RHYTHM OF SOIL & SOUL

(SANTAL CULTURAL COMPLEX, DINAJPUR)

By

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I would like to thank the entire Santal community of Dinajpur for inspiring me to choose this project as my final project. They helped me a lot during study phase and encouraged by their unique architecture.

I would like to thank my parents Lt col. (Rtd.) Firoz Ahmed and Nasrin Rahman, younger sister Samantha Fahreen. My design teachers Imon Chowdhury, Mahmudun Nabi, Nandini Aowal and S. A. Shimul my design instructors who guided me throughout the semester.

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ABSTRACT

Among different indigenous groups of Bangladesh Santal is one of the major group. They basically live on the South side of the country. They are very rich in their own culture like other indigenous groups. They follow unique architecture in their living and despite being low income group of the country they maintain high aesthetical value in their daily living. They do not have a specific cultural center for them at south. There is a government proposal to build a cultural center at south. So this project I choose to do by following Santal culture and vernacular architecture along with accommodating high aesthetical value of the community.

CHAPTER 01: BACKGROUND OF THE PROJECT

1.1 Project Brief:

Project Name: 'Rhythm of Soil & Soul', Santals Cultural Complex.

Site: Dinajpur, Bangladesh.

Client: Ministry of Indigenous Culture and Education Bangladesh.

Area: 17 acres.

1.2 Project Introduction:

It is estimated that there are more than 370 million indigenous people spread across 70 countries worldwide. Among them nearly 70 different indigenous groups can be found in Bangladesh. Practicing unique traditions, they retain social, cultural, economic and political characteristics that are distinct from those of the dominant societies in which they live. Spread across the world from the Arctic to the South Pacific, they are the descendants - according to a common definition - of those who inhabited a country or a geographical region at the time when people of different cultures or ethnic origins arrived. The new arrivals later became dominant through conquest, occupation, settlement or other means. These groups are very important cultural strength of our country and they are important citizens as self- identification as indigenous peoples at the individual level and accepted by the community as their member, historical continuity with pre-colonial and/or pre-settler societies, strong link to territories and surrounding natural resources, distinct social, economic or political systems, distinct language, culture and beliefs, form non-dominant groups of society, resolve to maintain and reproduce their ancestral environments and systems as distinctive peoples and communities. By building a common platform of expressing their culture architecture and all in all their living style along with nature can create an international example of sustainable vernacular architecture.
Santal is one of the major indigenous group found in Bangladesh. This indigenous community lives in the southern part of the country.According to the official census in 1991, the total number of Santals in the country is about 2, 02,744. Along with distinct culture, lifestyle and other indigenous characteristics Santals follow unique techniques to create indoor and outdoor spaces which have high architectural quality, where functionality and aesthetics compliments each other. This can add a new dimension of identity as well to the native Santals of our country and can create a strong example of vernacular architecture along with modern technologies in the field of architecture.

1.3 Objectives of the project:

- Organizing a cultural center for Santal community, currently this is not present.
- Creating an archive which will accommodate all the traditional knowledge, myths, beliefs, culture according to its evolution over decades.
- To sharethe idea about their culture to the other cultural groups and creating a learning field which will allow them to know about others culture as well.
- Communicating general people by workshop, multipurpose hall & library to add national participation.

1.4 Aims & Focus of the project:

- Main focus of the project will be expressing vernacular sustainable living of Santals.

- Creating a field to exchange the idea about how their culture is.

-Exploring architectural characteristics of Santal houses.

- Exploring different construction techniques.

- Exploring natural building materials.

- Creating an international platform of sharing and learning diversified cultures.

1.5 Given program of the project:

Programs are divided as _

- Public
- Semi- public
- Private

Public includes: auditorium, museum, gallery, library & research.

Semi-public includes: administration (some of the parts), guest house.

Private includes: administration, directors house, dormitory, teachers/staffs residence.

Administration

FUNCTION	SPACE	USERS Visitors staff		AREA sft.	SPECIAL REQUIREMETS
ENTRY & VISITORS WAITING	Lobby & waiting	--	--	600	• Seating for 15 persons
	Information center	--	01	150	
	Toilets (male, female)	___	--	50	
ADMINISTRATIVE PERSONNEL	Director general's office	--	01	400	• With attached toilet
	P. A.'s office	03	01	200	
	Asst. D. G.'s office	--	01	350	• Should be connected with D. G.'s office
	Seminar hall	30	01	800	
	Tea room (Kitchenette)	--	02	200	• With attached toilet
	store	--	--	250	
	Secretary office	--	01	350	• With attached toilet
	Cultural officer	--	01	350	
	Asst. Cultural officer	--	01	350	• With attached toilet
	Account's officer	--	01	300	
	Asst. account's officer	--	01	300	• With attached toilet
	General office & Clerical support	--	12	1600	
PUBLICATIONS	Editor's room	--	01	120	• Open office plan
	Asst. editor's room	--	01	120	
	Toilet	--	--	80	
	Sales center	--	02	100	
	Composer's room	--	02	200	
	Secretarial support	--	04	500	
	Store	--	01	200	
TOTAL		+30% circulation			

Total 8240 sft

Tribal museum and art gallery:

FUNCTION	SPACE	USERS Visitors	staff	AREA sft.	SPECIAL REQUIREMETS
ENTRY & VISITORS WAITING	Lobby & lounge Ticket counter Check room Baggage storage Toilet (male, female)	– – – –	– 02 02 01	1200 150 100 150 50	• Seating for 20 persons
ADMINISTRATION	Manager's office Asst. manager's office Clerical support	– – –	01 01 02	200 180 300	• Open office plan
DISPLAY	Exhibition for museum Storage Art gallery Storage	– – – –	– – – –	6000 300 3000 200	
PREPARATION	Workshop Storage	– –	02 –	2000 600	
TOTAL					+30% circulation

Total 14862.6 sft

Library and research:

FUNCTION	SPACE	USERS Visitors	staff	AREA sft.	SPECIAL REQUIREMETS
ENTRY & VISITORS WAITING	Lobby & lounge Reception Check room Baggage storage Toilet (male, female)	– – – –	– 01 01 01	1000 100 150 150 50	Seating for 20 persons
ADMINISTRATION	Librarian office Asst. librarian office	– – – –	01 01 02 –	180 150 150 200	

	Clerical support Store				
BOOK SECTION	Changing counter Reference Reading section Stacking books-50000 Film, Video & Record collection Store	-- -- 200 -- -- --	03 02 03 03 01 --	200 800 4000 1500 400 400	• Issue & return • Catalogue, drawer, desk, reference book stack • Security controlled environment
DISCUSSION	Multipurpose space	30	02	600	• Projection facility • Lecture or conversation section (participatory)
+ 30% circulation					

Total 10330.9 sft

Cultural academy Total 8000 sft

Cafeteria

FUNCTION	SPACE	USERS Visitors	staff	AREA sft.	SPECIAL REQUIREMETS
ENTRY & WAITING	Lobby & lounge Reception	-- --	-- 01	600 100	Seating for 15 persons
DINING	Indoor Outdoor	50 40-50	03 03	900 1000	• With preferably best view of the complex or surroundings

SERVICE	Kitchen Pantry Store	-- -- --	05 -- --	600 200 200	
TOTAL	+30% circulation				

Total 3708 sft

Open Air Theater

FUNCTION	SPACE	USERS Visitors	staff	AREA sft.	SPECIAL REQUIREMETS
THEATER	Sitting Stage	300 --	-- --	5000 1000	• Integrated with landscape
TOTAL				+30% circulation	

Total 6180 sft

Guest house

FUNCTION	SPACE	USERS Visitors	staff	AREA sft.	SPECIAL REQUIREMETS
ENTRY & WAITING	Lobby & lounge Reception Toilet (male, female)	-- -- --	-- 01 --	1000 100 250	• Seating for 20 persons
ADMINISTRATION & STAFF	Manager's office Staff accommodation	-- --	01 04	200 400	• With attach toilet
GUEST HOUSE	Single bedded room Double bedded room Suit (cottage)	-- -- --	-- -- --	6000 300 400x07 =2800	• -- in number • With attach toilet • -- in number • With attach toilet • 07 in number • a full homely environ ment in

					a natural setting
SERVICES & FACILITIES	Dining Kitchen + pantry Storage Newspaper& magazine Indoor games	35 – – 15 12	04 03 -- 01 02	700 400 200 200 500	• separate service entry
TOTAL				13412+30% circulation	

TOTAL SPACE REQUIRED: 76,705.50 SFT

CHAPTER 02: SITE APPRAISAL

2.1 Site location:

The site is located at Dinajpur district. The district is bounded by Thakurgaon and Panchagarh districts in the north, Gaibandha and Joypurhat districts in the south, Nilphamari and Rangpur districts in the east and the state of West Bengal, India in the west. Main rivers are Dhepa,Punorbhaba and Atrai.

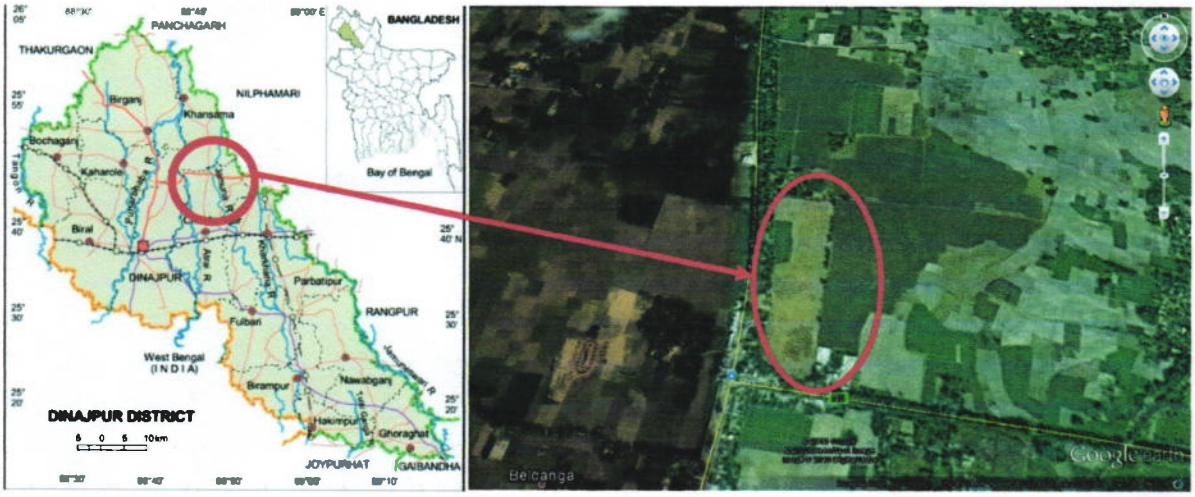


Fig 2.1: Location of the site

2.2 Site surroundings:

The site is located at the southern part of the country. To give a proper access to the site it is located just beside one primary road; Dhaka-Thakugaon highway. It has less traffic compared to the other highways. This area is also has got diversified tourist access because of the presence of Kantaji temple. Mostly agricultural lands are the surroundings of this site. Most of the lands are government lands and some of them are on lease taken by different non-governmental groups.

Fig 2.2: Site Surrounding

2.3 Historical & social background:

40 years ago this site was an agricultural land. But later on because of the importantDhaka-Thakurgaon Highway the commercial value of the lands adjacent to the highway increased. As a result some of the owners of the agriculture land sold the land to different companies and rest of the lands are owned by the government.

Due to the presence of Kantaji temple on the area it has got historical significance.it has been known as the best terracotta work throughout the world. Every year it contains national and international level tourists in this temple area.

Fig 2.3: Kantoji's Temple

2.4 Vegetation of the Site:

Entire site has many trees scatteredly located in it. Among them most prominent trees are Coconut tree, Mango tree, Mehagoni, Papaya tree, Banana tree, Banayan, Krishnochura, Sal tree, Bamboo and many shrubs and herbs can be found there. Along with all these as the entire site is surrounded by different argricultural lands it has got different crops and vegetableswhich gives highly diversified vegetation to the site.

2.5 Climate of the site:

Location: Tropical zone

Climate: Warm-Humid climate

Level: 35'-0" above of the sea level

Average climate of the site is not characterized by great extremes of heat and rainfall for its geographical location of the district.

2.6 Temperature and rainfall:

Annual average highest temperature of Dinajpur district are 33.5 °C and lowest 10.5 °C; annual rainfall 2,536mm.

2.7 Wind:

Wind speed of this site for the all year round average is 3.1 knots. In the month of June and July there is a rise in the speed when it reaches 5 knots. The cyclones occur usually during the retreat of monsoon with the speed reaching 40-60 mph most of storm hit from the north west.

2.8 Natural disasters caused by nature of wind:

Time	Name of Storm	Speed
April-June	Kalbaishakhi	60-100 mph
Autumn	Cyclonic storm	40-60 mph

2.9 SWOT Analysis:

Strengths:

1. Located just beside the Dhaka-Thakurgaon Highway which is one of the most important highway.
2. The site has strong natural surroundings.
3. Existence of natural elements adds more value to the site.
4. Variation of vegetation can be seen in the site.
   Maintenance would be easy because of the location as the area is surrounded by many Santal communities.
5. It can be open for the general people and perform as a bridge for diversified cultures.
6. For the location it can be most potential site for a national level museum.

Weaknesses:

1. The site is away from the capital.
2. Transport from the main capital can be a problem.

Opportunities:

1. This site can create a very potential place and location for a national level cultural complex which is required for the given project.

Threats:

1. Can create traffic problems for this cultural complex.
2. Direct natural view might get interrupted for the building of the museum.
3. Many migratory birds may not find the land as safe as before.
4. Natural vegetation of the land might get disturbed.

CHAPTER 03: LITERATURE REVIEW

3.1 Introduction:

Bangladesh is inhabited by 129 million people among them at least two and a half million belong to indigenous nationalities. These ethnic minorities are commonly called as 'Adivasi'and most of them also identify themselves as that. 'Adivasi' came from two different words; 'Adi' – original and 'Vasi' – dwellers. There are about 70 distinctly recognizable indigenous nationalities in Bangladesh. These groups today are basically descendants of the original inhabitants of the Indian Subcontinent. The advancement of the powerful Aryans into India pushed these primitive dwellers into scattered settlements in remote corners of the country. In this process the distance between these groups and the outside world has been beneficial in the long run for maintaining their unity and indigenous culture and tradition. There are almost 70 indigenous groups can be found in Bangladesh. Among all these groups 'Santal' is one of the major groupfound at northern part of the country.

3.2 Evolution of Santals:

There are many hypotheses regarding the origin of Santals. According to Skrefsrid, 'Santal' came from the word 'Soontar'. According to one hypothesis these group of people lives on the long plain land which is known as 'Shaoto' so they are called as Santals. Some people call them as 'Kheroar' as well. According to one hypothesis they originated from Samanta-Bhumi (a part of Medinipur district, India) and thus get the name 'Saontar'. Another hypothesis argues they were inhabitants of the border areas of India thus getting the name 'Samantapal' which means Guards of the Borders. The wide spread of Santal settlement today is chiefly attributable to the later migration of these people.Santals are one of oldest indigenous group found all over the Indian Subcontinent. Some assumes that they came here even before Aryans (considered as the first dwellers of this subcontinent). Santals belong to Proto Australoyed group. In terms of physical structure, culture and rituals they have got similarities with nearby Munda and Orao community.

Santals used to live in scattered settlements in all over India. In 1836 British government fixed an area for them where they all could live in one community. That area was known as 'SantalPorgana'. Majorly they were dependent on agriculture for their lives. But for the interference of Hindu businessman, land owners and British employees they were losing their lands ownership. Santals had to pay high interest rate to the Hindu Jamidar as well as British government. Eventually they lost their lands and jobs in agricultural field and they started serving different odd jobs. Because of this unwanted occurrences in 1955 Santal community declared revolutionagainst British government. That revolution is historically known as 'SantalRevolution'. Nearly ten thousand Santal people died in this revolution and they failed to achieve their demands. After that they did not feel safe to live in that 'SantalPorgana' and most of them left that area. According to D. PiyerBesynet, most of the Santals in Bangladesh came from that area after the revolution.

3.3 Socio-Economic Factors of Santals:

3.3.1 Community Activities:

Originally Santals relied on hunting as their chief means of subsistence. A balanced community feeling was shared by the people and the entire group was like an extended family with close symbolic relationship. Later with the practice of agriculture and migration to different regions, the individual units became more self-sufficient. But the community feeling still binds them in harmonious and interdependent social structure. Major community activities among the community are –

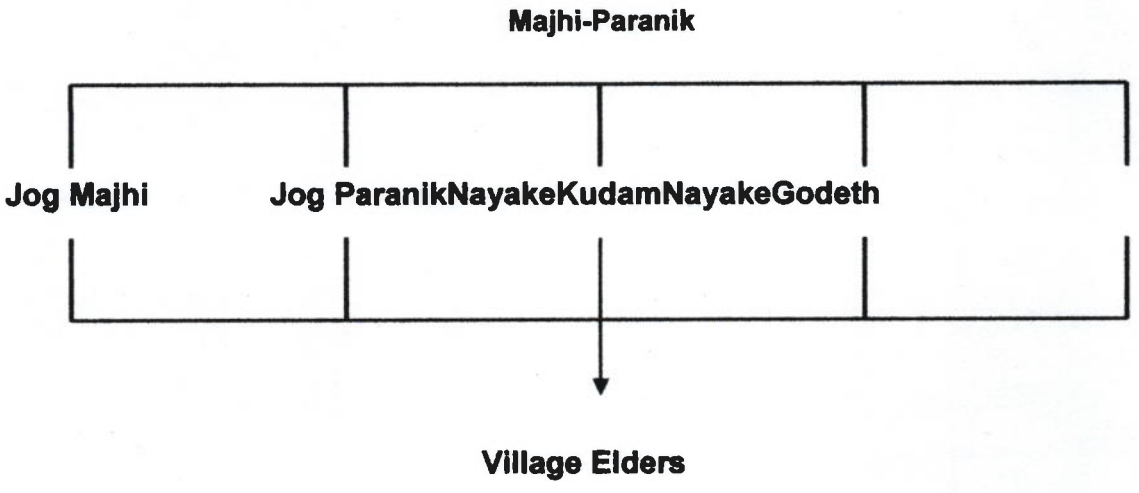
- Community dances and singing at the 'Jaher Than' and 'Majhi Than'.
- Congregation of villagers at 'Majhi Than' or under central village tree for chatting or dispensing of administrative activities.
- Drawing of water at the common village tube wells serving as the congregational space for women.

3.3.2 Social Structure:

Santals are classified under 12 'gotrais' (sections). These are –Kisku, Hasda, Murmu, Hembrom, Mardi/Mandi, Soren, Tudu, Baske, Besra, Chare, Pauria, Bedea. Among these 11 are found to exist today. These divisions were primarily based on different professional traits. But it is not necessary that one village has people of a particular sector. Normally people of different sectors are found to peacefully coexist in a village.

3.3.3 Administrative Hierarchy:

The village is administrated by a body of senior members each of whom is assigned a special function. These members are Majhi, Paranik, Jog Majhi, Jog Paranik, Nayake, KudamNayake, Godeth. These administrative bodies have got different roles and responsibilities regarding the entire community. Briefly their roles are given below –



a. **Majhi-** The village headman. Any small and legal problems, important village functions and administrative activities are managed by them.
b. **Paranik-** Assistant to the Majhi. Acts in his absence.
c. **Jog Majhi-** Takes up responsibility for the customs and conduct of the youth of the village.
d. **Jog Paranik-** Assistant to Jog Majhi.
e. **Nayake-** Priest of the village.
f. **KudamNayake-** Assistant priest wards off evil spirits.
g. **Godeth-** Messenger of the Majhi. Arranges meetings and ceremonial get together among several villages.

3.3 Impact of different factors on Santal architecture:

As an indigenous group Santals have their own specific cultural identity. Which distinguished them from other groups. According to their own cultural belief and practice they have got different socio-economic factors, religious factors, cultural factors, customs, festivals, music-dance etc. these different factors has got a major impact on the expression of Santal architecture.

3.3.1 Impact of socio-economic factors on architecture:

Main socio-economic factors of Santal group are basically community activities, social structure, administrative hierarchy, law and order, occupation, family structure, position of women, lifestyle, dress etc. These factors have following impacts on Santal architecture –

Settlement level - now-a-days, main occupation of Santal people is agriculture or any kind of work related to agriculture. So in the plan of any general Santal house it has been seen that each units one to one relationship is with the agricultural field necessitates as axial layout of the village with immediate proximity of built forms and

field. In addition a central axial road is provided to facilitate the transport of agricultural products from the fields to the unit.

The main places of congregation and community activities the MajhiThan, the central tree, the water sources (e.g. tube wells) and the tea shop are situated at central or nodal positions signifying their importance. Majhis house occupies the most strategic location. It has being placed at the entrance node of the village.

Unit level - based on occupation and family structure three types of unit clusters have been identified. These can described as following

Land owning joint family houses with enclosed private courtyards.

Extended families with hired land having semi-enclosed common courtyard.

Individual unit clusters with loosely defined common open spaces.

The units of the village leaders are seen to be bigger and more well-maintained than the others. These points to the greater economic stability of the village heads. These houses are further made unique by the use of color and decoration.

Low plinth level of houses can be attributable to the affinity for crouched sitting pasture.

3.3.2 Impact of religion on architecture:

Settlement level - The majhiThan is centrally located to signify its importance. JaherThan where community dancing is done requires a large open space and thus located on outskirts of the village.

Unit level - one corner of the bedroom called Bhito is reserved for the home-god (GrihaDevata). No idol is placed over here.

Windows are mostly absent or very small size if present. This attributable to the belief that evil spirits (Bongas) might look through them causing misery to the intimates. This is a case of religious beliefs super siding comfort factors.

3.3.3 Impact of cultural effects on architecture:

Settlement level - Burial fields for the dead of family ownership are present on the outskirts of the village.

The central axial road facilitates the movement of the cultural processions through the village.

Unit level - Decoration of houses with ornate frescoes is specially done before festivals such as Janthar.

An external verandah called 'Kulhi' is present facing the road for viewing of cultural processions.

Courtyard serves as the defined space for convening cultural festivals such as marriage and Tanthar.

3.3.4 Law and Order:

Small legal complications are solved by the Majhi. More serious cases are decided by an annual court called Law-Bir-Bicher-headed by a man called Dishari.

3.3.5 Occupation:

The chief occupation is based on agricultural and associated activities. Accordingly three classes of agriculturists can be identified.

a. Cultivators on personally owned tracks of land.
b. Cultivators on land obtained on hire from land-owners (mahajans).
c. Land-less laborers working on a day to day basis on the fields. The other side occupations identified are
d. Brewing and selling of local liquor called "mahua".
e. Rearing of pigs, sheep and cattle.

3.3.6 Family Structure:

The chief binding factor of an agrarian society is agricultural land. The cohesion of a family is thus seen to vary based on the ownership of land. Accordingly three family patterns have been identified.

a. Joint families with common ownership of large tracts of land.
b. Extended families having family relations but individually self-sufficient and working on hired land.
c. Nuclear families of usually landless laborers.

3.3.7 Position of Women:

Santal women are held in high esteem in the social fabric. This can be validated by –

a. Acceptance of goddess worship.
b. Absence of child marriage.
c. Dowry paid by the groom's side.
d. Polygamy not encouraged.
e. Purdah is not present.

3.3.8 Life Style:

a. Eating and cooking is mostly done outdoors in the courtyards or semi-enclosed spaces. During rains this activity shifts to a corner of the porch. Brewing of liquor (mahua) is also done in the courtyards.
b. Act of sitting – Low wooden stools are used for sitting in a crouched position. Bamboo or reed mats are also used for sitting on ground or porch.

3.3.9 Dress:

a. Women dress themselves by two pieces of cloth called 'parhaut'. Men wear a single dhoti type cloth called 'panch'.
b. Women wear heavy ornaments especially during festivals.
c. Tattoo is another common way of ornamentation done on the forehand which has got a religious significance. A girl without this is never considered sacred.
d. Boys have the custom of having Shika marks on their left hands in odd numbers.

3.4 Religious Factors of Santals:

Santals do not practice any daily rituals. They do not have a proper deity or idol for worshipping. The MajhiThan serves the purpose of the seat of the resident god of the village. This village god is known as 'Marangburu'. But now a days some of the Santals are converting their religion to Hinduism and Christianity.

3.4.1 Religious Festivals:

The religious festivals of the Santals area are the reflection of their closely nit community life and symbolic relationship with nature. There are various festivals followed by Santal community. Most prominent of them are 'Sohrai' and 'Baha'.

Sohrai- Performed every year in January-February. This is a thanks giving festival to the Gods for bestowing of a bountiful harvest. Relatives visit the houses from distant places. Dances are held at the Jaher Than.

Baha- Performed every year in February-March. This is the flower festival of Santals. The nature Goddess is worshipped and offerings are made to a Sal Tree.

3.4.2 Gods and Goddesses:

Marangburu- The chief God and guardian spirit of the village.

Sing-Boga-The sun God, who is supposed to save villagers from calamities.

Moreko-Tunelko-Savior from disease and ensures bountiful harvest.

Jaher Era- Goddess of JaherThan, the religious center of the village.

3.5 Cultural Factors and Customs of Santals:

3.5.1 Birth:

-A pregnant lady undergoes strict restrictions which are given cultural connotations but are actually meant to nullify harm to the stillborn.

-A separate enclosure or birth chamber is temporarily constructed before delivery.

-Umbilical cord is served with a shell for a girl and an arrow for a boy.

-The whole village celebrates the birth in a festival called 'JanamChatiya'.

-Adoption is widely practiced for orphans.

3.5.2 Marriage:

- Marriages between the same sects or Gotrasis strictly prohibited thus preventing weakening of genetic traits. Defaulters might be killed by 'Bit-laha' practice.

- Proposals are always made by the grooms party who also have to pay dowry to the brides family.

- The 'Majhi' plays the role of the chief arbitrator and is helped by 'Godeth'.

3.5.3 Death:

-The 'Godeth' informs the 'Majhi' about the death.

- Cremation and burial customs are both practiced.

- Hair and nails of corpse are stored for a few days and then immersed in a river.

- After five days a small funeral service called 'Teinahana' is celebrated. A bigger community ceremony called 'Vandan' is organized on the first death anniversary.

3.5.4 Festivals:

Cultural festivals of the Santals are another reflection of their closely knit community life and their agrarian lifestyle. The following main festivals are celebrated –

Janthar/Nabanna- Observed at the time of harvesting.

Erk Seem and Hariyar Seem- Festivals before and after seed sowing.

MaghSeem- Year ending festival.

Makarme- Festival to ward off natural calamities.

3.5.5 Music and Dance:

The music and dance of Santals is representative of the simple, carefree lives of the people and their ties with nature. All the dances are based on community participation providing an opportunity for entertainment and strengthening of socio-cultural ties.

Chief instruments played are reed flutes and ceremonial drum (Madol). Most dances take place at the 'Jaher Than' or in front of the Jog Majhi's house.

3.6 Vernacular Architecture:

Vernacular architecture is a category of architecture based on localized needs and construction materials, and reflecting local traditions. Vernacular architecture tends to evolve over time to reflect the environmental, cultural, technological, and historical context in which it exists. It has often been dismissed as crude and unrefined, but also has proponents who highlight its importance in currentdesign.

It can be contrasted against polite architecture which is characterized by stylistic elements of design intentionally incorporated for aesthetic purposes which go beyond a building's functional requirements.

3.6.1 Definition of Vernacular Architecture:

Ronald Brunskill has defined the ultimate in vernacular architecture as:

"...a building designed by an amateur without any training in design; the individual will have been guided by a series of conventions built up in his locality, paying little attention to what may be fashionable. The function of the building would be the dominant factor, aesthetic considerations, though present to some small degree, being quite minimal. Local materials would be used as a matter of course, other materials being chosen and imported quite exceptionally."

The term is not to be confused with so-called "traditional" architecture, though there are links between the two. Traditional architecture can also include buildings which bear elements of polite design: temples and palaces, for example, which normally would not be included under the rubric of "vernacular." In architectural terms, 'the vernacular' can be contrasted with 'the polite', which is characterized by stylistic elements of design intentionally incorporated by a professional architect for aesthetic purposes which go beyond a building's functional requirements. Between the extremes of the wholly vernacular and the completely polite, examples occur which have some vernacular and some polite content often making the differences between the vernacular and the polite a matter of degree.

The Encyclopedia of Vernacular Architecture of the World defines vernacular architecture as:

"...comprising the dwellings and all other buildings of the people. Related to their environmental contexts and available resources they are customarily owner- or community-built, utilizing

traditional technologies. All forms of vernacular architecture are built to meet specific needs, accommodating the values, economies and ways of life of the cultures that produce them.

3.6.2 Influences onthe Vernacular Architecture:

Vernacular architecture is influenced by a great range of different aspects of human behaviour and environment, leading to differing building forms for almost every different context; even neighbouring villages may have subtly different approaches to the construction and use of their dwellings, even if they at first appear the same. Despite these variations, every building is subject to the same laws of physics, and hence will demonstrate significant similarities instructural forms.

3.6.2.1 Climate:

One of the most significant influences on vernacular architecture is the macro climate of the area in which the building is constructed. Buildings in cold climates invariably have high thermal mass or significant amounts of insulation. They are usually sealed in order to prevent heat loss, and openings such as windows tend to be small or non-existent. Buildings in warm climates, by contrast, tend to be constructed of lighter materials and to allow significant cross-ventilation through openings in the fabric of the building.

Buildings for a continental climate must be able to cope with significant variations in temperature, and may even be altered by their occupants according to the seasons.

Buildings take different forms depending on precipitation levels in the region – leading to dwellings on stilts in many regions with frequent flooding or rainy monsoon seasons. Flat roofs are rare in areas with high levels of precipitation. Similarly, areas with high winds will lead to specialized buildings able to cope with them, and buildings will be oriented to present minimal area to the direction of prevailing winds.

Climatic influences on vernacular architecture are substantial and can be extremely complex. Mediterranean vernacular, and that of much of the Middle East, often includes a courtyard with a fountain or pond; air cooled by water mist and evaporation is drawn through the building by the natural ventilation set up by the building form. Similarly, Northern African vernacular often

has very high thermal mass and small windows to keep the occupants cool, and in many cases also includes chimneys, not for fires but to draw air through the internal spaces. Such specializations are not designed, but learnt by trial and error over generations of building construction, often existing long before the scientific theories which explain why they work.

3.6.2.2 Culture:

The way of life of building occupants, and the way they use their shelters, is of great influence on building forms. The size of family units, who shares which spaces, how food is prepared and eaten, how people interact and many other cultural considerations will affect the layout and size of dwellings.

For example, the family units of several East African ethnic communities live in family compounds, surrounded by marked boundaries, in which separate single-roomed dwellings are built to house different members of the family. In polygamous communities there may be separate dwellings for different wives, and more again for sons who are too old to share space with the women of the family. Social interaction within the family is governed by, and privacy is provided by, the separation between the structures in which family members live. By contrast, in Western Europe, such separation is accomplished inside one dwelling, by dividing the building into separate rooms.

Culture also has a great influence on the appearance of vernacular buildings, as occupants often decorate buildings in accordance with local customs and beliefs.

3.6.2.3 Nomadic Dwellings:

There are many cultures around the world which include some aspect of nomadic life, and they have all developed vernacular solutions for the need for shelter. These all include appropriate responses to climate and customs of their inhabitants, including practicalities of simple construction such as huts, and if necessary, transport such astents.

The Inuit people have a number of different forms of shelter appropriate to different seasons and geographical locations, including the igloo (for winter) and the tupiq (for summer). The Sami of Northern Europe, who live in climates similar to those experienced by the Inuit, have developed different shelters appropriate to their cultureincluding the lavvu and goahti. The

development of different solutions in similar circumstances because of cultural influences is typical of vernacular architecture.

Many nomadic people use materials common in the local environment to construct temporary dwellings, such as the Punan of Sarawak who use palm fronds, or the Ituri Pygmies who use saplings and mongongo leaves to construct domed huts. Other cultures reuse materials, transporting them with them as they move. Examples of this are the tribes of Mongolia, who carry their gers (yurts) with them, or the black desert tents of the Qashgai in Iran. Notable in each case is the significant impact of the availability of materials and the availability of pack animals or other forms of transport on the ultimate form of the shelters.

All the shelters are adapted to suit the local climate. The Mongolian gers (yurts), for example, are versatile enough to be cool in hot continental summers and warm in the sub-zero temperatures of Mongolian winters, and include a close-able ventilation hole at the center and a chimney for a stove. A ger is typically not often relocated, and is therefore sturdy and secure, including wooden front door and several layers of coverings. A berber tent, by contrast, might be relocated daily, and is much lighter and quicker to erect and dismantle – and because of the climate it is used in, does not need to provide the same degree of protection from the elements.

3.6.2.4 Permanent Dwellings:

The type of structure and materials used for a dwelling vary depending on how permanent it is. Frequently moved nomadic structures will be lightweight and simple, more permanent ones will be less so. When people settle somewhere permanently, the architecture of their dwellings will change to reflect that.

Materials used will become heavier, more solid and more durable. They may also become more complicated and more expensive, as the capital and labor required to construct them is a one-time cost. Permanent dwellings often offer a greater degree of protection and shelter from the elements. In some cases however, where dwellings are subjected to severe weather conditions such as frequent flooding or high winds, buildings may be deliberately "designed" to fail and be replaced, rather than requiring the uneconomical or even impossible structures needed to withstand them. The collapse of a relatively flimsy, lightweight structure is also less likely to cause serious injury than a heavy structure.Over time, dwellings architecture may come to reflect a very specific geographical locale.

3.6.2.5 Environment and Materials:

The local environment and the construction materials it can provide governs many aspect of vernacular architecture. Areas rich in trees will develop a wooden vernacular, while areas without much wood may use mud or stone. In early California redwood water towers supporting redwood tanks and enclosed by redwood siding (tankhouses) were part of a self-contained wind-powered domestic water system. In the Far East it is common to use bamboo, as it is both plentiful and versatile. Vernacular, almost by definition, is sustainable, and will not exhaust the local resources. If it is not sustainable, it is not suitable for its local context, and cannot be vernacular.

CHAPTER 04: CASE STUDIES

4.1 Jean-Marie Tjibaou Cultural Center:

Typology: Cultural Center
Address: Rue des accords de Matignon, Tina B.P. 378 98845, Nouméa, Nouvelle Calédonie
Site Area: 7650 sqm
Building dimensions: small : 63 sqm ; medium : 95 sqm ; large : 140 sqm
Height: 20, 22 and 28 meters respectively
Floors: 2

4.1.1 Story behind the project:

The Centre was named after Jean-Marie Tjibaou, a Kanak independence leader who was assassinated in 1989. The Kanak people are widespread throughout the Pacific region, above all in New Caledonia where they account for nearly 41% of the island's entire population. The island, whose capital is Nouméa, is a French territory that is on its way to gaining its autonomy. During the negotiations for the island's independence, the local authorities requested the French government to fund the construction of a large cultural center that would be dedicated to Kanak culture. In 1990, within the sphere of President François Mitterand's "grandstravaux", an international invitation-only tender was established for the realization of the project. The center was officially inaugurated by French Prime Minister Lionel Jospin in 1998. The site was located on the Tina peninsula, to the east of capital city Nouméa. This spectacular location, between the open sea and the protected lagoon, is set against the backdrop of the mountains and the promontories jutting out into Magenta bay. The scope of the competition was quite broad: the project would have to be designed to honor traditional Kanak culture, while at the same time providing a focal point for the inevitable development of its society. The centers activities include exhibits, special events, as well as performances involving music and dance: the objective was to ensure that, despite its adaptations, the Kanak culture would not lose touch with its historical roots.

The spirit of the Pacific is ephemeral: traditional Kanak buildings are born in unison with nature and make use of its perishable materials; for this reason, the village's continuity over time is not bound to the survival of each individual building, but rather to the preservation of a specific construction scheme. Building upon this civilization's typical deep bond with nature, the project

followed two main guidelines: on the one hand evoking Kanak construction capabilities, while on the other hand making use of modern materials, such as glass, aluminium, steel and advanced lightweight technologies, in addition to traditional materials, such as wood and stone. The Centre is not contained within one building alone: it's a combination of "houses" and open spaces with trees, of various functions and pathways, of fills and voids. While surrounded by the sea on three sides, the site is covered by thick vegetation and is traversed by a number of winding pedestrian paths that lead into the "villages": clusters of buildings which are intrinsically bound to their surrounding environment and, with their semicircular layout, delineate open public spaces. The various parts of the complex are connected by a covered, and slightly curved, walkway, which runs along the ridge of the promontory. The constructions are curved structures, similar to huts, made out of wooden beams and arches: archaic-looking dwellings with interiors that are furnished with all of the comforts that modern technology has to offer. These ten large monothematic environments open up directly onto the Centre's internal roadway, thus creating a transition from a compact space to an unexpectedly ample outdoor area. The external boards are of different widths and are spaced unevenly: the slightly vibrating optical effect obtained in this manner enhances each building's affinity with its surrounding vegetation.

4.1.2 Concept of the Project:

Renzo Piano's Jean-Marie Tjibaou Cultural Center, located in New Caledonia, aFrench territory in the South Pacific. The building's ten wooden cases, referencing the traditional Kanak huts as well as the surrounding vegetation, create the imagery of the building. These cases are also a highly articulated environmental system which allows for natural ventilation of the building. In examining the building's development, as well as the thermodynamic principles used, it is clear that the cases were not created out of a desire for a specific environmental system. Rather, the cases and the remainder of the building were adopted to accommodate this natural ventilation system. This integration of imagery and function within the cases prevents them from being mere iconography and binds them to the remainder of the building.

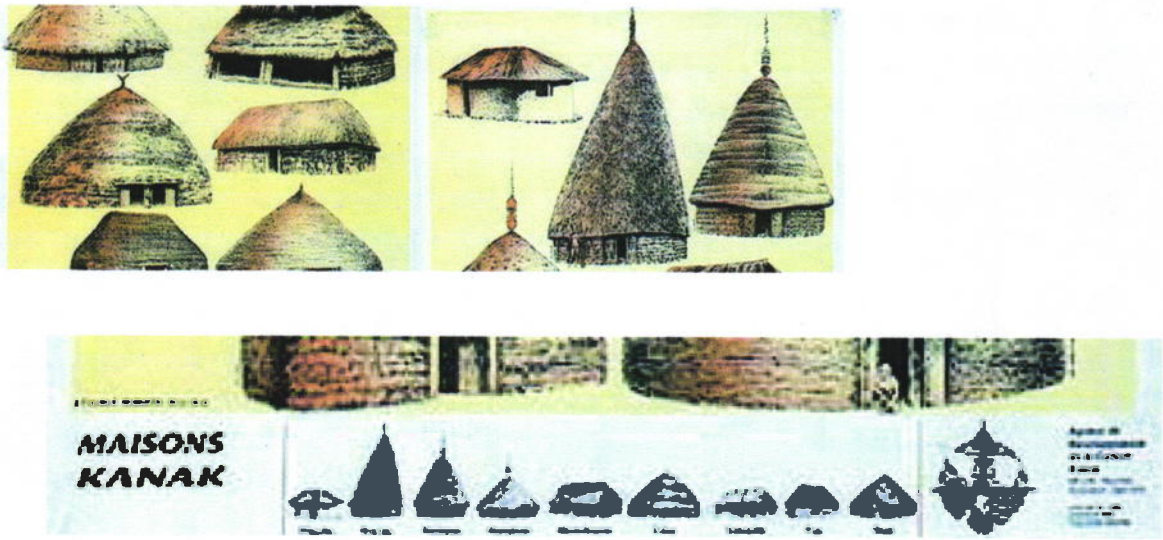


Fig 2.4: Traditional Kanak Huts

4.1.3 Climate of the Project:

New Caledonia is an island in the Pacific Ocean about 1600 kmeast of Australia. The Jean-Marie Tjibaou Cultural Center is located on a thin peninsula near the island's capital, Noumea. Running east-west, the 1000 foot long circulation spine runs along the peninsula's ridge. On the more protected lagoon side are four Modernist, flat-roofed glass and steel pavilions. On the bay side are the 10 wooden cases with their curved facades towards the prevalent winds coming across the ocean.

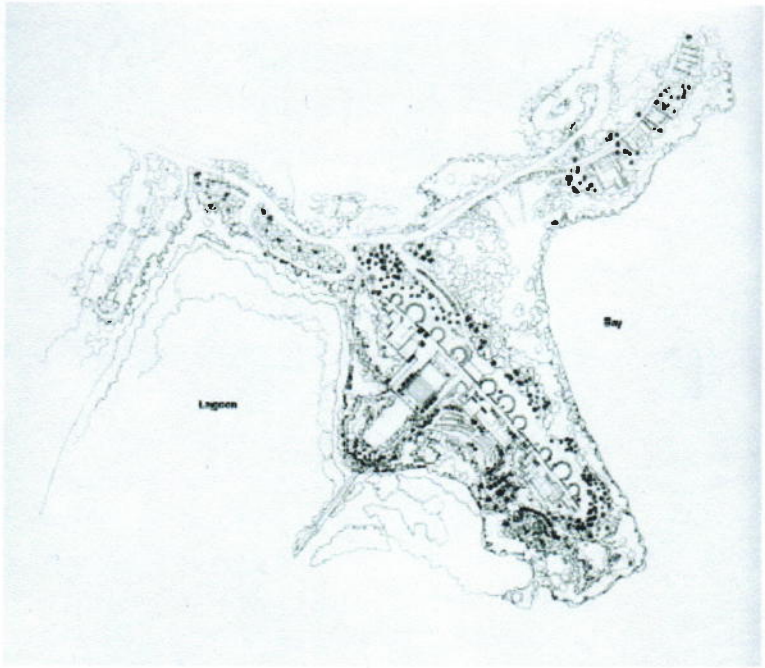


Fig 2.5: Site plan of the Cultural Center

Renzo Piano received the commission for the Jean-MarieTjibaou Cultural Center, a $33.4 million arts and education complex, through an international design competition held in 1991. The center was a gift of the French government to the territory to promote and preserve the native Kanak culture. The structure of the cases, which are up to 28 meters tall, is laminated iroko wooden beams with steel cross bracing and connections. Natural wood, glass, and steel compose the remainder of the building. Three different programmatic spaces are contained within the building. The first, most public space contains the entry, a theater, exhibition spaces, cafe, and gift shop. The middle section contains offices for visiting scholars, a library, a computer and media room, and more exhibition spaces. The third part, located at the end of the peninsula, arethe administrative offices and educational facilities.

The climate in Noumea is considered to be 'oceanic tropical'. There are only moderate variations in temperaturesfrom a winter minimum of 65 degrees Fahrenheit to a summer maximum of 93 degrees Fahrenheit. The average relative humidity is about 75% RH with average monthly maximums of 90% RH and minimum of 60% RH (Banfi 26) In such a warm and humid climate, ventilation is required in order to supply fresh air, for body cooling, and for

cooling of building. Wind speeds within the building desirable for such tasks are 0.53 to 3.04 m/s with 0.28 m/s being the minimum (Bansal 138, table 3.3.5-2).

Fig 2.6: Arial view of the complex looking towards lagoon in background

4.1.4 Thermodynamic principles&Development of the building design in relation to natural ventilation system:

The Jean-Marie Tjibaou Cultural Center was designed with the desire to utilize natural ventilation. Throughoutits development and in its final design, two main principles are used to achieve natural ventilation: stack ventilation and ventilation due to wind forces.

From the beginning of the project, Piano desired the incorporation of a natural ventilation system. Additionally,the engineering firm, Ove Arup, stressed the benefits of low technology because of the expense of importing and maintaining mechanical equipment (Banfi 26). This system, however, did not generate the initial form of the building but rather responded to it. As the design progressed, the natural ventilation system was further incorporated into the design and exerted formal changes upon the building.

4.1.4.1Competition Entry:

In the original scheme, the cases were found onboth sides of the circulation spine. These cases were inspired by the traditional huts of the Kanak people. In fact, in this initial scheme, the cases were arranged into distinct groups which were thought of as "villages". These cases also sought to establish a relationship with the surrounding vegetation, especially the tall evergreen trees (Buchanan 192, Zabalbeascoa 4). Piano even went as far as proposing that local materials be used for the cladding and replaced periodically replaced by the community (Buchanan 192).

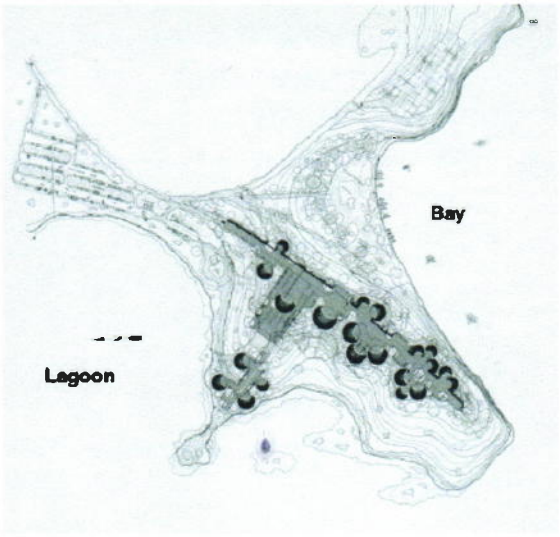


Fig 2.7: Plan of competition entry with cases on both sides of the circulation spine

Fig 2.8: Drawing of the Kanak huts

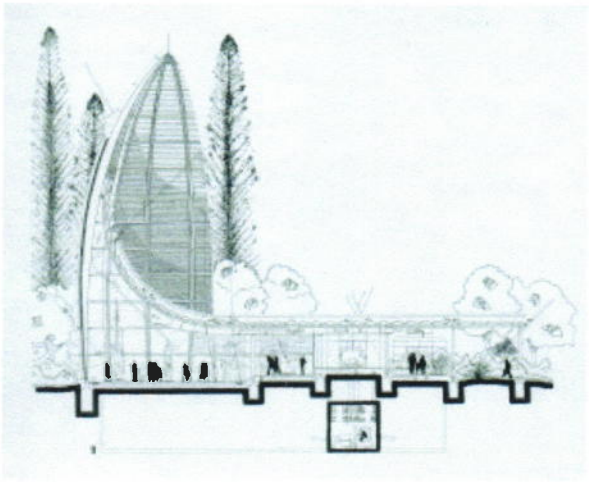


Fig 2.9: Sectional drawing of the competition entry showing the original form of the cases

Fig 2.10: Photgraph showing relationshipbetween the forms of the final cases and theKanak huts

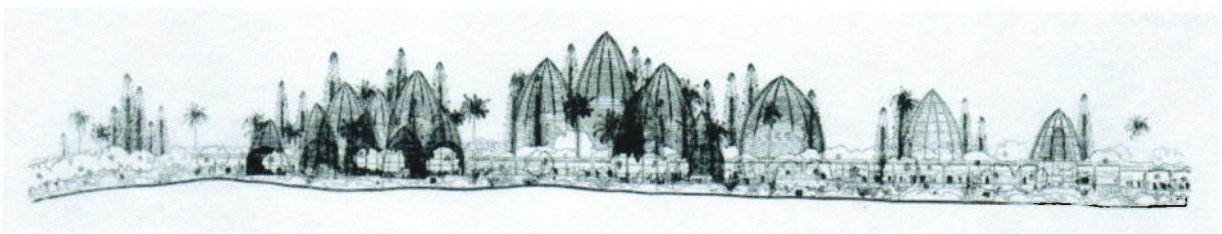


Fig 2.11: Sectional drawing of the competition entry showing the relationship to the tall trees

Two methods of natural ventilation were proposed in this competition entry. The first relied upon the placementof the cases on both sides of the promenade, some open in the direction of the wind and some with their back to the wind, to achieve an even ventilation of the building

(Buchanan 192). This scheme utilizes the principle of ventilation due to wind forces with the cases providing the openings on the windward and leeward sides of the building . Therefore, this ventilation scheme is not related to the tall, curved forms of the cases, but could be performed by a low, orthogonal building. The second proposed ventilation method utilized the form of the cases as wind scoops. This, however, did not give the ventilation scheme enough flexibility to respond to the different wind directions and strengths (Banfi 26), and wind tunnel tests demonstrated that wind was not being brought into the building (Buchanan 197).

4.1.4.2Abstraction of the cases and incorporation of natural ventilation:

In developing the building from this initial competition entry, changes were made to create a more feasiblenatural ventilation system. Some of these changes stemmed from formal design considerations. In other instances, introduction of ventilation elements exerted formal changes upon the building. By January of 1992, there was an effort to make the cases more abstract, rather than quoting so directly from the Kanak vernacular architecture. Iroko wood, with its great durability, was chosen for the cases, rather than opting for the frequent replacement of local materials. The vertical elements no longer meet at a point and were no longer the same length. This new form allowed the ventilation of the cases to be converted from the unsuccessful wind scoops of the initial design into thermal chimneys. The north side of the cases (the side toward the promenade) were opened, and air could move through the cases and up the chimney.
Additionally, during this design iteration, all of the caseswere moved to the south side facing towards the windward, ocean side. This allowed a structural system to be designed to withstand the hurricane winds coming off of the ocean. It also had implications for the ventilation system, as all the cases were now facing in the windward direction.

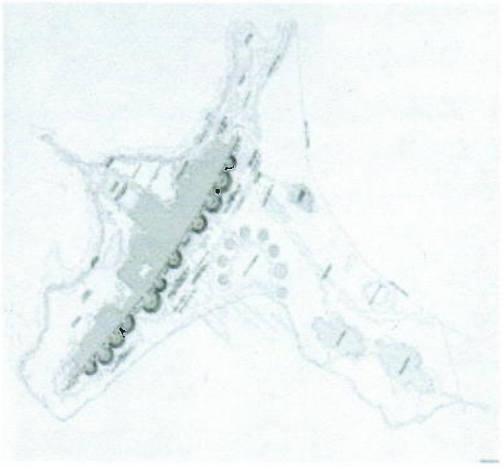


Fig 2.12: Plan showing all the cases moved to the southern side facing the ocean

By January 1993, the walls of the cases had developed intotwo concentric rings (Buchanan 199). The interior ring was composed of vertical columns of laminate iroko wood and formed the interior wall of the cases. The exterior ring was composed of curved laminated wooden members. Steel bracing and connections were used to connect the two rings and make them rigid. This double wall construction greatly improved the performance of the proposed thermal chimney(Buchanan 199, Banfi 28).

The performance of the ventilation system was considered further in the design of the cladding systems. Theexternal ring was clad in wooden slats from top to bottom which were placed more closely together at the middle in order to reduce the wind at that point. This would allow wind to either pass freely through the top of the case, or to be forced downward to aid with the internal ventilation. Bringing wind in through a low opening provides better circulation for the interior because air moves past the occupants rather than remaining at ceiling height. These circulation patterns were also considered for the louver system that was introduced to the internal ring. Louvers were placed at the base of the room to allow wind into the building. Another louvered opening was placed at the ceiling to allow the heated air to escape up the thermal chimney. These louvered openingsare used to control ventilation through wind forces and convection. This proposed ventilation system was tested in the wind tunnel using 1/50 models with the blowers directed at the model's outer face. Again sensors within the model registered no significant air movement entering the interior space through the openings in the shells. The CSTB (Scientific and Technical Building Center) engineers reasoned that an additional opening would draw air through the space and out by cutting a hole.

The need for the patios is again autilization of the principle of windventilation. These patios (or the proposed openings in the roof) allow for cross-ventilation to occur. Hence, the ventilation system exerted a formal change upon the building by introducing these interior courtyards in the roof; they were able to achieve the desired ventilation. Rather than penetrating the roof, Piano added small interior patios across the central walkway to induce the desired cross-ventilation (Hart 155,156).

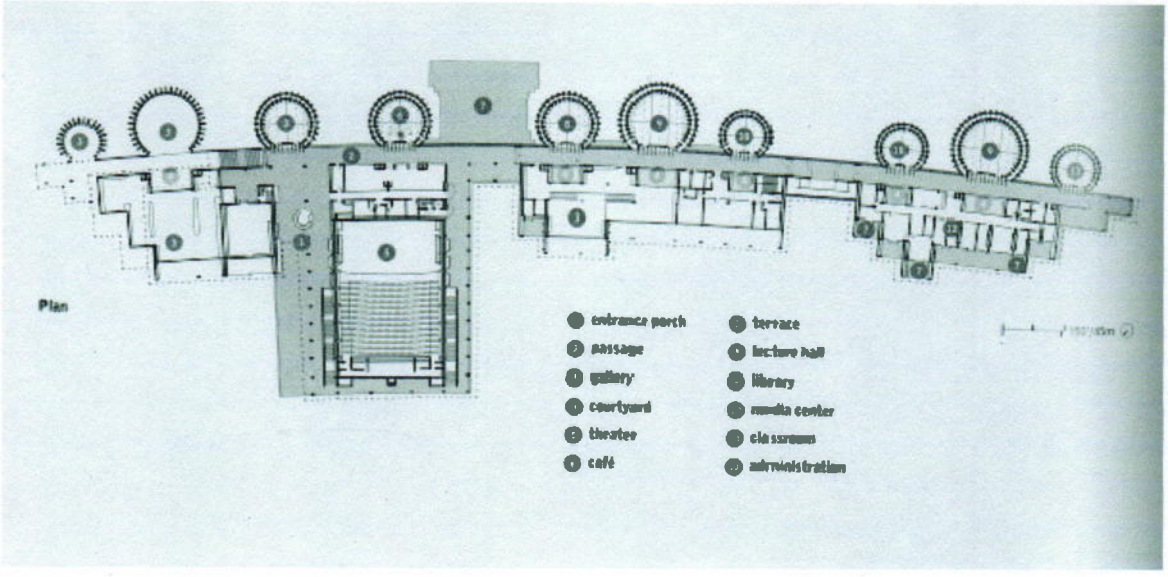


Fig 2.13: Final plan of the cultural center

4.1.4.3Analysis of natural ventilation system in final design:

The final natural ventilation system incorporates both the principles of the stacked ventilation and of ventilationdue to wind forces. Depending upon the wind forces, different types of ventilation are utilized through the opening and closing of louvered apertures. These computerized louvers are located in the interior ring of the cases. At the ceiling are 2 meter high operable louver windows, and at the base there are 0.5 operable louvers. Additionally, across the circulation spine from each case there is another computerized louvered opening at the courtyards. These computerized louvers respond to different wind speeds to control the ventilation of the building to a maximum speed of 1.5 m/s (Banfi 26).

-The first mode, shown in figure 2.14, is usedwhen there are light winds or still air. With the thermal chimney closed, ventilation of the building is solely dependent upon wind forces. The height of the building is not utilized to ventilate the room.

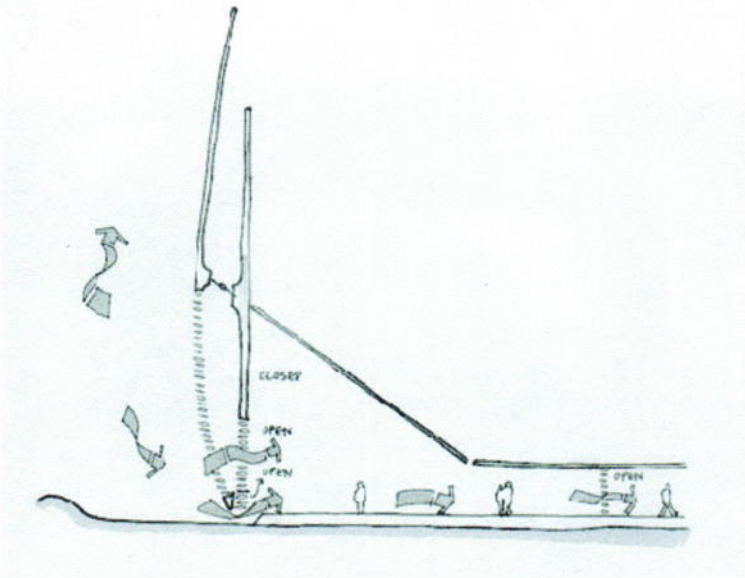


Fig 2.14:Mode 1 for ventilation

-The second mode, shown in figure 2.15, is usedwhen there are moderate winds and light breezes). Examining the basic equation for ventilation due to wind forces: Q = KAV it can be seen that with the higher wind velocity, the smaller opening will maintain the same rate of airflow as in mode 1. Again, ventilation relies solely upon wind forces, and the height of the building is not utilized.

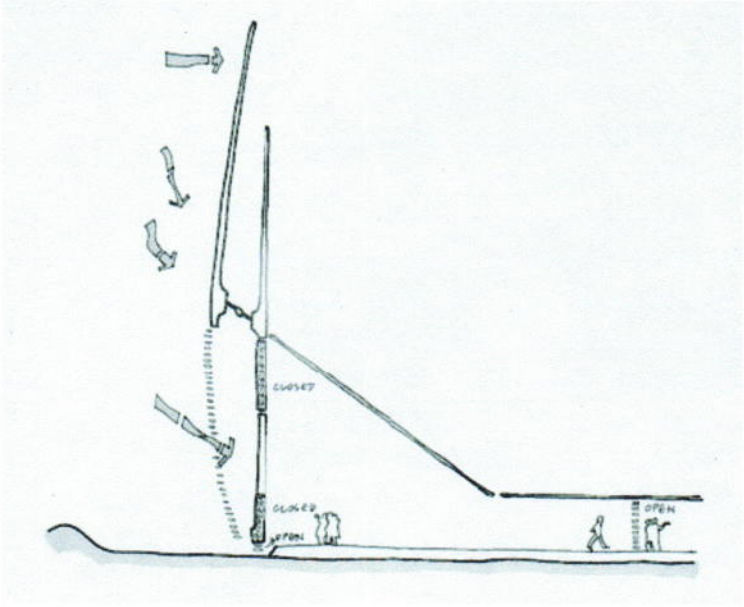


Fig 2.15:Mode 2 for ventilation

-The third and fourth modes, as shown in figure 2.16, are used when there are strong winds. This method relies upon both convection and the negative pressure created by the wind. Utilizing the principles of stacked ventilation, the air entering the room is heated and exits through the upper opening and up the thermal chimney. This is aided by the fact that the wind is creating negative pressure across the top of the thermal chimney, causing the air to be sucked up the chimney.

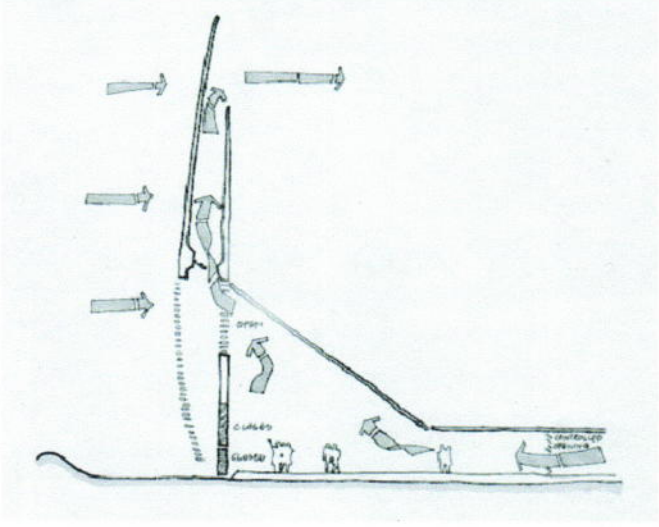


Fig 2.15: Mode 3 & 4 for ventilation

-During cyclone conditions, as shown in figure 2.16, all of the louvered opening are closed.

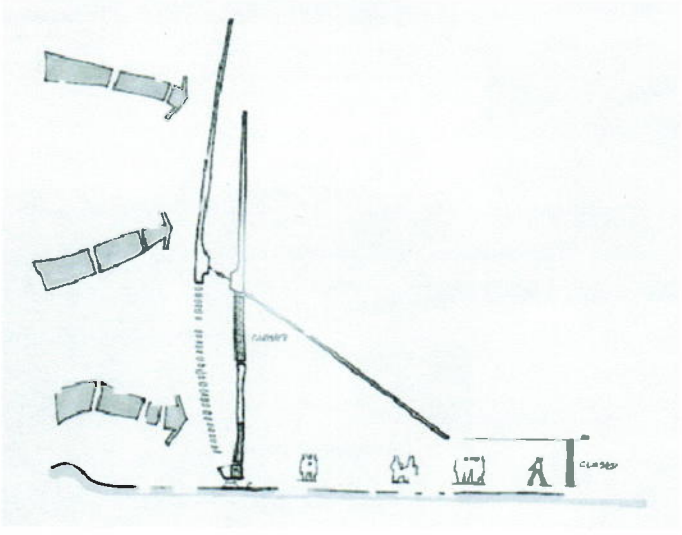


Fig 2.16: Ventilation system during hurricane

There are times that the winds come across thelagoon, rather than across the bay, as shown in figure 2.17. During these times, both the principles of wind ventilation and stacked ventilation are used. The louvers on both the sides are opened, allowing the wind to move from the positive pressure on the northern side to the negative pressure on the positive side. Additionally, as air heats up within the room, it rises through convection and can exit out of the thermal chimney.

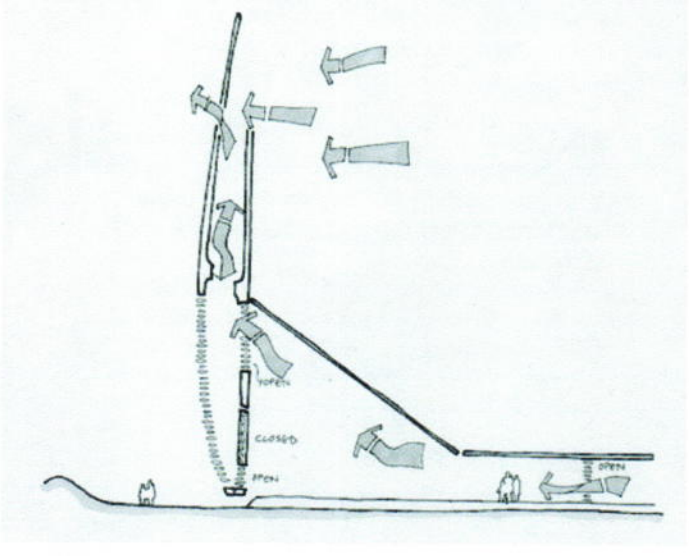


Fig 2.17: Ventilation system during reverse winds

4.1.5 Drawings:

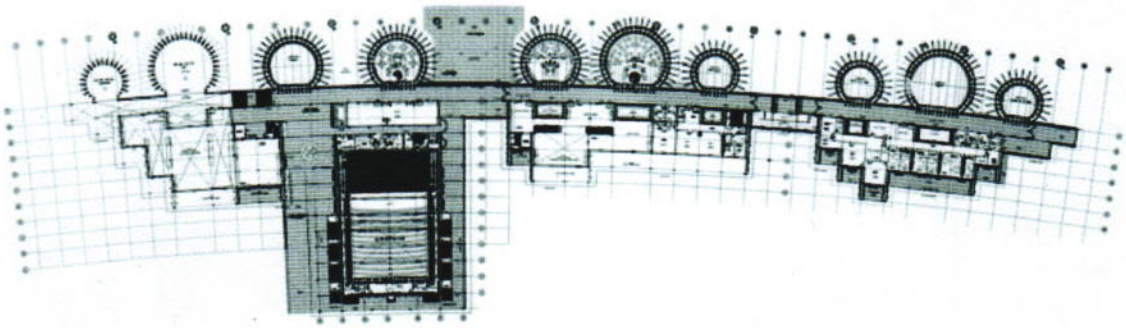


Fig 2.18: Plan of the complex

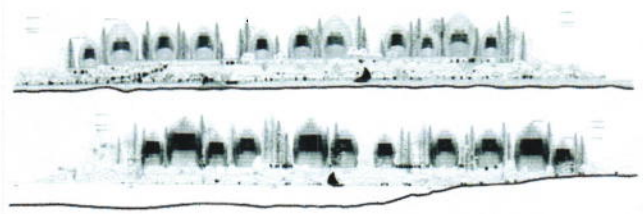


Fig 2.19: Elevations of the complex

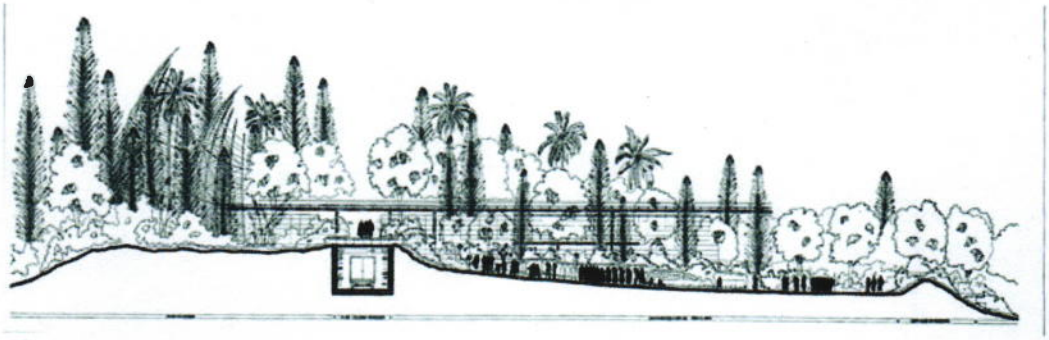


Fig 2.20: Longitudinal section-I of the complex

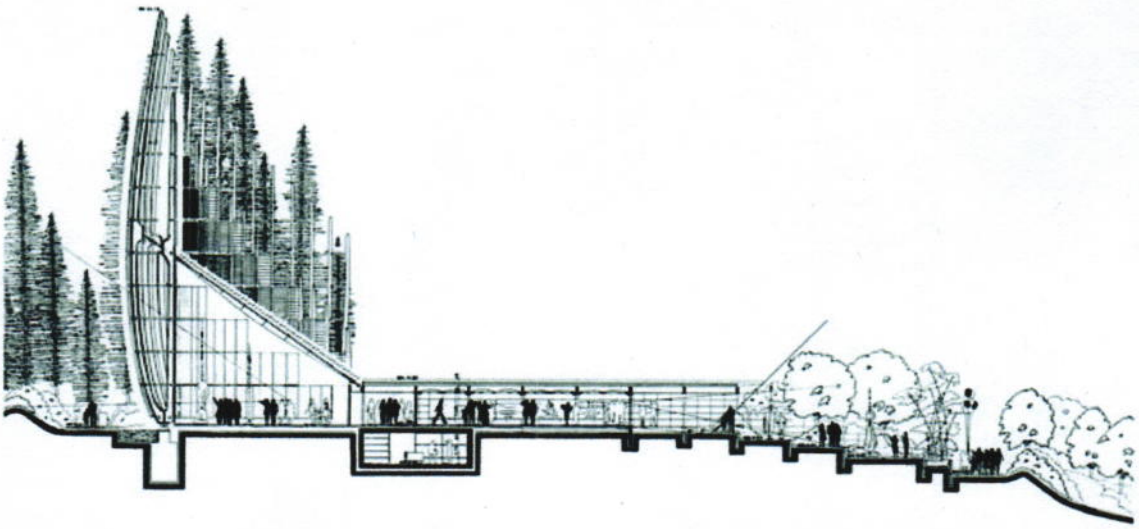


Fig 2.21: Longitudinal section-II of the complex

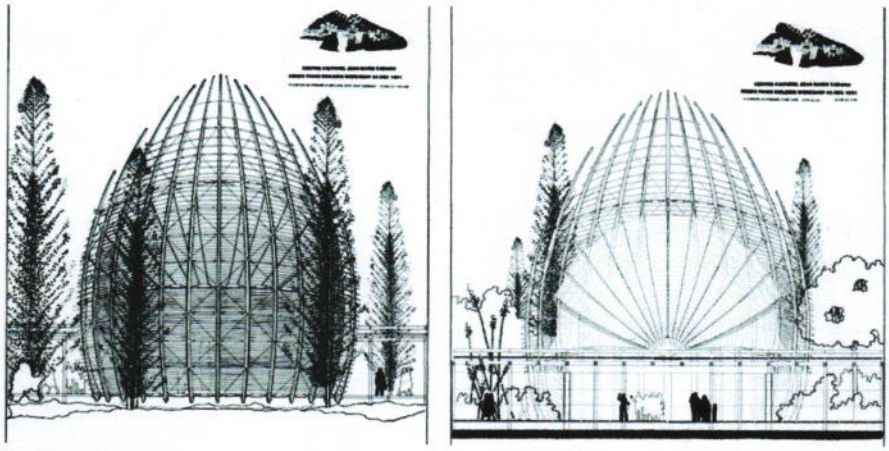


Fig 2.22: Kanak huts inspired forms

4.1.6 Spaces:

This is a town that has its own ways, vegetation and public spaces, and is located in direct contact with the ocean.The cultural complex is composed of ten houses, all of different sizes and functions. The small houses are 63 square meters, the medium houses 95 square meters and large houses, 140 square meters. Their heights range from 20 to 28 meters, with a circular floor plan, which are grouped into three villages, each with a distinct role. All of them are

connected by pedestrian walkways in the form of spokes evoking the central promenade of traditional villages.

4.1.7 Three Villas:

Villa I - One part of the cultural package is aimed at permanent and temporary exhibitions and contains an auditorium and an amphitheater.

Villa II - In the second group of huts are divided spaces administration, research, library and a conference room.

Villa III - Finally, other studies contain cabins for traditional activities such as music, dance, painting and sculpture.

4.1.8Structure:

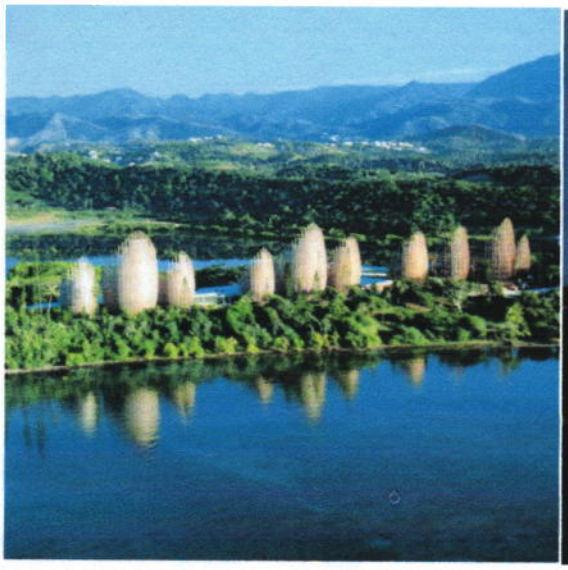
The structure and operation of the cabins Caledonia replicated and adapted architectural and socially.They all have created a structure shaped peinetairoko. Reminiscent of the huts and crafts Kanak, the slender ribs of the lath structure and among them are seamlessly integrated in the lush landscape and the culture of its inhabitants. Although these ancient wooden slats were also, on this occasion, the union has made structural tube horizontal and diagonal bracing rods of stainless steel. These structural elements reminiscent of traditional mainstays such as the spine of the fish to avoid the beams warped long.Renzo Piano describes the structures that are curved like huts, built with wooden beams and nerves are looking containers archaic archaic, whose interiors are equipped with all the possibilities offered by modern technology.

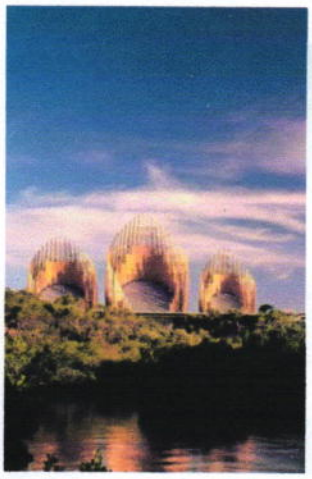
4.1.9Materials:

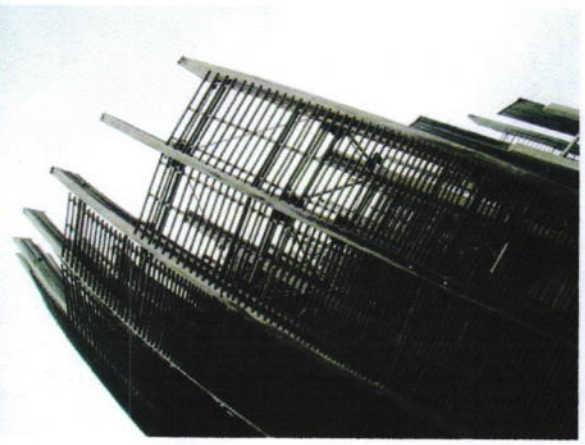
Vernacular buildings are born of intense communion with nature. They used perishable materials and their implementation on the territory is based on a very fragmented.Following these references were used traditional materials and construction systems, and also won the respect of natural elements such as wind, light and vegetation The cabins are built with wooden materials in combination with iroko sober and discreet as steel, glass or cork, which provide simplicity to their interiors. According kanaka culture should have been built with wood from young palms. The wood siding and stainless steel, based on the shape of huts regional kanakas

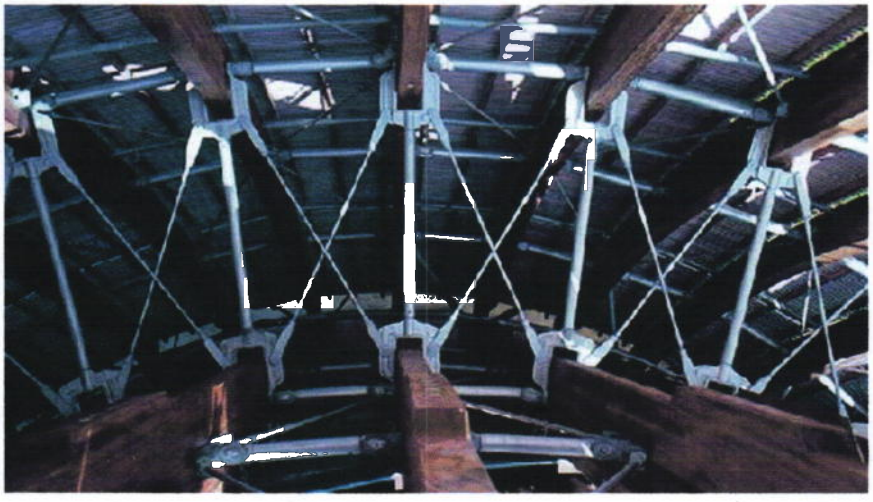
provide protection from the weather when it is needed, but also allows the passage as necessary to ventilate as wind strength and direction.

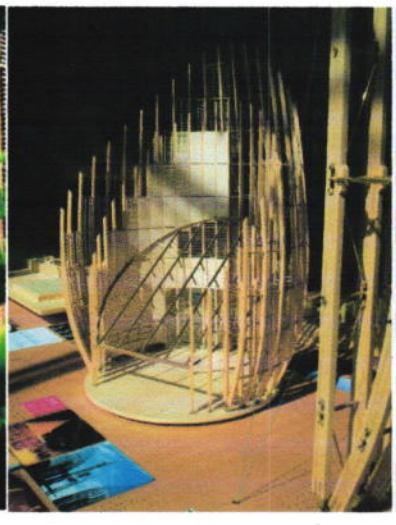
4.1.10 Images:

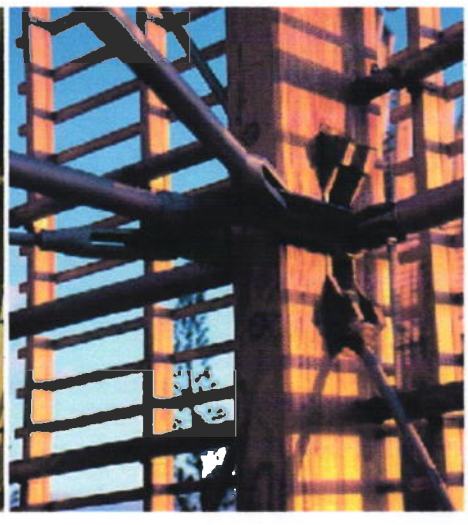




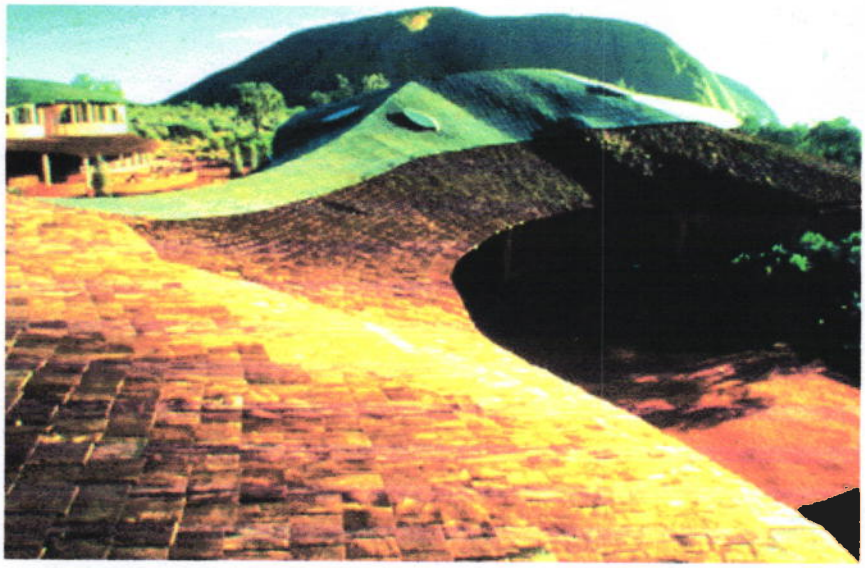








4.2 Uluru Aboriginal Cultural Centre:



Architect_ Greg Burgess Architects

Engineer

Peter Ytrup and Associates

Builder

Sitzler Brothers

Location

Uluru-Kata Tjuta National Park, Northern Territory

4.2.1 Introduction

Located one kilometer to the south of Uluru in central Australia, Uluru-Kata Tjuta Aboriginal Cultural Centre is intended to be a meeting place where the Anangu people of the western desert, the traditional custodians of the national park, can share their stories and traditional laws with visitors to the national park.

Architect Gregory Burgess spent a month with the Mititjulu people, the community of Anangu who live adjacent to Uluru, who explained through stories, song and dance, their culture and landscape. A brief was developed and through sketches in the sand and then paintings, the group developed a design consisting of two sinuous undulating buildings around a central courtyard.

Using natural forms and materials, Burgess and the Mitijulu people have created an uncomplicated but not unsophisticated building. It is not a slick and predictable design, but a building of rough edges, bumps and distortions and natural forms. The design captures the distinctive qualities of the desert and the culture of the Mitijulu people. But it is also a design that challenges the passive consumer experience of the tourist, leaving them with a meaningful understanding of the place and its peoples.

Description - Following the contours of the surrounding dunes, the two main buildings of the centre wrap around a central courtyard. The two parts can be interpreted as representing Liru and Kuniya, two snakes from Anangu mythology, watching each other across the battlefield. The two buildings are joined by curving timber and brush walls creating various outdoor spaces for dances and other cultural gatherings.

The visitor enters the southern building, which contains displays explaining the traditional laws and arts and crafts of the Anangu peoples, and a display describing the joint management of the park. The northern building contains a multi-purpose hall, shops selling souvenirs and take-away foods, offices, storerooms and plant rooms. To the west of the buildings is an outdoor space for dances, which will eventually be shaded by vines and traditional structures. The northeast opens up to a courtyard that frames spectacular views of Uluru.

In capturing the shifting and dynamic qualities of the western desert, so different to the landscape of most of the visitors, Burgess and his collaborators have created an experience where the visitor is constantly crossing thresholds: from inside to out, light to shade, intimate space to endless vista. There is no prescribed movement path and the visitor is constantly faced with choices and options. Each visit, like the desert, reveals something new. Hopefully this will take the visitor out of the passive tourist mode, and stimulate them to pause, inquire, think and learn, leaving the Anangu people's land with an understanding of their culture and the landscape of Uluru.

4.2.2 Structural Description

A range of natural materials and inventive detailing were used in the construction of the cultural centre. The adobe walls that encircle the building act as a thermal flywheel, stabilising the temperature inside the building by absorbing heat during the day and releasing it at night when the temperature drops. These walls are tied to the main structural frame of over 200 round poles. Both the adobe walls and poles sit on foundations of compacted sand stabilised with concrete. Rigid steel frames within the timber structure brace the building.

The main roof structure on both buildings is supported down the centre by an undulating LVL ridge beam, which in turn is supported by timber poles. Plywood gussets and nails connect the different segments of the ridge beam. For the 14 meter span of the multi-purpose room, the LVL ridge is replaced by a truss made of 200 diameter natural poles joined by steel connectors concealed within the poles. At the perimeter the roof structure falls either directly on a timber pole or an LVL perimeter beam spanning between the poles. For larger spans a composite rafter is made up of two radial sawn members nail laminated together.

The rafters spanning from the ridge to the perimeter beam are mostly radial sawn Yellow Stringy Bark with some round pole rafters. The rafters support a roofing system of Blood wood timber or copper shingles on timber battens and plywood.

4.2.3 A Strategy for Design in Timber

4.2.3.1 Radial Sawn Timber

The varying availability of our timber resource makes using the most out of what is harvested an imperative. Greg Burgess likes using timber, which he regards as an environmentally sustainable material, but he wants to get as much resource out of each log as possible. Radial sawing, an old method of milling now adapted to automated operations, involves cutting a log from the outside to the centre to produce wedge shaped segments of timber. This method has two major benefits.

It uses far more of the log than traditional milling methods. With radial sawing 70-80 % of the log is used compared with 30-50% with back and quarter sawing. The Architects estimated three times as many trees would have been needed to produce the roof structure using normal milling methods. With each piece of timber the growth rings are always at right angles to the face of the timber. Since most shrinkage as timber dries is around the growth rings this means there is little distortion when drying, unlike unrestrained back sawn and quarter sawn timber.

This second point is very pertinent to the cultural centre. Most of the timber used in the building came from the wet temperate forests of Australia's east coast. As the timber reduced its moisture content to match the dry environment of the central desert, significant shrinkage and distortion would have followed. The dimensional stability of radial sawn timber greatly reduced distortion and shrinkage relative to backsawn.

In the Uluru-Kata Tjuta Aboriginal Cultural Centre radial sawn timbers were used as exterior cladding, timber grills, balustrades and internal linings, as well as for structural members.

Building with the tapered sections of radial sawn timber presents unique problems compared with square sectioned timber, but with careful and considered detailing there are no barriers to its successful use.

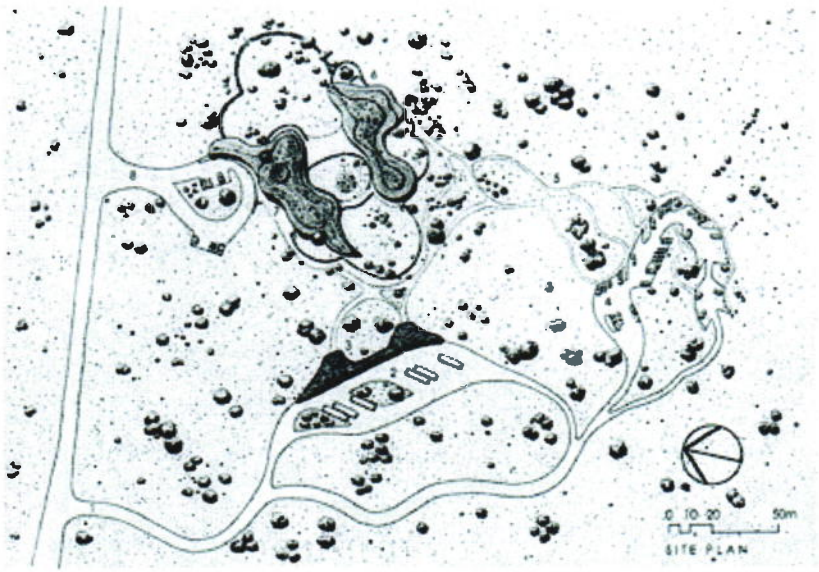
4.2.3.2 Detailing of Timber Connections

An important process in the design of any building is the detailing of the connections that join the structural members. There is no timber structure that does not make use of connections. In contrast to many other materials, timber offers a wide variety in the type of connections. This provides the architect with great scope for creativity in the detailing of joints. However, in designing a joint it is important that consideration be made of the type and species of timber being connected, the structural load on members, durability and fire resistance, the construction process and available skills of the builders, movement in the structure, cost and aesthetics.

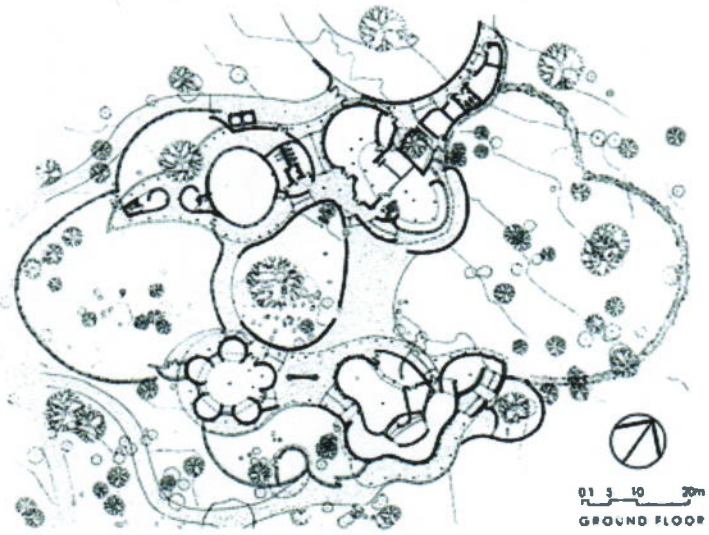
In detailing the Uluru-Kata Tjuta Aboriginal Cultural Centre, the architects and engineers had to take into account its remote location and chose low technology, on site fabricated solutions. For the connection of the radial sawn rafters to the ridge beam, the end of each rafter was back nailed to a plywood gusset, which was then nailed to the LVL ridge beam. Where pole rafters

met pole columns, a ledge was cut out of the pole, on which the rafter sat. The connection was then secured with soft wire looped around the head of coach bolts in all the adjacent members. These simple and ingenious solutions were appropriate to the building process, but also fitted in with the natural, approachable quality of the centre and the low-technology, improvised building tradition of central Australia.

4.2.4 Drawings:

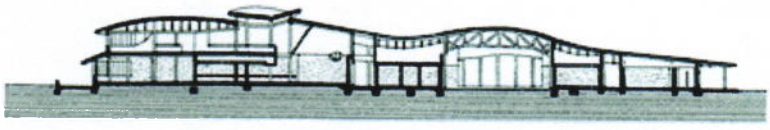


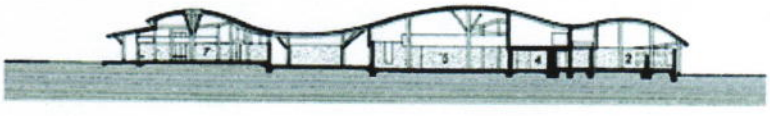
Site plan



Ground floor plan

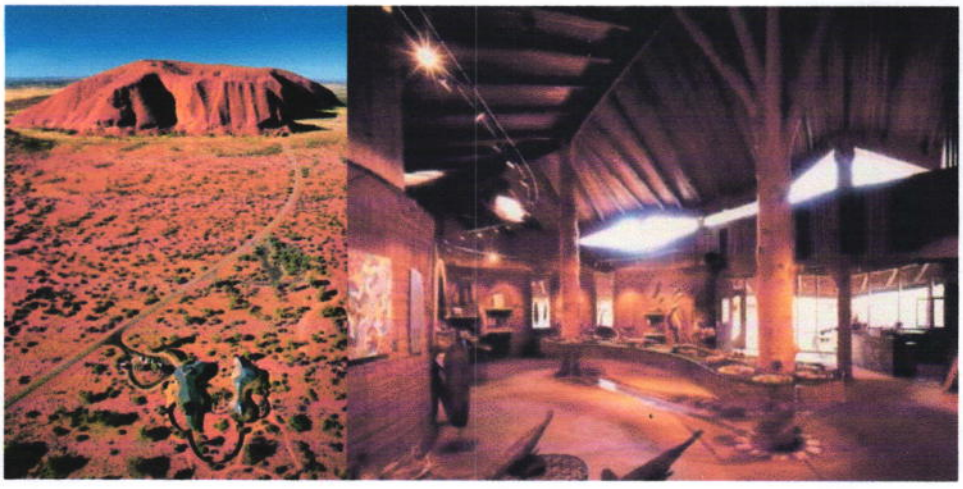
Elevations





Sections

4.2.5Images:



4.3 Nk'Mip Desert Cultural Centre

Architects: Hotson Bakker Boniface Haden architects + urbanistes
Location: Osoyoos, British Columbia, Canada
Principal in charge: Bruce Haden
Project Architect: Brady Dunlop
Project Team: Norm Hotson, Stephanie Forsythe, Tina Hubert, Julie Bogdanowicza
Project year: 2006
Site Area: 1,600 acre
Constructed Area: 1,115 sqm
Materials: Rammed Earth, Concrete, Bluestain Pine Cladding
Structural Engineering: Equilibrium Consulting Inc.
Contractor: Greyback Construction
Lanscape Architecture: Phillips Farevaag Smallenberg
Client: Osoyoos Indian Band
Rammed Earth Wall Sub Contractor: Terra Firma Builders Ltd.

The Nk'Mip Desert Cultural Centre is designed to be a specific and sustainable response to the building's unique context-the unusual Canadian desert found in the South Okanagan Valley in Osoyoos, British Columbia. Sited adjacent to a remnant of the Great Basin Desert (approximately 1,600 acres are being preserved by the band as a conservation area), this interpretative centre is part of a larger 200-acre master plan.

Nk'Mip is the first of a number of new B.C. aboriginal centers, and part of a growing trend to explore the expressive potential of architecture to convey the rich past and the transforming future of aboriginal culture. The practical reasons behind this architectural exploration grow out of provincial leadership-a premier whose efforts to improve aboriginal relations have resulted in changes to the treaty process-as well as a shift in the regulatory environment governing the types of buildings permitted on reserve land. The building features indoor and outdoor exhibits that celebrate the culture and the history of the band, and is designed to be an extension of the remarkable site, and reflects the band's role as stewards of the land.

The desert landscape flows over the building's green roof, held back by a rammed earth wall. The partially submerged building is sited very specifically to focus the visitor's eye away from the encroaching development of Osoyoos to the west, with the height of the wall set to create a

layered view of the desert rising up in the middle ground, receding to the riparian landscape adjacent, and the mountains in the distance.

The attenuated entry sequence from the parking area moves visitors through a series of nested concrete walls up to an entry plaza at the end of the rammed earth wall. The plaza-used for collecting large groups, and signage about events of the day-leads along a low concrete wall that separates the original desert landscape and the building. This route is further defned by channel of water that draws people towards the entry, past the cor-ten steel gate of the service court and administration access. Entry into the interpretive centre occurs at the midpoint of the gently arcing wall. Inside, a theatre and "black box" exhibition space present information about the band and its historical relationship with the land. The round volume of the "pit house" at the centre of the exhibition space invokes the experience of conversation around a fre. From here, visitors move through a glazed wall into exterior exhibit space featuring information on native planting, an outdoor performance area and amphitheatre, a tule mat teepee, a large fgural sculpture, and a snake research area demonstration space. This area also serves as a trailhead for guided and unguided walks along 50 kilometres of paths through the desert. Small interpretive pavilions and a village of reconstructed pit houses and interpretive sculptures punctuate these trails.

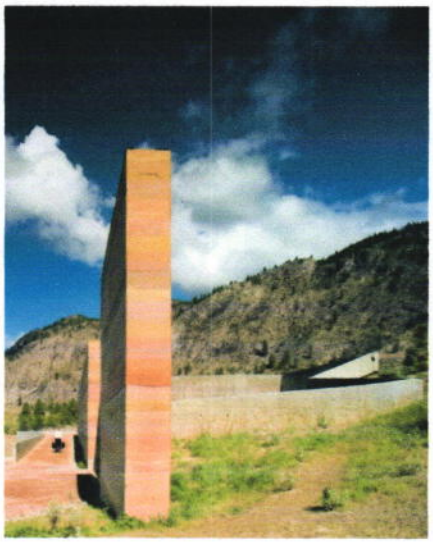
4.3.1 Sustainability Features

The Nk'Mip Desert Cultural Centre is located in one of the most spectacular and endangered landscapes in Canada. It's rare desert condition is the northernmost tip of the Great American Desert, which extends southward as far as the Sonoran Desert in Mexico. This parcel of land is the largest intact remnant of this unique habitat in Canada. It is part of the land of the Osoyoos Indian Band. This band also belongs to the larger Okanagan Nation which extends down into the US (the Okanagan represents a broader geographic area of bands sharing common language with separate constituent bands). The project's concern with deep sustainability grows out of the fragility of this landscape, and reflects the core values and history of the band.

The extreme climate made sustainable design a very particular challenge. Hot, dry summers and cool, dry winters see average temperatures ranging from -18 degrees to +33 degrees and often reaching +40 on summer days. The building's sitting and orientation are the first strategic moves toward sustainability: the partially buried structure mitigates the extremes in temperature,

and its orientation optimizes passive solar performance, with glazing minimized on the south and west sides. The project's ambitious approach towards sustainable design also includes the following features:

- The largest rammed earth wall in North America, at 80m long, 5.5m high, and 600mm thick, this insulated wall (R33) stabilizes temperature variations. Constructed from local soils mixed with concrete and color additives, it retains warmth in the winter, its substantial thermal mass cooling the building in the summer-much like the effect the surrounding earth has on a basement.



- The use of bluestain pine, A recent infestation of pine beetles in British Columbia has led to an excess of bluestain pine, which here is used in interior and exterior applications. Although bluestain pine is a local material not normally specified for finished building use, Nk'Mip is something of a demonstration project, showing how it can be used both inside and outdoors to celebrate its unique visual qualities As its name suggests, the wood has a blue-tinted cast as though a blue wash has been applied, rather than the typical yellow color more typical of pine. Although its inherent structural qualities are equivalent, the preferences of the powerful Japanese international market have historically influenced demand for yellow (white) pine.

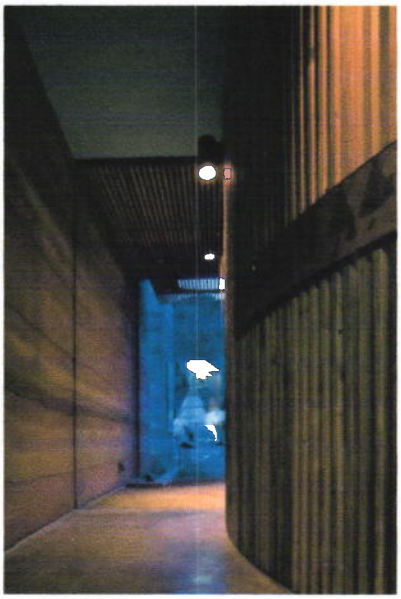
4.3.2 A habitable green roof

This habitable landscaped roof reduces the building's visual imprint on the landscape, and allows a greater percentage of the desert landscape habitat to be re-established on the site (replanting uses indigenous species). The roof also provides further temperature stabilization and insulation.

4.3.3 Mechanical features

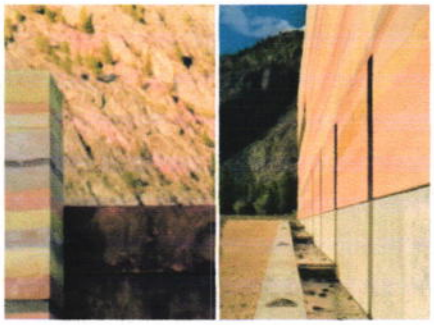
In-slab radiant cooling and heating in both ceiling and floor slabs create an even, comfortable environment that avoids blasts of air, noise and dust. Coupled with 100% outdoor air displacement ventilation, the system will result in savings of 30 to 50% over a forced air system.

- Endangered species research, the building program includes facilities for the band's award-winning rattlesnake research project, as well as public viewing areas where visitors can see endangered rattlesnakes captured, tagged and micro chipped for further study and protection.



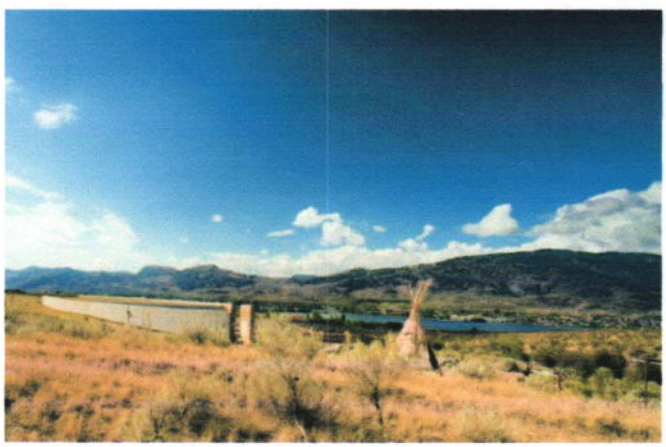
- Careful water use management, water is precious in the desert, and a spare channel of water at the entrance along the rammed earth wall introduces this theme. Less visibly, demand on the site fed well is reduced by 40% by incorporating low-flow faucets, waterless urinals, and dual flush toilets.

- Rammed Earth Wall, North America's largest rammed earth wall gives the building exterior a unique material and poetic sensibility, its graduated layers of earth shades evoking geological sedimentation within a distinctly contemporary architectural language. The wall has the appearance of being at once handmade and precise-its layers irregular, and its overall form sharp and geometrical, (the wall's surface telegraphs the familiar horizontal lines from the wooden formwork used in constructing it) as well as the irregular horizontal strata of the compacted layers of earth used to construct the wall. Rammed earth construction is a traditional building technique found most often in dry regions where wood is scarce. The modern version of this earth-based wall system combines two -250mm withes of compacted sand and cement with 100mm of insulation sandwiched between.



Successive layers of differently colored local soils were placed into the 600mm wide formwork and a pneumatically powered tamper was used to compress each layer to about 50 percent of its unstamped height.

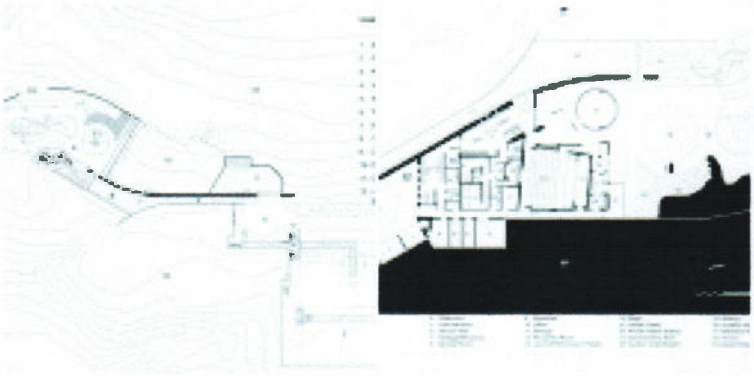
Sedimentary-like in appearance, the exposed surface acts as the finished wall, is extremely stable and doesn't off-gas toxic or greenhouse gas emissions. The technique results in a physically strong, durable wall with excellent thermal qualities-heating up slowly during the day in the hot Okanagan sun, and releasing its heat in the evening.



Sustainability of building process also extends to the involvement of band members on the wall's construction, contributing to the long-term ecological sustainability of the area, of the band, and providing an opportunity to evolve an authentically South Okanagan building technique (something of an antidote to the faux Santa Fe style that increasingly dominates the region).

This project created the opportunity for the Osoyoos Indian Band to develop unique, highly artisanal construction skills as rammed earth contractors and a team of band members worked with the contractor on the fabrication of the wall.

4.3.4 Drawings



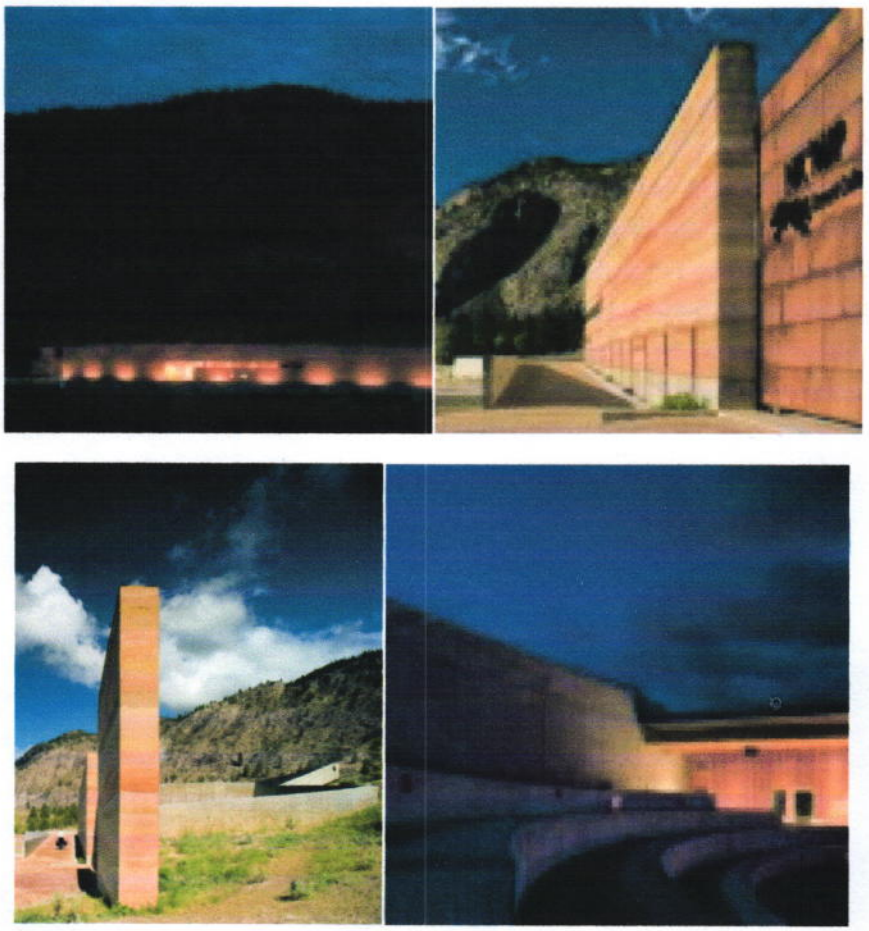
Site plan

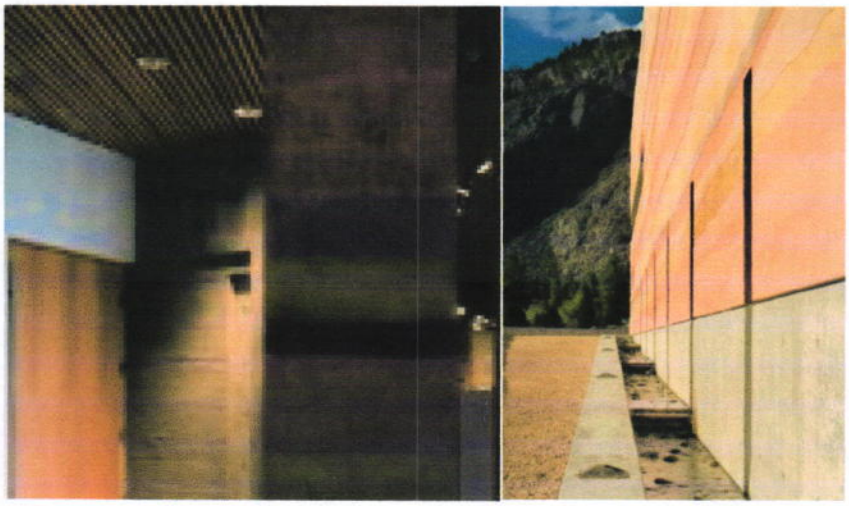
Ground Floor Plan

West Elevation

Section BB

4.3.5 Images





CHAPTER 05: Program Development

PUBLIC

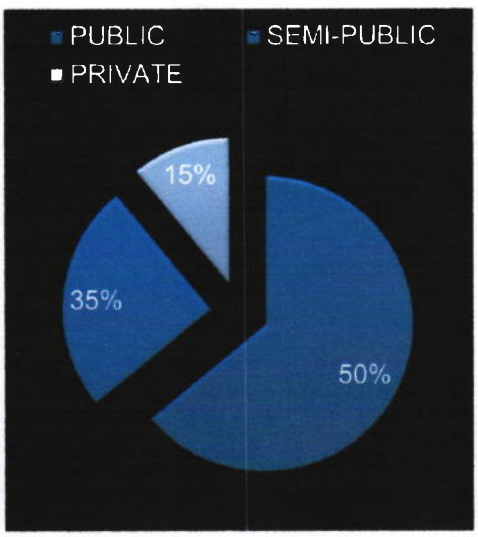
1. Auditorium
2. Museum
3. Gallery
4. Library & Research

SEMI-PUBLIC

1. Administration
2. Guest House

Private

1. Director's residence
2. Dormitory
3. Teacher's residence



Administration

FUNCTION	SPACE	USERS Visitors	staff	AREA sft.	SPECIAL REQUIREMETS
ENTRY & VISITORS WAITING	Lobby & waiting	–	–	600	• Seating for 15 persons
	Information center	–	01	150	
	Toilets (male, female)	—	–	50	
ADMINISTRATIVE PERSONNEL	Director general's office	–	01	400	• With attached toilet
	P. A.'s office	03	01	200	
	Asst. D. G.'s office	–	01	350	• Should be connected with D. G.'s office
	Seminar hall	30	01	800	
	Tea room (Kitchenette)	–	02	200	• With attached toilet
	store	–	–	250	
	Secretary office	–	01	350	• With attached toilet
	Cultural officer	–	01	350	
	Asst. Cultural officer	–	01	350	• With attached toilet
	Account's officer	–	01	300	
	Asst. account's officer	–	01	300	• With attached toilet
	General office & Clerical support	–	12	1600	
PUBLICATIONS	Editor's room	–	01	120	• Open office plan
	Asst. editor's room	–	01	120	
	Toilet	–	–	80	
	Sales center	–	02	100	
	Composer's room	–	02	200	
	Secretarial support	–	04	500	
	Store	–	01	200	
TOTAL		+30% circulation			

Total 8240 sft

Tribal museum and art gallery:

FUNCTION	SPACE	USERS Visitors	staff	AREA sft.	SPECIAL REQUIREMETS
ENTRY & VISITORS WAITING	Lobby & lounge Ticket counter Check room Baggage storage Toilet (male, female)	– – – –	– 02 02 01	1200 150 100 150 50	• Seating for 20 persons
ADMINISTRATION	Manager's office Asst. manager's office Clerical support	– – –	01 01 02	200 180 300	• Open office plan
DISPLAY	Exhibition for museum Storage Art gallery Storage	– – – –	– – – –	6000 300 3000 200	
PREPARATION	Workshop Storage	– –	02 –	2000 600	
TOTAL					+30% circulation

Total 14862.6 sft

Library and research:

FUNCTION	SPACE	USERS Visitors	staff	AREA sft.	SPECIAL REQUIREMETS
ENTRY & VISITORS WAITING	Lobby & lounge Reception Check room Baggage storage Toilet (male, female)	– – – –	– 01 01 01	1000 100 150 150 50	Seating for 20 persons

ADMINISTRATION	Librarian office Asst. librarian office Clerical support Store	-- -- -- --	01 01 02 --	180 150 150 200	
BOOK SECTION	Changing counter Reference Reading section Stacking books-50000 Film, Video & Record collection Store	-- -- 200 -- -- --	03 02 03 03 01 --	200 800 4000 1500 400 400	• Issue & return • Catalogue, drawer, desk, reference book stack • Security controlled environment
DISCUSSION	Multipurpose space	30	02	600	• Projection facility • Lecture or conversation section (participatory)
+ 30% circulation					

Total 10330.9 sft

Cultural academy Total 8000 sft

Cafeteria

FUNCTION	SPACE	USERS Visitors	staff	AREA sft.	SPECIAL REQUIREMETS
ENTRY & WAITING	Lobby & lounge Reception	-- --	-- 01	600 100	Seating for 15 persons
DINING	Indoor Outdoor	50 40-50	03 03	900 1000	• With preferably best view of the complex or

					surrounding s
SERVICE	Kitchen Pantry Store	-- -- --	05 -- --	600 200 200	
TOTAL	+30% circulation				

Total 3708 sft

Open Air Theater

FUNCTION	SPACE	USERS Visitors	staff	AREA sft.	SPECIAL REQUIREMETS
THEATER	Sitting Stage	300 --	-- --	5000 1000	• Integrated with landscape
TOTAL				+30% circulation	

Total 6180 sft

Guest house

FUNCTION	SPACE	USERS Visitors	staff	AREA sft.	SPECIAL REQUIREMETS
ENTRY & WAITING	Lobby & lounge Reception Toilet (male, female)	-- -- --	-- 01 --	1000 100 250	• Seating for 20 persons
ADMINISTRATION & STAFF	Manager's office Staff accommodation	-- --	01 04	200 400	• With attach toilet
GUEST HOUSE	Single bedded room Double bedded room Suit (cottage)	-- -- --	-- -- --	6000 300 400x07 =2800	• -- in number • With attach toilet • -- in number • With attach toilet • 07 in number

					• a full homely environment in a natural setting
SERVICES & FACILITIES	Dining Kitchen + pantry Storage Newspaper& magazine Indoor games	35 -- -- 15 12	04 03 -- 01 02	700 400 200 200 500	• separate service entry
TOTAL				13412+30% circulation	

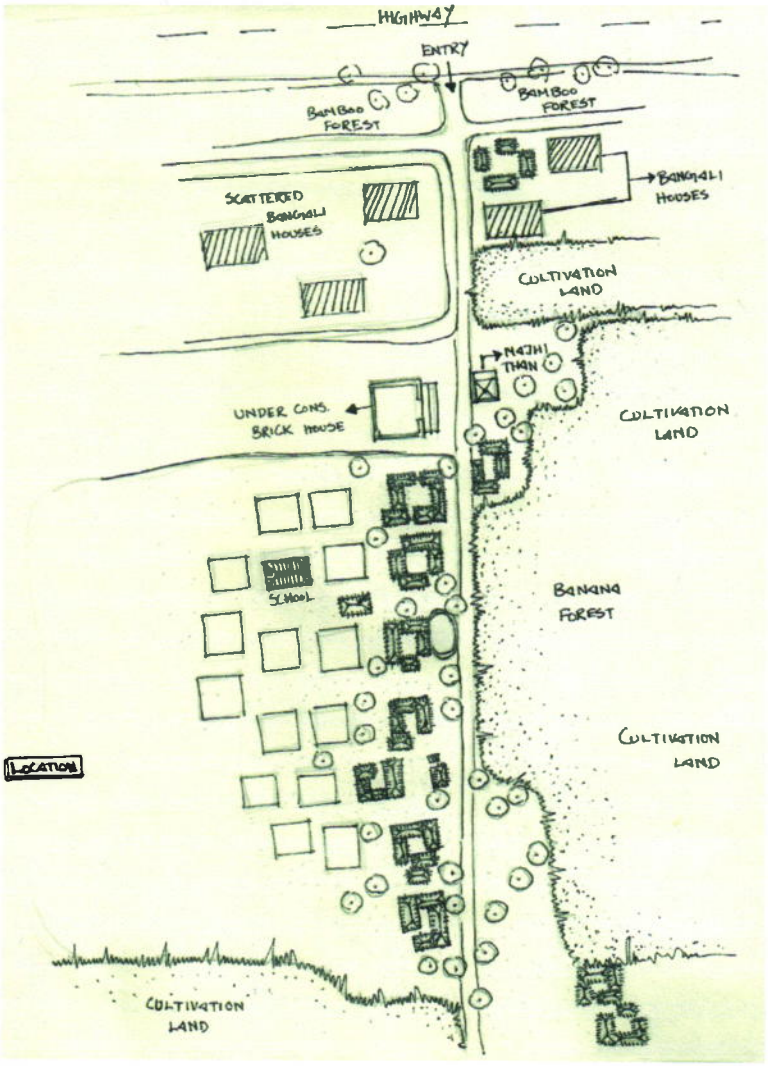
TOTAL SPACE REQUIRED: 76,705.50 SFT

CHAPTER 07: Design Development

7.1 Concept

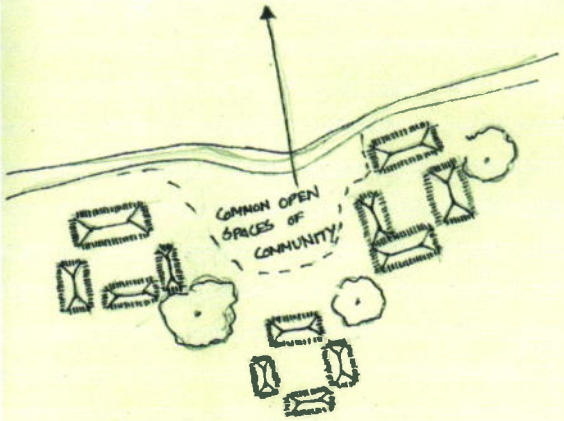
Santal community and its maintained culture influenced the entire design process. Basic concept of the project is representing Santal culture by an architecture which will be clearly distinguished from other cultural center. Form of the project developed by the functional analysis of Santal community from their daily life to the style of celebrating festivals. Solid void ration of different functions gives different dimensions to the form.

7.2 Conceptual Analysis



USE OF OPEN SPACES -
BY SANTAL COMMUNITY..

FESTIVAL CELEBRATION SPACE



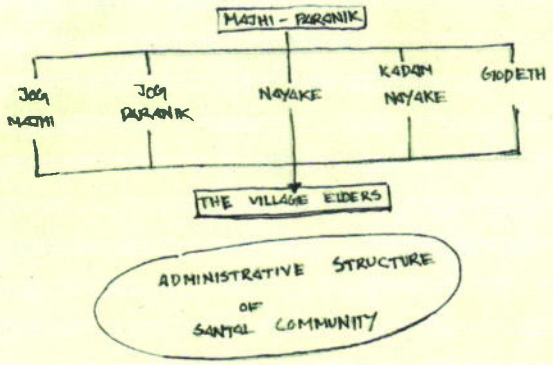
SANTAL FESTIVALS

I) JANTHAR/NABANNO -
OBSERVED @ THE TIME OF HARVESTING.

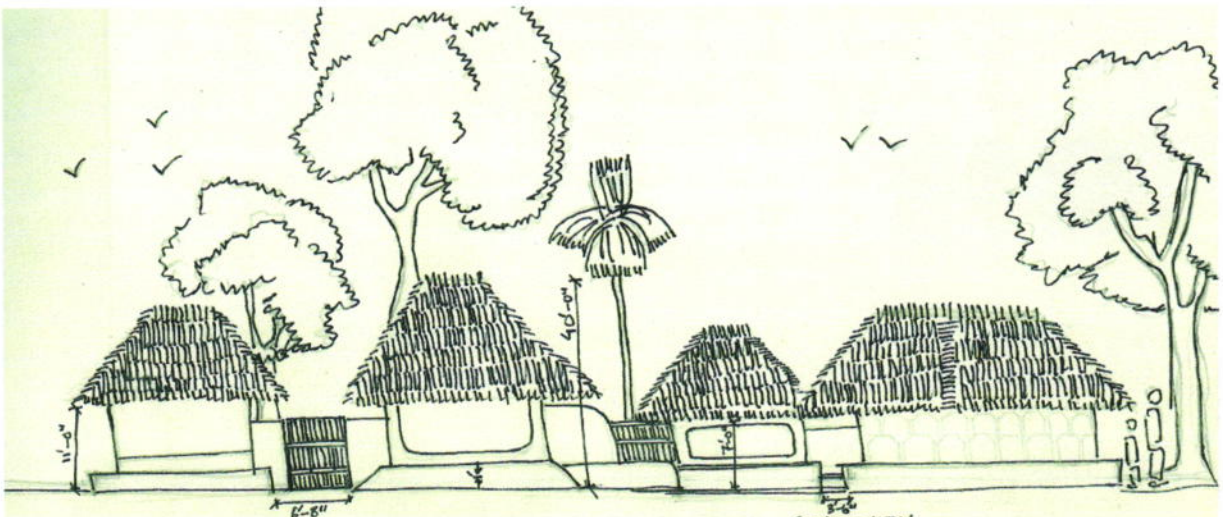
II) ERK SEEM & HARIYAR SEEM -
FESTIVALS BEFORE & AFTER SEED SOWING.

III) MAGH SEEM -
YEAR ENDING FESTIVAL.

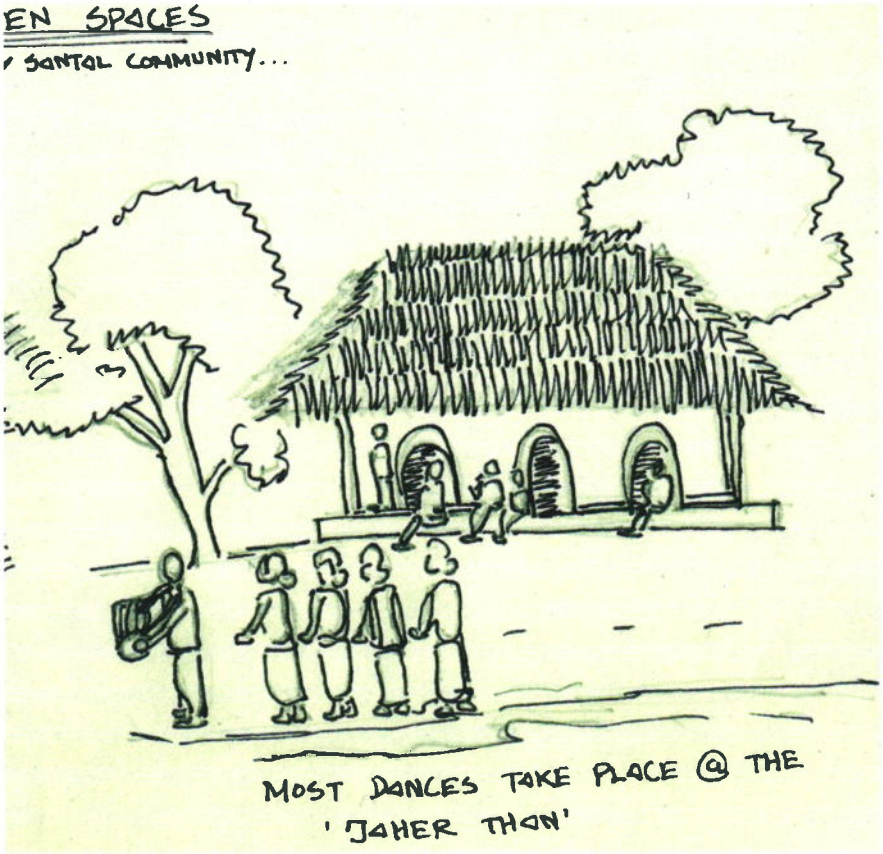
IV) MAKARME - FESTIVAL TO WARD OFF NATURAL CALAMITIES...

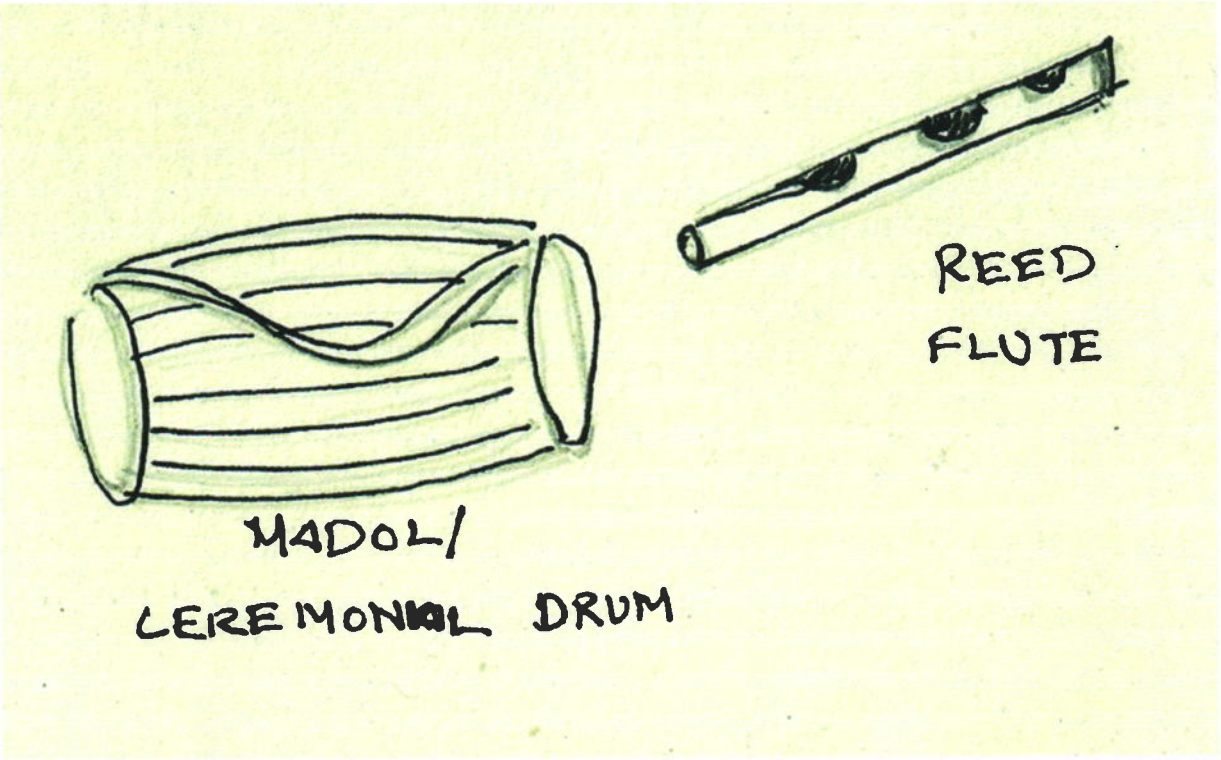


ADMINISTRATIVE STRUCTURE OF SANTAL COMMUNITY

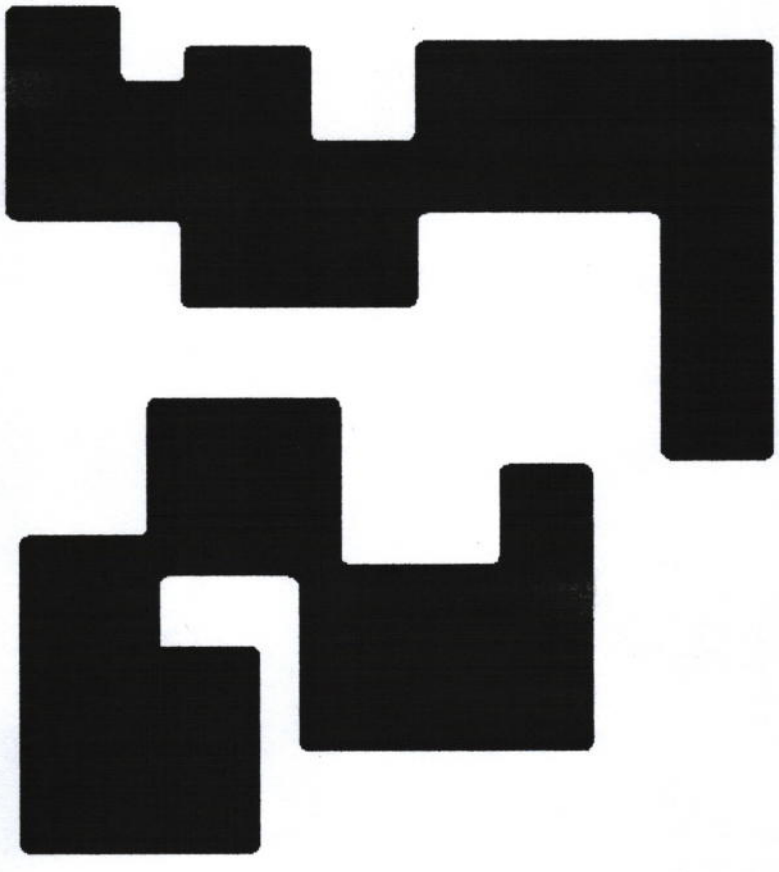


- ELEVATION FROM STREET OF A SANTAL COMMUNITY -

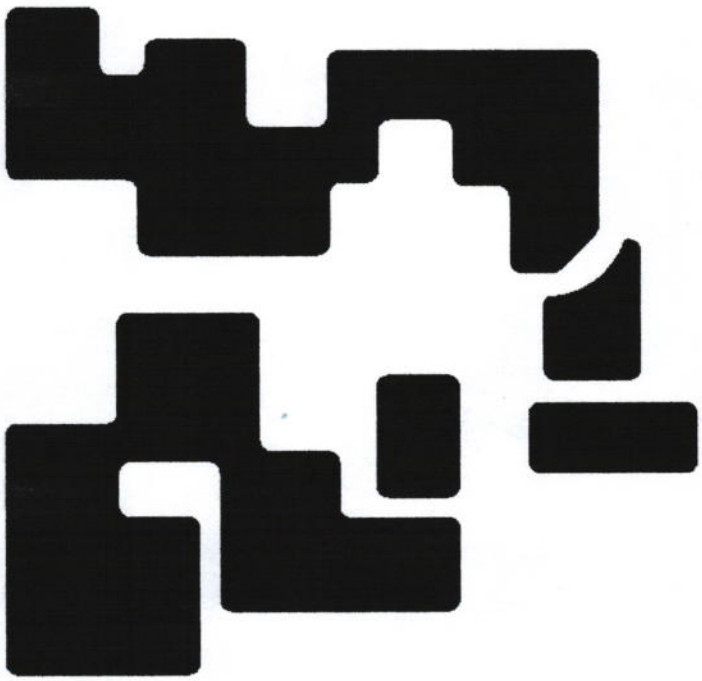

EN SPACES
SANTAL COMMUNITY...
MOST DANCES TAKE PLACE @ THE
'JAHER THAN'



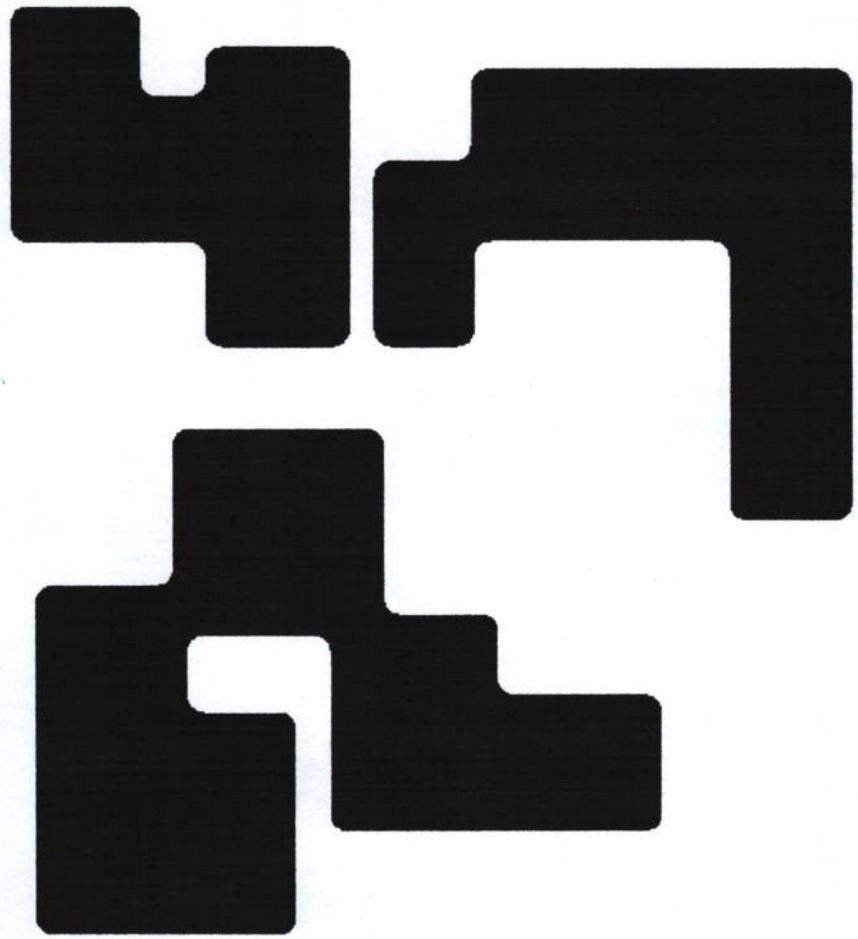
7.2 Form Development



Phase 01



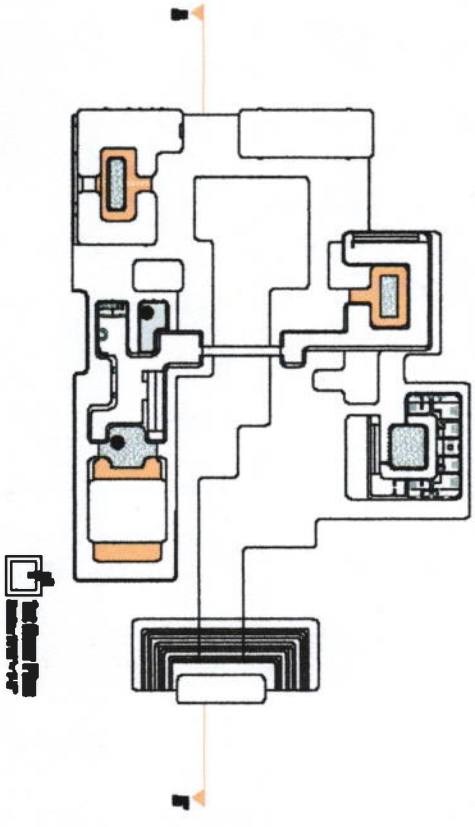
Phase 02



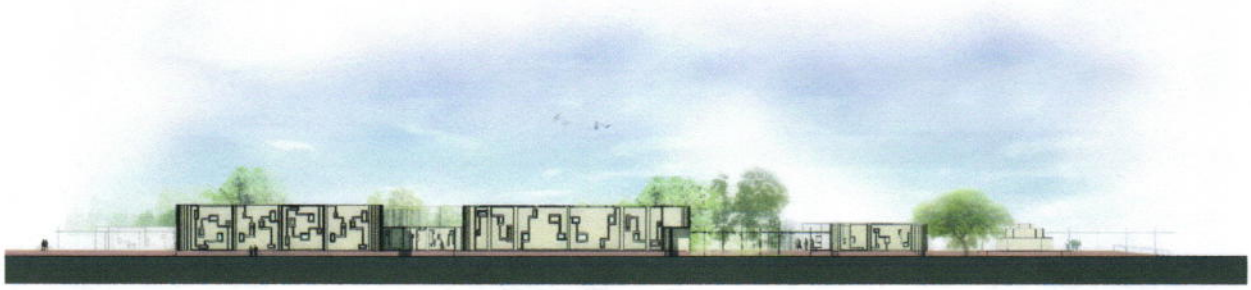
Phase 03

7.3 Drawings

Ground Floor Plan



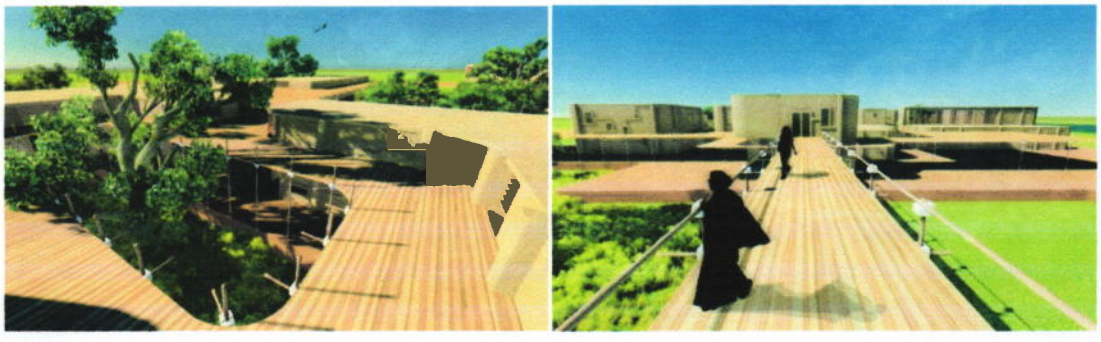
First Floor Plan

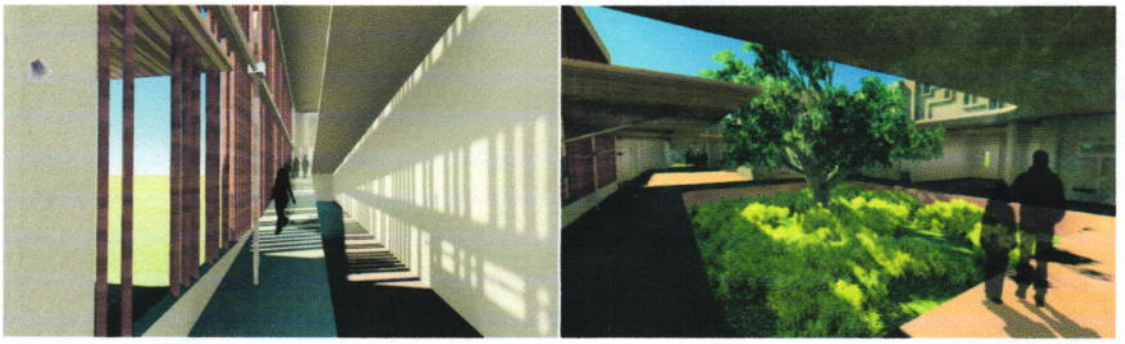


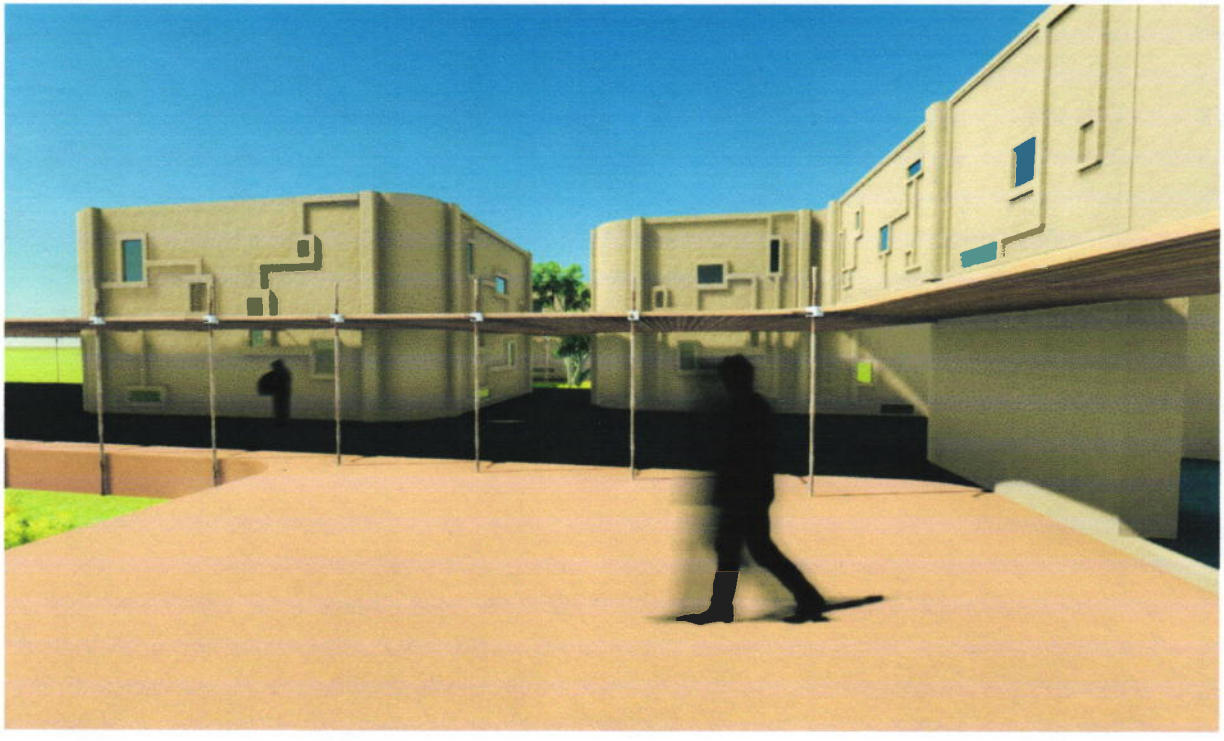
North Floor Plan

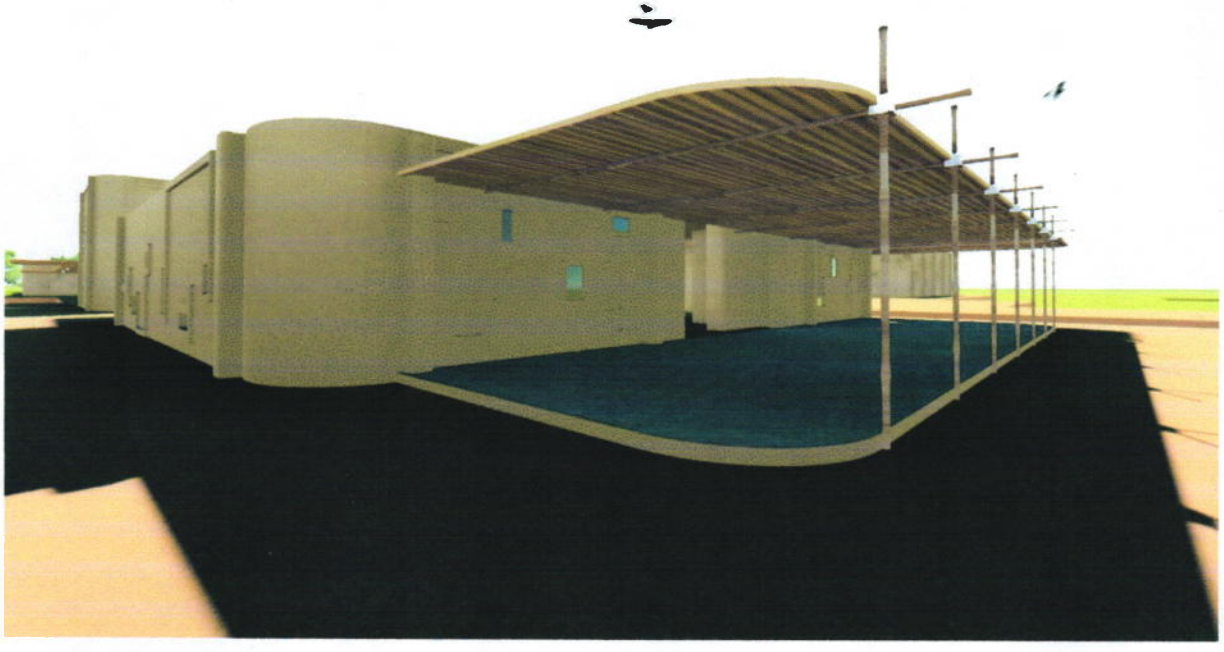
South Floor Plan

7.4 3D Views & Renders









Fahmee 80

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