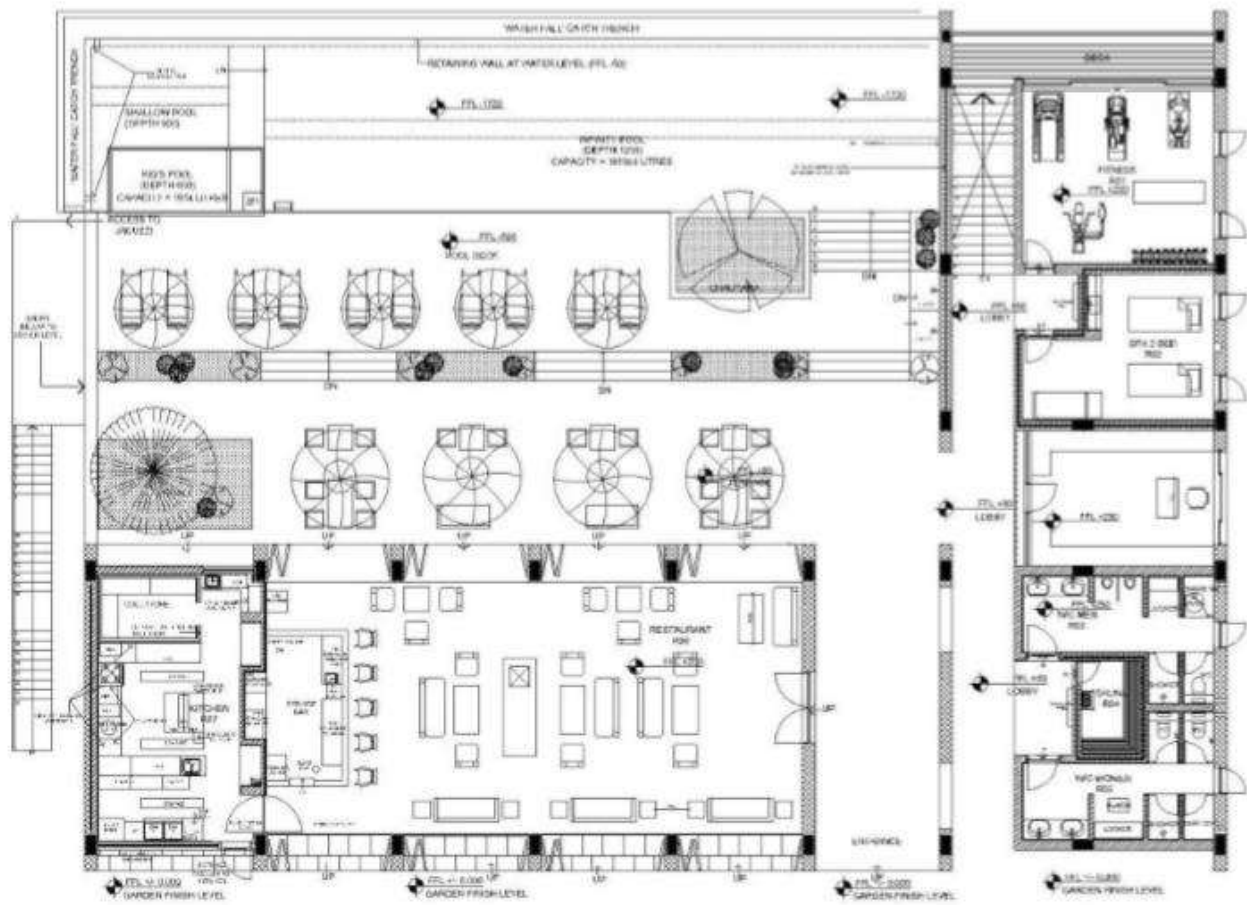
The clubhouse is designed in a split level configuration to suit the natural topography, and is broken down into 3 segments for seismic considerations. The upper level has guest related functions and the lower level has spaces to support operations.



The restaurant has a variety of seating arrangement ranging from swinging chairs, to easy loungers and tables. A lavish marble bar with a spectacular backdrop has been placed to the rear. A large central open fireplace segregate the two spaces and gives privacy. Large folding windows have been placed on either side to let in the natural environment and for natural ventilation. Outdoor seating's with umbrellas have been placed adjacent to the restaurant for guest to dine in the open. This leads to a lowered sun deck with its own traditional 'chautara' garden and an infinity swimming pool with heated Jacuzzi.



The upper level also has a male/female changing room, a sauna, a boutique, luxurious SPA, gym and kitchen. The lower level has a modern office overlooking a lush green wetland garden, and basement rooms used as operation spaces for stores, bakery and office.



4.1.2 Himalayan Height Resort

Location : Setidevi V.D.C- 9, Kathmandu
Covered Area : 30 Ropani
ESTO. Date : 21st Dec, 1990
Owner :Diki Chedden Lama (Bhutanese national)
Designed By : Ar. Narendra Pradhan



Figure 16: Himalayan Height Resort

This is one of the renowned resort of the valley focused on nature based recreation and located in middle of the pine forest. The objective of study is to understand the zoning and use of contour in site planning.

4.1.2.1 Planning and Zoning

Separation of front and back of the house is not strictly followed.

Though there is service entry, it has been useless and guest entry is serving the purpose of service entry. Vehicular access is only up to resort boundary. All guest rooms are facing north and provided, with large and wide glazed windows. All pathways inside the resort are paved with stones. The site is elongated towards east-west. The resort land is owned by government which has been taken in lease for 40 years.

The resort is divided into many blocks and there are altogether 13 blocks in resort premises.

4.1.2.2 Architectural Expression

The site is planned in organic manner without following specific geometric order. The buildings reflect resort architecture and constructed using bricks and stones. The hybrid wall of bricks and stones gives the texture which is in harmony with surrounding. The buildings are lost inside the jungle as they are perfectly blended with internal environment. All building except mix-use block have sloped tiled roof.

4.1.2.3 Components of Resort

Parking

Open parking area outside the resort boundary. The area for parking is graveled and it can hold 50 cars and more than 100 motor bikes.

Main Entrance

Two Kilometer long graveled road comes to an end at the main entrance of the resort. There is no presence of any welcoming gate and main entrance is followed by a guard's quarter. The walkway from main entrance leads towards reception.

Reception

This is single storied block with large reception longue with waiting area for 20-25 guests. The block has only one large room where a guest enters for check-in and check- out. This block has stone walls and PVC tiled roof supported by timber beams, joists and planks.

Main Block

The main block is restaurant block which is the largest building in resort which comes after reception block. It is constructed using stones and designed in contour. The lower northern side walls are supported by buttress like structure. This block has provided space for, Restaurant, Bar, Kitchen, Library, Administrative office and front office.



Figure 17: main block

Restaurant

The restaurant is located in the main block of resort which is divided into two levels. Upper level can accommodate 30 guests at a time while lower level can accommodate 22 guests and there is space for terrace dining for 56 guests.

Barbeque kitchen is present out in terrace. Restaurant is supported by Bar, Kitchen, Bakery, Food and Beverage Store and bill counter.



Figure 18: outdoor dining

Guest Units: Guest rooms are divided in 10 cottages, with altogether 32 rooms. All rooms are provided with coffee tables & chairs, Closet, Dressing unit, and attach bath. Resort can accommodate 96 guests overnight. All rooms are faced north so that one can have good view of mountain and Kathmandu valley

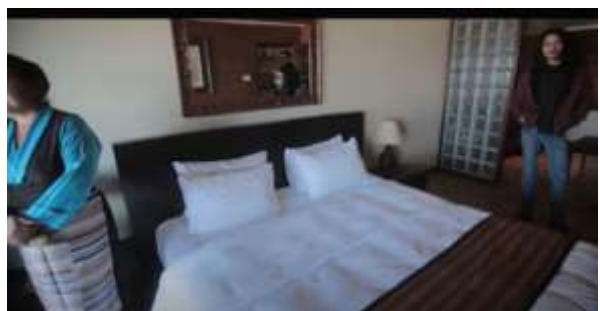


Figure 19: outdoor dining

even from room. There are J categories of rooms, normal, deluxe and suite and they all have

its own AC and room heater. The rooms of rooms are carpeted and very few are parqueted. Guest rooms are divided in cottages from block A- J

Block A-D :4 Rooms each

Block E-1 : 2 rooms each

Block 1 : 6 rooms, all suite

Meeting Hall

The resort has not focused its service for providing space for meeting facilities so there is only one meeting hall which is located upper floor of Mix-use block. The size of meeting hall is 39'-7'' whose capacity is 26 in U layout and 60 in theatre layout.

Sports and Recreation

Resort provides very less option to sports based recreation. Table tennis, badminton and billiard are only games available. There is area for children's play eith swing, sea-saw, slides, etc recreation is based on nature stay and mountain view so keeping this in mind, owner of resort has realized that people come there to feel intimacy with nature and kept no television in guest rooms.

Staff Quarter and Laundry

On the lower northeast pat of the site, there is laundry section and Staff Quarter. Staff quarter can accommodate 20 staff and there is separate kitchen and dining for them. Stoff quarter is in lower level of mis-use block and in its upper floor, there is sports hall and meeting hall.

Sewer and Solid Waste Management

Sewerage has to components, Grey water and night soil. Grey water is treated using chemical and used in garden while night soil is collected in septic tank. All organic solid, wasted are taken 10 piggery and non-organic wastes are burnt.

Building Services

- Electricity - 3 phase line from Nepal Electricity Authority and Powered by 25 KV A genset during load shedding.
- Solid Waste Management - Organic Manures are taken to piggery and inorganic wastes are burnt.
- Water Supply - KUKL water supply from nearby source Satmul taken 10 the resort through pumping on 3 different levels. Resort u e 4000 liters of water a day.
- Security - Security is managed by security personnel.
- Lightening Arrestor - Each building has its own lightening arrestor.

Landscape

Natural Land cape is combined with planned land cape and ornamental plants. Most of the part of resort has pine trees, and local shrub. Land cape of resort is like recreational lawn.

Sustainability

- Use of micro solar PV modules for power backup.
- Use of solar water heater to heat water instead of boiler (nearly 50 panel)
- Water treatment and reuse in garden help in water management.
- Use of solarium like structure in block-C (traps solar radiation and acts as buffer between kitchen and guest room)

Energy use

Maximum energy in resort is used for room heating.

Average LPG use per day - 1 cylinder (15kg)

Electricity 30-35 thousand/ month in winter
15- 20 thousand/ month in summer

Average Petroleum Use/ day -10 ltr. in generator and room heater

Inference

- Sustainability approach is easy to implement in resort.
- Building have to be planned considering site topography.
- Buildings should be planned so that local ecology is not disturbed.
- Use of hybrid walls can be implemented to enhance aesthetics.

4.1.3 Chitlang organic village resort

- Location: Chitlang, taha municipality, Makwanpur
- Area: 180 ropanies, used 50 ropani only
- Site type: slope land less than 20 degree
- Owner: Devendra Nepal



Figure 20: Chitlang organic village resort

4.1.3.1 Objective of the study

- To understand overall planning
- Eco friendly design, material and Technology and economical design

4.1.3.2 Planning approach:

The resort has been conceptualized to give the organic feel and eco-friendly in every sense possible with minimal footprint to the environment from its early design stage to its and its services to the people.

4.1.3.3 Architectural features

It is designed with low cost and locally variable materials and craftsmen. The resort has a low carbon footprint, and is set in the natural landscape and farm setting. Different shelter are designed in a segregated form. No specific zoning. Rooms inside the pear garden. Structure construct without large damage to natural setting.

4.1.3.4 Components:

- Kitchen/dinning: 70-80
- Small tent type: 10(3-4)
- Large tent type: 5(4-8)
- Cottage type: 5(4-8)
- Room type: 4(3-4 pacs each)

4.1.3.5 General ecofriendly features

Heating and cooling: natural ventilation as it is semi open and cross ventilation through windows in cottage type units. Materials and technology: timber, tent, mud, tree, branches, block, stone, recycle bottle

Food: fresh organic food, staple crops, fruits, vegetables, milk and meat are farmed within the village which will serve the guests of the resort.

4.1.3.6 Inferences:

Use of locally available materials and technology.

- Eco-friendly technology
- Organic pear farm within the resort
- Transparency with nature
- Existing natural landform is respected and designed to suit the natural topography.

4.1.4 Dhulikhel mountain resort

4.1.4.1 Purpose of the study:

- To study the planning of resort on hill
- To understand the use of vernacular architecture

4.1.4.2 General information

Location: khawa, Dhulikhel, Kavre

Area: 200 ropanies

Ground coverage: 45 ropanies

Topography: contour land, spreading over slope facing north

Architectural style: vernacular



Figure 21: Dhulikhel mountain resort

4.1.4.3 Components

- Reception, lounge (capacity 35 people)
- 42 rooms in villas (deluxe room with double, twin, single beds)
- Indoor restaurant: 80
- Outdoor restaurant: 350
- Kitchen: (16*8)
- Seminar hall, 2 nos. (35 and 50)
- Curio shop
- Horticulture farm
- Helipad
- Village walk, sunrise viewpoint
- Spa unit with massage rooms 3 nos. with two massage beds (3'*7')
- Staff quarter

4.1.4.4 Zoning and planning:

There is clear separation of front and back of house through visual as well as physical barriers. Guests units are clustered together in 3 consecutive rows on the northern part of the site while resort services are scattered. Horticulture farm is located on up land while waste water and sewer treatment plant is planned on low land. Helipad is located on topmost part of the site from where one can have panoramic view of mountains and panchkhal valley. The design of resort is achieved through progressive development and not by designer or an architect. The use of local materials, technology and workmanship which blends with surrounding environment makes a resort a part of nature.

4.1.4.5 Architectural expression:

- Typical hill architecture with use of indigenous materials; mud motor, bricks and thatch roof
- (Slope angle more than 40°)
- Use of thick fibrous roofing materials (replicating slate) on new accommodation.
- Site planning is in organic pattern without following any definite principles and pattern
- All buildings are in load bearing structures constructed using modern technologies. The walls having rough texture are exposed brick in cement sand mortar which is painted red.
- Slope thatch roof is constructed using bamboo and wheat straw over flat RCC slab which acts as insulation keeping internal temperature maintained
- Wooden false ceiling and pillar cladding in restaurants.

4.1.4.6 Building services

- Electricity: 3 phase line from Nepal electricity authority
- Solid waste management: organic manure are made compost and organic burnt
- Water supply: 24/7 water supply from nearest spring. Water use is 10000 ltrs/day
- Lighting arrestor: only transformer pole is equipped with lighting arrestor.



Figure 22: Solid waste management

4.1.4.7 Recreational activities:

The resort receives around 4000 external and nearly same number of internal tourists each year. Basically it is a holiday resort which provide a fine view of Gaurisankhar mountain range. It also provides packages like rafting, hiking and organizes multiethnic cultural programs. It also offers agro based recreation and village tour.



Village tour



Cultural program

Figure 23: Recreational activities

4.1.4.8 Sustainable techniques:

- Use of solar panels in staff quarter
- Use of eco green boiler for hot water in villas
- Preparation of compost manure from organic wastes
- Buildings constructed in local style uses less energy for room heating.

4.1.4.9 Inferences:

- Eco-friendly planning without much impact on local ecology
- Use sustainability techniques for energy efficient design
- Horticulture farm can overcome kitchen requirements
- Arrangements of buildings guided by contour
- Villas are designed with windows only on north side (lack of natural light on rooms)

4.2 Regional case study

4.2.1 Shaam-e-sarhad village resort

Location: rural location of Indian (Gujarat). It is 63km from Bhuj city, Bhuj Airport and railway station around 20 km before to great rann of Kutch:



Figure 24: Shaam-e-sarhad village resort

About the project

SShaam-e-Sarhad- the name means “Sunset on the Border”

The village resort that has been hand crafted by the local community to replicate the vernacular traditions of architecture and design.

All living spaces are designed to showcase local talent and are handcrafted

Indulge in the rare pleasure of staying in Bhungas, Mud Tents, and Family cottages crafted with indigenous resources.



Figure 25: Dining area

The rooms are set up in local style and decorated with crafts of the area, creating an authentic atmosphere. There are different types of 12 accommodations at the resort: eco-friendly mud tents, family cottages, Suite Bhungas and Standard Bhungas.

The Bhungas are circular mud huts with sloping roofs, typical of the Banni region. A sustainable livelihoods and rural development project.

Food features

- Traditional Gujarati lunch
- Traditional Kutchi Dinner
- Indian Breakfast
- Jain food available on request

Inferences

- Use of local traditional construction
- Designing in perfect harmony with the surrounding nature
- Conserve the culture and tradition of the site
- Involve the local crafts and talent and skill
- Nature friendly design



Figure 26: Vernacular architecture

4.2.2 The wind flower spa and resort

Introduction

Name of the project: the wind flower spa and resort

Completion: 2011

Architect: Ar. CP Raj

Owner: Mr. Giri Raj

Structure type: Pitched roof Building

Location: Vythiri, Wayanad, Kerala

Area of the site: 25 acres structure

Material: RCC

Function: Residential spa resort

Type: Typical Kerala Style



Figure 27: The wind flower spa and resort

Chamundi surrounded by the green and historically significant landscape of the city. Featuring palatial rooms, private si-outs, well-appointed bathrooms with rain showers in some, villas with private plunge pools are just to name a few features of the accommodation. The resort hosts its signature emerge the wellness spa featuring healing therapies written during the ages of Rishis of Ayurveda, a sunken outdoor pool and many indoor and outdoor activities.

Figure 8: exterior view of the resort



Figure 28: site plan of the resort

- All the cottages and restaurant have the view to the Chembara Hills.
- Vehicular movement is restricted upto the administrative block such that the pollution can be avoided.
- Electric club cars are used for taking the visitors to cottages and services.

Zoning of the site

Private zone has been separated to maintain the privacy

Semi public zones has been located in northern part of the resort

Public zone is designed in such a way to provide clear view of chembara hills.



Figure 29: Zoning of the site

Outdoor:

- Swimming pool
- A restaurant with lounge
- Outdoor jacuzzi
- Plantation treks

Indoor:

- Activity rooms with board games
- Steam sauna and chilled shower
- Fully equipped suites and villas

Business:

- Technologically equipped conferences rooms
- Board rooms with banquet halls
- Soundproofing materials also provided

Services

Swimming pool

Provided swimming pool, framed by tall teak and silver trees with the view of chembara peak which is the highest peak in wayand and near to that one open shower is also provided.



Figure 30: Swimming pool

Yoga

Separate yoga section is there with cool atmosphere. It is simple yet powerful and nature would improve.

Plantation tours

This is an ideal place for trekking. Because of the rolling hills, cool mountain and the breathtaking scenery and long mountain walks. Visitors can learn all about tea, coffee, and cardamom plantations.

Sewage treatment plant

- After separation, solid waste directly goes to tank and waste water goes through carbon-sand-salt filter
- After chlorination, it is using for gardening

Contextual analysis

The basis concept of the wind flower is to give more human comfort inside the forest with eco-friendly materials. The resort is partly elaborated with the traditional materials. It has designed in linear form to maintain the privacy of the rooms. The anti-passive cooling has been adopted with double tiling roofing systems. It has extended roof to avoid the water inside the room, each and every cottage have balcony which gives direct view of the Chembara mountain. Wooden cladding, hollow bricks, Mangalore tiles, stone flooring more natural environments.

Merits

- It is linear planning to maintain the privacy, newly planted trees has been used.
- All the zone has been separated by means of pedestrian pathway.
- Spa is located in cool and calm area to get better concentration.
- Having direct view of Chembara peak from restaurant.

4.3 International case study

4.3.1 Yun house boutique eco-resort

- Architects: areas partners, atelier liu yuyang architects
- Location: xingping scenic area, Yangshuo, Guilin, Guangxi, China
- Category: Adaptive reuse
- Area: 3000 sqm
- Master plan: Atelier Liu Yuyang Architects
- Collaboration: Atelier Liu Yuyang Architect for planning and New building design



Figure 31: Yun house boutique eco-resort

Yun House is a boutique eco-resort nestled within a village at north eastern part of Yangshuo which situated along the dramatic landscape of the Li River. The site consists of nine renovated old farm houses and one new addition which functions as an all-day dining restaurant for hotel guests. Taking on a sensitive approach to the local culture with villagers still living nearby, the overall planning and landscape design blends into the original village structure without creating new boundary conditions to the villagers.



The rammed earthed buildings were retrofitted to accommodate refreshing and uncompromisingly contemporary living, while the new restaurant addition adopts an understated presence with the use of steel frame, glass pivot doors and windows, in contrast with the locally sourced rough-cut stone blocks, charcoal treated wooden louvers and terra-cotta roof tiles to provide a rich tactile experience.

The spatial dialogue and sense of continuity between the old and the new buildings maintain An order of symbiosis between the foreign (hotel) and the local village

The typical layout of the vernacular house here is a three bay structure with a double height volume in the middle bay.

Each typical building consists of four guest rooms with a shared living and hangout space in the center.

Bamboo, wood, galvanized steel, concrete finishes and pebble washed stones are main materials being used in interior spaces.

Most of wood beams and existing wooden doors are being refurbished and reused on the project.

The exterior building material is quite modest and unpretentious which we would want the interior to



Figure 32: Site plan



Figure 33: Section

4.3.2 Pacuare eco-resort

Objectives

To study the sustainable techniques on eco-resort

General Informations

Locations: Limon, Costa Rica

Area: 25,000 acres

Topography: riverside forest

Architectural style: vernacular architecture



Figure 34: Pacuare eco-resort

About

- Eco-resort with 20 suites and situated on the riverbank, Pacuare River
- Its vibrant nature, offers a scenic backdrop to adventure, romance and wellness
- Simple and yet sophisticated, the indigenous Cabecar-inspired architecture

SUSTAINABLE TECHNIQUES

Sustainable construction

- Site conservative design
- Timber use
- Thatch roof



Figure 35: Timber construction

Carbon neutral tourism

- Purchased 840 acres of primary rainforest
- No visitors are allowed in this area in order to protect this area



Figure 36: Carbon neutral tourism

Water protection

- Bathroom are equipped with biodegradable soap and shampoo
- To avoid pollution, all waste water flows into septic tank

Generate own energy

- Hydro electricity from nearby steam
- Solar power
- Bio-gas for kitchen



Figure 37: Electricity generation

Organic food is the rule

- Use only organic products

Providing employment to local people

- Improve the live of local people by providing them employment
- All the resort staff are from local communities



Figure 38: Organic food

Environmental education

- More than 300 students are taught
- Best use of water, responsible energy use, recycle programs, wildlife protection







Figure 39: Environment education

Inferences

- Use of indigenous materials
- Carbon neutral tourism
- Generate own energy
- Environmental education
- Need to do 90 min. rafting to reach the resort to minimize carbon footprint

4.4 Case Study comparison

RESORTS	THE PAVILION HIMALAYA ECO RESORT	DHULIKHEL MOUNTAIN RESORT	SHAAM-E-SARHAD VILLAGE RESORT	PACJARE ECO-RESORT
General Information	<ul style="list-style-type: none"> Location: Chisapani, Pokhara Area: 39 ropanies Topography: contour land 	<ul style="list-style-type: none"> Location: Dhulikhel, Kavre Area: 200 ropanies Topography: contour land 	<ul style="list-style-type: none"> Location: Gujarat, India Area: 30 ropanies Topography: plain land 	<ul style="list-style-type: none"> Location: Limon, Costa Rica Area: 198,000 acres Topography: riverside forest
Objective	<ul style="list-style-type: none"> To study the overall planning To study eco friendly design 	<ul style="list-style-type: none"> To study the planning of resort within the contour 	<ul style="list-style-type: none"> To study the culture and traditional conserving design 	<ul style="list-style-type: none"> To study the sustainable technique of eco- resort
Zoning and planning				
	<ul style="list-style-type: none"> Conceptualized to be a part of village Single and split level configuration to retain contour, 15 villa units 	<ul style="list-style-type: none"> front and back of house Guests units> three consecutive rows> facing north 	<ul style="list-style-type: none"> 12 units: eco-friendly mud tents, family cottages, suite bhungas, standard bhungas 	<ul style="list-style-type: none"> 20 suites situated on riverbank
Architectural Expression	<ul style="list-style-type: none"> Rustic contemporary design with Nepali architecture 	<ul style="list-style-type: none"> Fusion of modern and traditional Nepali architectural style 	<ul style="list-style-type: none"> Vernacular architectural style 	<ul style="list-style-type: none"> Contemporary architectural style
Materials and technology	<ul style="list-style-type: none"> Local materials such as stone, timber, slate roof 	<ul style="list-style-type: none"> Rcc structure mud mortar, brick, thatch roof 	<ul style="list-style-type: none"> mud wall, thatch roof, timber 	<ul style="list-style-type: none"> Timber structure Timber, bamboo, thatch roof
Sustainability approaches	<ul style="list-style-type: none"> Solar panel, rainwater harvesting Recycling of gray water Bio gas, organic farm 	<ul style="list-style-type: none"> Solar panel organic farm 	<ul style="list-style-type: none"> eco-friendly mud tents Sustainable livelihood 	<ul style="list-style-type: none"> indigenous materials Carbon neutral tourism Generate own energy
Inferences	<ul style="list-style-type: none"> Use of eco friendly design techniques to minimizes carbon foot print to surrounding environment. 	<ul style="list-style-type: none"> Proper utilization of natural topography 	<ul style="list-style-type: none"> Conserve the site culture and tradition Involve the local crafts, talent and skill 	<ul style="list-style-type: none"> Use of site conservative design

CHAPTER 5:

PROGRAM FORMULATION

Chapter 5 Program formulation

From the literature review and the case studies all the programs and data. They are likely to change during design phase according to the requirements.

Program and amenities	Capacity	Area sq. m.	Numbers	remarks
A. Accommodation units(74 p)				
1. Executive	4	180	3	580
2. Deluxe	2	60	8	480
3. Standard	2	45	14	630
4. Dormitory	4	160	2	320
5. Camping	2	45	5	90
				2060
B. Restaurant				
1. Washroom		55	1	55
2. Indoor dining	24	45	1	45
3. Terrace dining	60	120	1	120
4. Cottage dining	24	13	6	78
5. Kitchen				
1. Bar		25		25
2. food prep. and serv. area		35		35
3. dishwashing areas		7		7
4. storage (dry and cold)		17		17
5. supplies and waste colle.		30		30
				470
C. Administration Block				
1. Staff toilet		15	1	15
2. Lobby		35	1	35
3. Reception		50	1	50
4.a. Meeting Hall	13	50	1	50
b. Buffer zone		30	1	30
c. water closet		50	1	50
d. Conference hall	100	120	1	120
5. locker		12	1	12
6. Store		12	1	12
7. General Manager		15	1	15
				331.56

Program and amenities	Capacity	Area sq.m.	Numbers	remarks
D. Service Area				
1. House Keeping		31.37	1	31.37
2. Laundry/Plant Room		23.69	1	23.69
3. Power House		19.7	1	19.7
				74.76
E. Staff				
1. Kitchen	16	19.37	1	19.37
2. staff bedroom	16	18.77	4	75.08
3. dining(indoor)		31.33	1	31.33
dining (outdoor)		44	1	44
4.Guard House		19.7	1	19.7
5.Toilet		11.86	4	47.44
				236.92
F. Spa unit				
1. Toilet/Shower		4.55	1	4.55
2. Changing room		4.02	3	12.6
3.Locker room		4.55	2	10.14
4.Steam	1	5.1	1	5.1
5. Sauna	8	14.41	1	14.41
6. Changing Room		4.02	3	12.6
7.Massage Room		14.61+20.69	2	35.3
8.Waiting Room		13.12	1	13.12
9.Reception		15.57	1	15.57
				123.39
G. Outdoor components				
1. Garden and parks		358.11		358.11
2.Outdoor camping		509.44	1	509.44
3. outdoor pool		128.076	1	128.076
				995.61
H. Yoga and meditation				
1. Yoga Pavilion	50	276.34	1	276.34
2. Meditation room	10	60.08	1	60.08
				336.42

Program and amenities	Area sq. m.
Total built up area	4062.48
Ground coverage (1.5 floors consideration)	2708.32
Site area	12718.43
GCR	21.29%
Parking (26 cars, 60 bikes)	1040

CHAPTER 6:

SITE ANALYSIS

Chapter 6 Site analysis

6.1 General information

Location: Pharping, Dashinkali

Accessibility: 4 kilometer from Pharping bazar

Altitude height: 1700m

Latitude: 27°37'20" N

Longitude: 85°13'55" E

Area: 30 ropanies

Topography: sloppy terrain landform

N-E orientated slope



Figure 40: Proposed site



Figure 41: Proposed site



Figure 42: sun path diagram

6.2 Site surroundings

North: Champadevi, ktm valley, mountain ranges

South: green hills, village of Makawanpur

East: Phuchowki hills

West: Green hills and villages of Makawanpur

6.3 Accessibility

4 km from pharping bazar

25 km from Kathmandu

12 feet road from main road that link with hetauda

6.4 Social and cultural importance

Dashinkali, sheshnarayan, vajrayogini temple are religious places

Own Newari and Tamang culture and tradition, harishankar jatra, pharping hydropower

Great place for picnic spot, sight seeing, trekking, hiking



Figure 43: View from the proposed site



Figure 44: Dashinkali temple

6.5 Local community

Specially people of this site is tamang but just about 2km we can get max number of newars and mix community.

Agriculture, specially animal husbandry is the main occupation of the people for livelihood

Community hospital, community school near the site

6.6 Geography and soil condition

There is the existence of the hard soil, soil mixed with small pebbles and stones, suitable for mustard, maize and millet cultivation

Hard form of soil, i.e rocks below certain depth of the soil

6.7 Property status

The land is private property and is near to the community forest

6.8 Local architecture

- Most of the house around the site is typical rural architecture style of Nepal.
- Timber posts, mud mortar and stone masonry wall with roof of slate and cgi sheets are the major building materials used in these areas.



Figure 45: vernacular architecture of site

6.9 Site attraction



Figure 47: mountain range and ktm valley view



Figure 46: Pharping Hydropower



Figure 49: Monastery



Figure 48: Indrasarowar lake



Figure 51: Dakshinkali temple



Figure 50: Vasmasur hill

6.10 Climatic Data

- Max temp 28.5°C in the month of may and minimum temperature 2.5°C in the month of January.
- Rain fall is maximum in the year 2014 during the month of July and august and minimum in the year 2017 while comparing with the rainfall data of last.
- Max precipitation: July (375mm) and Minimum at December (50mm)
- July, August maximum humid (85%) and minimum at Jan, Dec (80%)
- Humid summer, cold and dry winters and precipitation during monsoon
- 20-25 km/hr wind speed from WNW to ESE and mostly wind flow north to south with speed of 5-10 km/hr

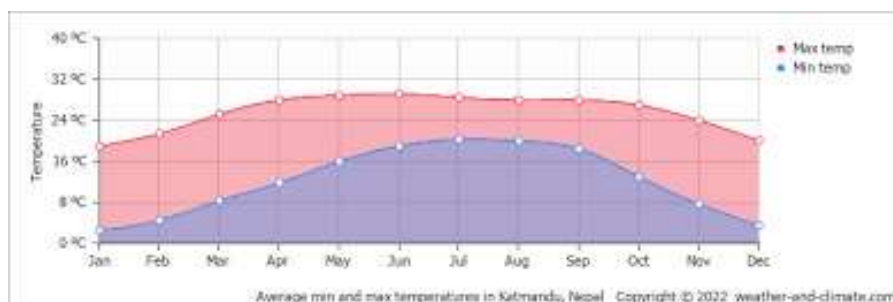


Figure 52: average temperature data

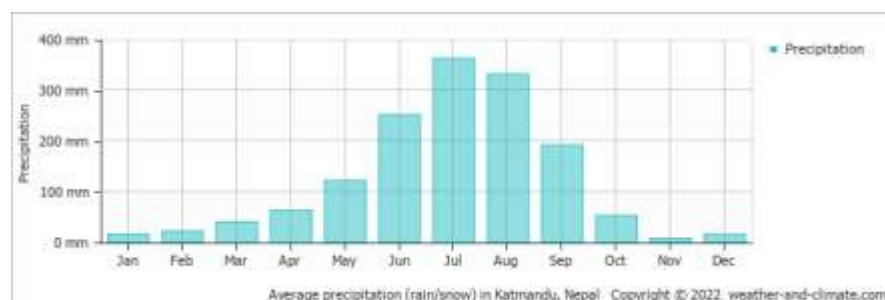
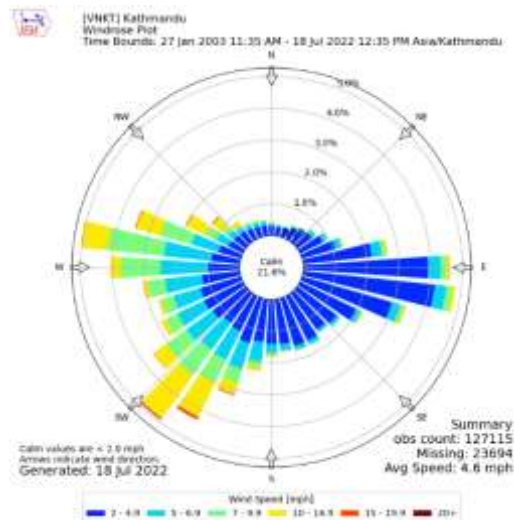


Figure 53: average precipitation data



source: metoblue

6.11 Swot Analysis

6.11.1 Strength

- Suitable for resort
- View of hill, valley, mountains
- Scenic and calm place
- Very close to pharphing

6.11.2 Weakness

- Insufficient water source

6.11.3 Opportunity

- Enhance surrounding of Pharphing and Champadevi
- Enhance the site's architectural and cultural value
- Contour land topography

6.11.4 Threat

- Landslide
- Wild animal
- Deforestation

6.12 Design inference from site

6.12.1 Natural view

- View of the northern Himalayan ranges, high hills, Kathmandu valleys etc as well as the view of the villages of the Makawanpur district.
- Restaurant blocks and executive blocks are to be kept at the top of site so that guests can enjoy the best view of the surroundings.

6.12.2 Use of local materials

Available materials in the site like mud, stone, bamboo etc can be used for the eco responsive design.

6.12.3 Natural friendly design

- Designing smaller and scatter structure in slope which in turn helps to retain most trees and natural topography of the site
- Use of the natural contours can be used for the overall planning of the resort design
- Vernacular technique and materials can be use and also the concept of the adaptive reuse also can be done by using the vernacular architecture.

6.12.4 Scale and proportion

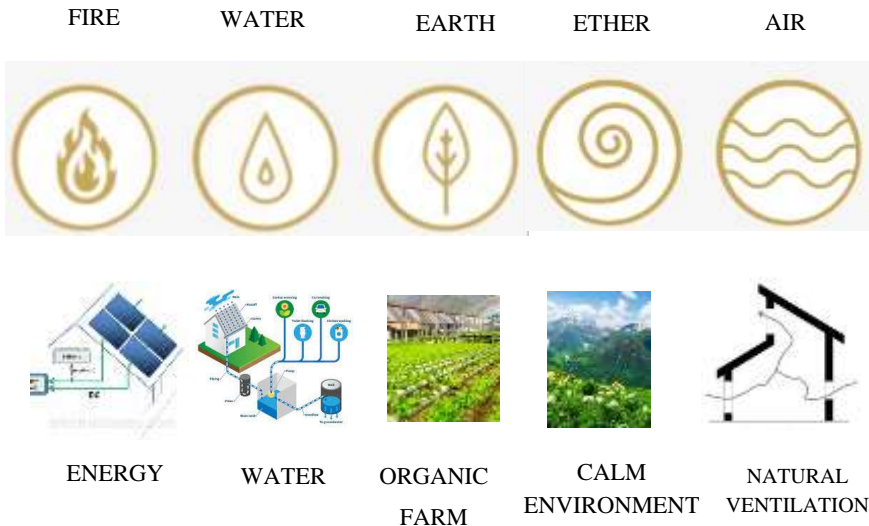
- All the the building will be in proportion with nature and the local community.
- Building should be the product of its site to make it more nature friendly.

CHAPTER 7: DESIGN CONCEPT

Chapter 7 Concept

7.1 Concept

Basically individual go eco-resort for relaxation and to attain peace. For an individual to attain peace, there need to be balance between body, mind and spirit. This balance is achieved through interaction of 5 classical elements of nature (fire, water, earth, air and ether). Concept is to reflect five elements of nature through design.



Fire is reflect in design through energy harvesting which is done through solar energy. Water is reflect through rainwater harvesting. Earth is reflect through organic farm. Ether is reflect through calm environment of the site and air is reflect through natural ventilation in the building.

7.2 Design approaches

- **Design based**
 - Passive and active solar design technique
 - Orientation of building
 - Designing with summer and winter sun
 - Solar energy harvesting
 - Rain water harvesting
 - Natural cross air ventilation
- **Materials**
 - Natural Rammed earth used in masonry wall construction
 - Bamboo used as a local material
 - Bamboo truss for slope roof
 - Stone cladding on column and stone masonry gravity wall to retain earth
- **Technology based**
 - Natural grey water treatment
 - Natural rainwater harvesting
 - Bio gas plant
 - Organic farming

- **Local community involvement**

- Skill manpower from the local community will be hired from the local community for the construction of the resort
- Local skilled people are given more priority as an staff
- Local people trained and promoted in organic farming in the village and the product is consumed in the resort
- Incase of maximum collection of solar power it will be distributed to the local community people

- **Project component**

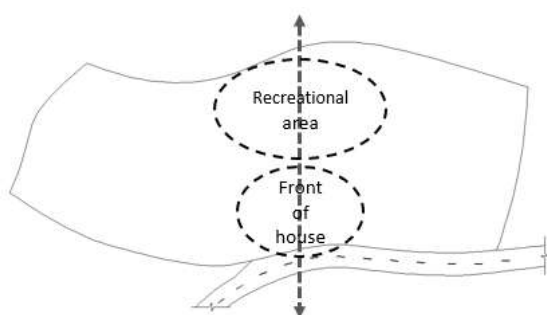
- Accommodation Unit
 - Standard unit
 - Deluxe unit
 - Executive unit
 - Dormitory
 - Camping
- Restaurant
- Recreational Unit
- Admin
- Conference hall
- Back of the House
- Staff accommodation
- Organic farming

7.3 Zoning and design development

Zoning of the programs plays an important role in the project. Thus, zoning is carefully done to support the planning concept and develop the proper flow of user in the site.

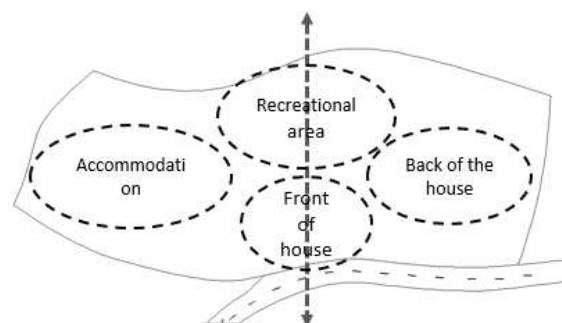
Step 1: Strong axis is created at the central portion of the site. Main entry is created at the starting point of the axis which is followed by front of the house and further followed by recreational area.

Step 2: Accommodation is placed at west part of site to take advantage of privacy from the road.



Zoning 1: As per privacy and function

Step 1



Zoning 2: As per privacy and function

Step 2

Step 3: our longitudinal axis is created considering the size and proportion of the building and to connect different functional spaces.

Further, accommodation zone is divided into four parts:

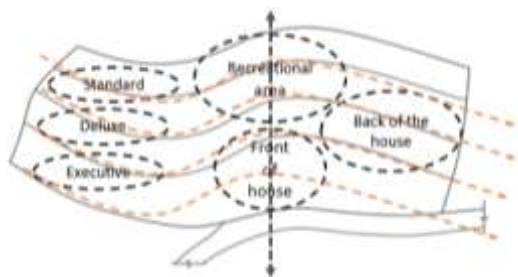
- Executive unit
- Deluxe unit
- Standard unit
- Camping

Executive units are placed at the top level for privacy. And its lower levels is followed by Deluxe units, camping and standard unit.

Infront of restaurant, camping is placed to provide the sense of openness for the restaurant.

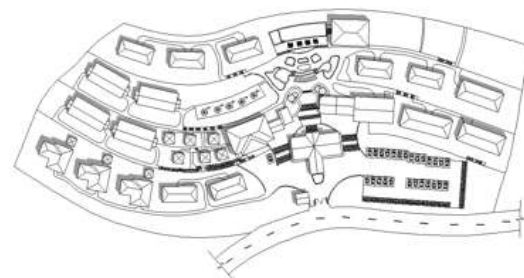
In order to provide natural view for greater number of guests, terrace dining is provided at greater number and cottage dining is provided for privacy.

Step 4: Considering the scale and proportion of the building to make harmony with the surrounding, the following form is created.



Division of accommodation

Step 3



Considering the scale and proportion

Step 4

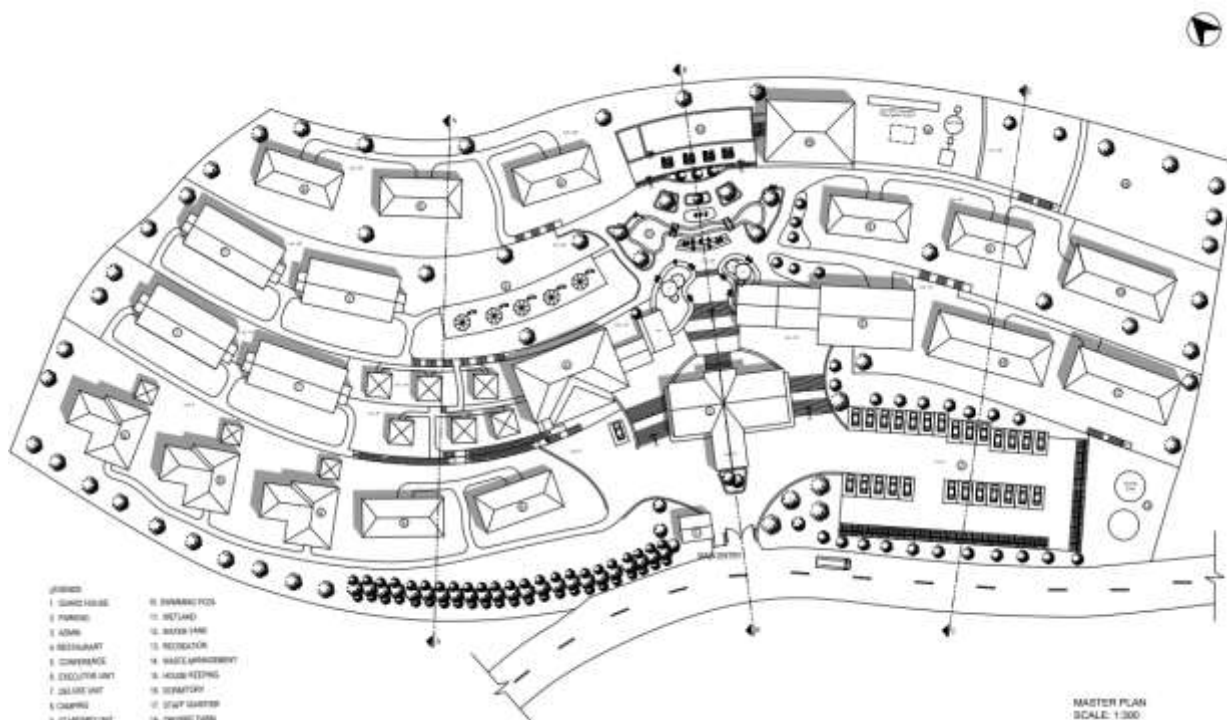


Figure 55: Master plan with sciagraphy

Admin

Drooping in on the porch, there comes the semi-open lobby for inviting visitors, and on the left there is reception and on the right there are staff room and manager room.

Restaurant and conference

Stepping down from the steps, there comes restaurant with open bar, on the ground floor of restaurant there is kitchen and indoor dining, above that there is semi-open dining. Behind the block there are cottage dining.

Stepping down from the right side of steps, there comes semi-open lobby which connect meeting room and conference hall.

Accommodation

On the top level of terrace, executive blocks are placed as top level has more privacy and then deluxe and standard blocks are placed. Each blocks are placed in such a way that blocks at the lower levels doesn't disturb the view of blocks on the higher level.

Recreation

Stepping down continuously from two terrain, there comes landscape area followed by swimming pool and at the right side there is spa, sauna, yoga hall.

Back of the house (BOH)

In the eastern part of the site, BOH is placed which includes staff quarter, dormitory, housekeeping, waste management.

7.4 Eco friendly design approaches

7.4.1 Water and waste management

□ Water consumption

S.N.	particulars	lpcd	No.	quantity
1.	Admin	45	8	360
2.	Seminar hall	15	100	1500
3.	Restaurant	45	86	3870
4.	recreation	30	25	750
5.	accommodation	100	62	6200
6.	Staff quarter	100	12	1200
			total	14900

<http://www.csgnetwork.com/waterusagecalc.html>

- Maximum consumption= 14900 lit = 14.9 cu.m.
- Max. consumption in 2 weeks= 224 cu.m.

□ Rainwater harvesting

- *The monthly rainfall in wet season (5 months) is around 201mm*
- Total catchment area= 2345 sq. m.
- *Average rainwater collection = $0.201 \times 2345 = 471$ cu.m. per month*
- *Average rainwater collection = 235 cu.m. in 2 weeks*
- Rainwater underground storage tank= 235 cu.m.= $10 \times 7.8 \times 3$ cu.m.
- Sewerage treatment underground storage tank= 26 cu.m. (safety factor=5) = $4.3 \times 3 \times 2$ cu.m.
- Fire tank= 50 cu.m. (NBC)
- *40% of the demand through the year is fulfilled by rainwater harvesting, sewerage treatment and remaining 60% demand is fulfilled from nearby natural water spring*
- Overhead portable storage tank= 16 cu.m.
- Overhead flushing water storage tank= 16 cu.m.

Rainwater is collected from the roof of the block and passes towards the wetland area, filtered naturally by using gravel, plants and bacteria and stored in an underground tank and reused in resort requirements including drinking, bathing, kitchen, and laundry.

Process:

- Sedimentator: water distribution, slow down water velocity, sediment suspended solid
- Rocks and gravel: provides surface area for bacteria to grow
- Aquatic plants: absorb excess nutrients and neutralize the wetland area
- Further treated through pressure sand filter, activated carbon filter, disinfection unit collected in an underground storage tank



Figure 56: Natural rainwater harvesting

Source: www.aquascapeconstruction.com

❑ **Grey water management (natural method)**

- Grey water from bathroom, kitchen, laundry is filtered naturally using plants and bacteria through a natural method which is derived from the sewerage treatment plant (STP) research prepared by IIT Bombay.
- used for toilet flushing system, landscaping and organic farm.



Figure 57: Natural grey water treatment

source: www.emergenviro.com

Process:

- Primary solid removal tank: reduce suspended solids (70-80%)
reduce biochemical oxygen demand (BOD) (45-55%)
- Planted bed: reduce BOD (85-95%)
- Tertiary treatment: remove remaining suspended solids and microbial contamination

❑ Permeable paving

- Local stone is used for paving
- It recharge runoff waste water in ground
- Minimize flooding in paved surface

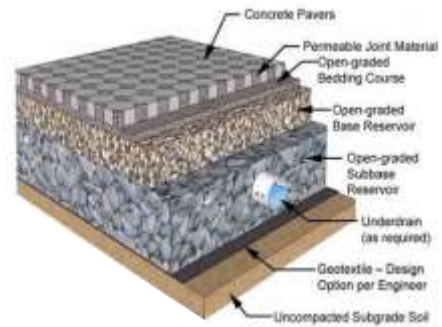


Figure 58: permeable paving

7.4.2 Energy management

Load	No	power	duration	Energy required
A. Administrative block				
1. lamps	55	20 watts	5 hrs	5500 whr
2. Projector	2	220 watts	4 hrs	1760 whr
3. Desktop Computer	4	150 watts	6 hrs	3600 whr
		Total energy required=		10860 whr
B. Restaurant				
1. Lamps	45	20 watts	5 hrs	4500 whr
2. Fridge	5	250 watts	24 hrs	30000 whr
3. Microwave oven	2	1000 watts	3 hrs	6000 whr
4. Stand mixer	2	300 watts	2 hrs	1200 whr
5. Coffee machine	2	1300 watts	5 hrs	13000 whr
				54700 whr
c. Banquet				
1. Lamps	40	20 watts	5 hrs	4000 whr
2. Fridge	3	250 watts	24 hrs	18000 whr
3. Microwave oven	2	1000 watts	3 hrs	6000 whr
4. Stand mixer	2	300 watts	2 hrs	1200 whr
5. Coffee machine	2	1300 watts	5 hrs	13000 whr
				38600
D. Accomodation				
1. Lamps	6	10 watts	5 hrs	300 whr
2. TV	1	150 watts	4 hrs	600 whr
3. laptop	1	75 watts	3 hrs	225 whr
				1125X22= 24750
E. Staff accommodation/ BOH				
1. Lamps	50	20 watts	5 hrs	5000 whr
2. TV	3	150 watts	4 hrs	4200 whr
3. Fridge	1	250 watts	24 hrs	6000 whr
4. Washing machine	3	500 watts	2 hrs	3000 whr
				18200

Source: www.daftlogic.com/information-appliance-power-consumption.htm

❑ Solar energy harvesting

- Due to the south east orientation of the roof, it receive maximum solar radiation which can be harvested to produce solar energy using solar panel.
- *In summer season*, getting 5 hrs of direct sunlight per day, solar panel output is calculated as= $5\text{hrs} \times 350\text{ watts} = 1.75\text{kwhr} / \text{day}$
- Total energy demand : 147.11 kwhrs/day
- Number of solar panels used=102
- Energy produced in the site using solar panels: $102 \times 1.75 = 178.5\text{kwhr/day}$
- *20% extra energy is produced which is supplied to grid line*
- *In winter season*, getting 4 hrs of direct sunlight per day, solar panel output is calculated as= $4\text{hrs} \times 350\text{ watts} = 1.4\text{kwhr} / \text{day}$
- Total energy demand : $147.11 \times 1.25 = 183.88\text{ kwhrs/day}$
- Number of solar panels used=102
- Energy produced in the site using solar panels: $102 \times 1.4 = 142.8\text{kwhr/day}$
- *22% energy is insufficient which is supplied from grid line*

7.4.3 Building material, design and construction

- Use of local material and technologies to make it more eco friendly
- Stone masonry wall for retaining walls
- Rammed earth wall is used due to its eco friendly properties as well as good thermal properties.
- bamboo truss and bamboo strip for roofing due to its light weight and local availability
- Bamboo is also use for reinforcing rammed earth. Bamboo is bring from Chalnakhel and Chobhar which is around 9 km from the site.

❑ Walls

Rammed earth is use for wall construction. Rammed earth is a technique for constructing foundations, floors, and walls by ramming natural raw materials such as earth, aggregate, cement or lime using a formwork. Using the earth from the site excavation saves a lot energy, cost and time. For the construction, soil is excavated from the site and local people are use for the construction.

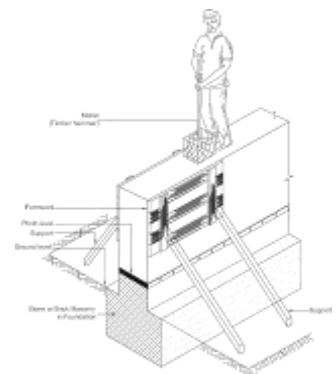


Figure 59: rammed earth construction

❑ Truss and roofing

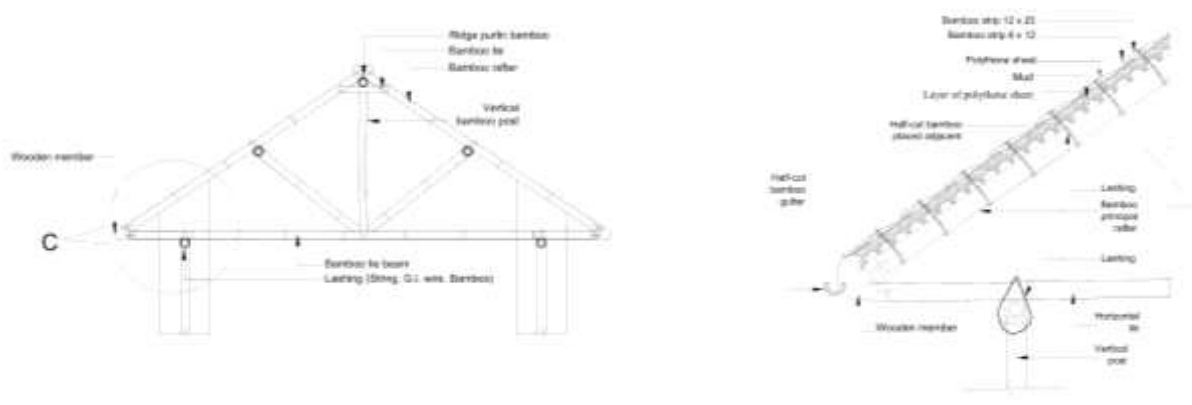


Figure 63: bamboo truss and roofing

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