ALTERNATIVES IN URBAN ARCHITECTURE THROUGH MATERIALS – MATERIAL EXPLORATION CENTRE

By

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A REPORT

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AIKTC
SCHOOL OF ARCHITECTURE

CERTIFICATE

This is to certify that the Design Dissertation titled

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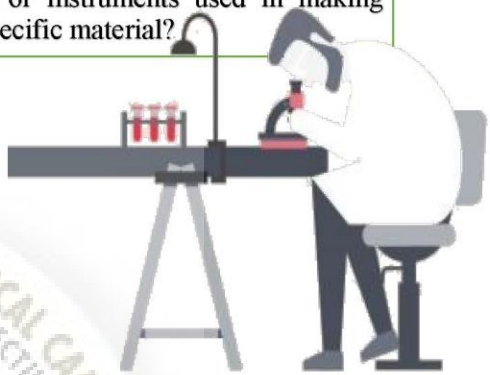
-Aziz .A. Shaikh

IMPORTANCE OF MATERIALS IN ARCHITECTURE

RESEARCH

LABS – Machines or instruments used in making alternatives of any specific material?



EDUCATION

- Material used in history (construction/product making).
- How material used has been changed till today, and how can we use in future?
- Effect of material on environments, and how can we make it more sustainable theoretically and practically, and what its going to cost in future?
- Causing problems due to manufacture or usage of material, and effect of carbon emission from such materials.

MATERIAL

TECHNOLOGY

- Alternative technique with alternative materials.
- Types of materials.
- Materials found in konkan.
- Differentiates konkan and traditional material

1. INTRODUCTION

1.1Background study

Building Material: Significance and Impact on Architecture

It is not just the structural importance and constructional behaviour, but also the visual impact along with the historical value of certain materials that form the essence of the built environment

1. Building materials has been an integral part of the architectural field. The kind and form of a structure is symbolized by the type of material used. The type of material selected deduces a form to the structure. It often induces the concept or theme of the design of the structure and hence the concept of building materials glorifies the importance of endurance and visual quality terms of a design. Henceforth it can be symbolized as a keen requirement of architectural aspects representing its core theme and concept in the architectural building industry. Thus it gives a meaning and aesthetic nature along with being an element of venustas(beauty) and firmitas(structure). The concept Architectural symbolism viz-a-viz building materials clarify the distinction between execution and representation of explorations in architecture.

2. Structural Importance

Building material signifies the structural existence. It demonstrates the presence of aesthetic sense in a design and hence defines the practicability of the structure. The use of building materials in designing of structure symbolizes its existence in the field of architectural visualization. It derives the visual quality and structural stability relationship in architecture. The building material selected by an architect generalizes the type of architecture practised in the construction. The conceived phenomenon of architectural symbolism is not isolated only to significance of changing trends in the architectural field. It is rather defined irrespective of any instinct and control.

Figure 1: Altas Building at University of Wageningen

3 Constructional Behaviour

Architectural aspects have been keen about the techniques of construction as per the kind of concept or theme of the design. These intentions are thus executed as per the kind of construction techniques by adopting different kinds of masonry styles signifying various kinds of architecture. The terminology or naming of some monuments or huge gigantic structures of past have been even influenced by the kind of materials used to build it. The history of architecture takes us back to the time when structures were being built of single piece of building element. And today it developed to such an extent varying from every corner.

Figure 2 Coba-coba Gonzo (Futuristic Pavilion)

4 Visual Impact

Building material even effect the vision of a structure as it deals with the appearance qualities of the structure. It refers to the durability of the structure too. It hence confines the symbolism of structural architecture in the structure built. Building materials shows the quantity and quality relationship as per the character of architecture. Therefore, building materials is important in the regard of architectural symbolism. It even influences the imposed theories of simplicity and complexity in the context of architectural designs. It emphasized the impressions on interests of innovations. It hence completely revolutionized the arena of architecture in creation of iconic structures all over the world.

Figure 3 Taj Mahal

5 Historical Value

Architectural symbolism depicts the kind of architecture used with respect to the function of the building. It is a kind of aspect that literally describes a structure. It is an aspect helpful in conservation n preservation of cultural and historic values. For example, in a religious structural design, the kind or type of building material used depicts the kind of architecture. Like mosques infer to the Islamic architecture and temples take us back to the ancient majestically dynasties' architectural designs depending upon the kind of material used. The kind of material used as the basic element and its availability in the period when the structure was built and its dressing or

technique of the way it has been used, glorifies the kind of architecture and art and customs of that period or civilization over the sands of time.

Figure 4: The Great Parthenon

6 Architectural Symbolism

In relation of sacred places with architecture, building materials symbolises the presence of religious marks on the world map. The kind of symbols used on it shows the time of its erection and tells us about the period in which king's reign it was built. Hence building materials is also acts as a time log between years defining the gradual involvement of art in construction. The unique representation of symbolism in the design itself makes it interesting.

Figure 5: Typical Churches

7 To create Sacred Places

Let it be the sacred places or the structures of religious importance, building materials have contributed greatly in retaining the true aesthetic pleasure of the theme and function of the structure. It is also keeping in firm with the customs and traditions without tampering the pleasing philosophy of the design. It leads a sense of function in utility regularising the pace of aesthetic pleasure with practicability. This sub-merging had made people experience amazing mystic features in a design to a great extent.

Figure 6 Sacred Place

8 Architectural Building Elements

The elements of a building structure are typically based on the kind of materials used in it. Every division of a space designed includes the main theme or concept of the structure. Every element of the building is related to the other in terms of concepts of colour or the dressing and outlook of the element depending upon the building materials. The architectural elements are unique enough to themselves with respect to the elements of architecture on the foreground of building materials. There is some particulate material generally used for a typical element. The materials often used for an element also sometimes contribute to its terminology and hence takes essential aspects in the kind of architecture practised. It brings out the theme and concept of the design of the elements of construction of the building project and hence is also of keen importance as

building materials as a part of Architectural building industry. The unique representation of selection in the elements of the design itself makes it interesting.

Figure 7: Historic fire Station, Tacluda

9 Site and Site Selection (Type of Project)

It is important to be informative about the site details before undertaking a building project for an architect. It is because an architect has to integrate the design of the building with its surroundings with the help of his aesthetic knowledge. The intellectual ability of building materials is used while the process of site selection. The availability of materials and need of the kind of materials used in construction greatly influences the architectural designing of a space. Hence it is the important aspect of site selection as in relation to the architectural building project. Therefore, building materials selected according to the availability of them in accordance to the site also affects and impacts the design.

10 Low cost Building Techniques

The total expenditure of the construction of a structure is very much connected to the materials used. An architect selects the kind of materials used according to the budget of the building

project. The cost of the total building construction can be increased or reduced in an impactful manner depending upon the techniques of construction. It is again in terms of the masonry kind adopted appropriate with the way of type of architecture practiced which is in fact with the building materials. Therefore, according to the requirement of the client, an architect manages the cost of building project by the type of building techniques in terms of the type of architectural masonry he adopts by choosing the appropriate and adequate building materials. And hence, it may also say that building materials influence and affect the budget and cost of a building project depending upon the building techniques adopted by the architect.

11 Inter-relationship between Quantity and Quality

The buildings materials inter-relate quantity with quality. The choosing of materials refers to the quality of the elements but in relation with the quantitative aspects depending upon the kind of design. It influences the qualitative as well as the quantitative assurance of the design of a building project. It creates an impact of aesthetic sense with respect to the endurance and creation of a structure and hence relates the technical aspects and structural aspects of a design of a built environment all together. Hence, it relates the philosophy of view along with the structural stability of the Architecture.


16 Materials YOU Need to Know (And Where to Learn About Them)
Bamboo
Wood
Concrete
Waste
Plastic
Steel
Straw
Organic Materials
Glass
Stone
Carbon Fiber
Earth
Textiles
Brick
Photovoltaic Cells
Kevlar

INTEGRATION OF VERNACULAR AND MODERN IN THE CONTEMPORARY DESIGN

Vernacular traditions lead a way towards the sustainable built environment. The valuable lessons from vernacular can be integrated with the modern to produce sustainable designs. Vernacular traditions can also be used as a design tool for slum re-developments. The designing of these settlements need understanding users' way of life, social and cultural values. LIC housing by Charles Correa, Anandgram by Kamath Design Studio in India are few examples of integration of vernacular and modern. Architects like Louis Kahn, Lourie Baker, B.V. Doshi, Shirish Beri, Revathi and Vasanth Kamath have incorporated the principles of vernacular traditions in their contemporary buildings.

Anandgram in Shadipur, Delhi is selected as an example of resettlement. It is designed by Kamath Design Studio, Delhi, India in 1983. Architect Revathi and Vasanth Kamath their work is a creative synthesis of attitudes and technologies into an aesthetic habitat and a way of life. They believe in using natural resources and utilize them to the most and are on a mission to substitute concrete, cement and energy-consuming systems with sun, water, wind and soil. Ecology must be understood to encompass both nature and culture (kamathdesign.org). The settlement is designed for traditional community of performing artists and craftsmen in their own traditional pattern by integrating values, customs, rituals, beliefs and lifestyle. The challenge was to provide the built-fabric in relation to the urban form. It is one of the best examples of reflection of culture in architecture in the contemporary design.

The changes in culture and architecture are reciprocal. The impact of one is reflected on the other. India's rich cultural heritage is vanishing due to the influence of urbanization and globalization. In order to protect and conserve our rich cultural and architectural heritage the elements of vernacular should be incorporated in the contemporary planning and architecture. The provision should be made to incorporate vernacular architecture and traditional knowledge in the policies. The policy makers, planners and architects should consider this in their work for betterment of society. By learning and appreciating the principles of vernacular architecture and integrating them with the contemporary knowledge and technology.

"Quality of life is enhanced through good architectural design which responds to the needs and wishes of users and use of natural materials and good urban design which allows creation of green spaces and reduction of noise and pollution." -Birkauser,

BUILDING FOR A GREENER WORLD

The gleaming skyline of a city is living being with its chrome glass & concrete extravaganza. Skyscrapers proclaim a city that has joined the ranks of elite but at what cost???

Today climate change is one of the threats to our planet & in this environment crisis buildings & urban construction insidiously emerge among most menacing offenders.

Buildings use much energy as vehicles consuming 30% of the world's total energy & 16% of water consumption .By 2050 they could go beyond 40% emitting 3800 megatons of carbon, main cause of global warming.

Today in the era of globalization-privatization, the advancements in field of science and technology have boosted the trend of modernization in architecture as well as planning, there by totally changing the housing typology, pattern and construction techniques to be used. As a result vernacular built forms and traditional construction techniques using local materials are disappearing. Rural housing also has not been exempted from impact of privatization and developments in construction techniques. The planning principles adopted in rural areas taking into account local context in terms of climate, environment, and vernacular construction technique and lastly the culture and tradition of the region are losing its importance in society and are being forgotten for the time being. However observing the production of monotonous concrete jungle without considering the context in cities due to impact of inflation in land values, it is necessary to revert back to architecture and planning principles adopted in rural housing where thought to social cultural, physical and last but not the least economic factors in design of housing pattern is given thereby enhancing the spatial quality. The future architects and planners should study and take into consideration the relationship of Indian traditions in various context, their respective settlement patterns and housing layouts and try to bring the same in developing urban and semi-urban zones, or conserve the built areas subjected to real estate pressure, so that it is suited to Indian psychology and environment. This will not only revive the local tradition-culture in respective zones but also save the traditional or vernacular built fabric from effects of Globalization!

Humanising Architecture through Innovations

Diagnosing the much needed discussion on Sustainability across various typologies and perspectives, this essay focuses on the idea of 'innovation' and 'transferability' or, in other words, scalable models, replicable technologies and alternate methods of construction.
Text: Anusha Narayanan

"It has been 40 years since the first oil-price crisis, 20 years since the inauguration of the term 'sustainable development' by the Brundtland Commission, and five years since the financial shock of 2008. What is the state of sustainable construction? The inconvenient truth is that, although a lot of things have been discussed, little has changed in the last 40 years about our everyday behaviour or the way we construct and operate buildings."
– Hansjurg Leibundgut

The call for an ecological way of life after the industrial revolution is perhaps one of the most impactful changes in the design attitudes and acumen the world over. Examining facts, theories, philosophies and practices from various perspectives, 'sustainability' today is more than a metaphor. It is about being functional and ecological, and yet not socially disconnected or contextually irrelevant. Innovative solutions to ecological problems do not just refer to mechanical solutions that look alien or are inappropriate within the climatic context of a region but just original approaches to design that yield better performances. It does not literally have to be a translation of Corbusier's statement that, "a home is machine to live in", in a contemporary avatar. It also does not refer to systems or structures that act as an appendage and are exceedingly out of place. The parameters of contextualism, universally endorsed design principles, environmental performance and resource management, all hold true for buildings that respond to sustainability through innovations. But those built environments that display a peculiar or unique technological, systemic or methodological difference in approach from the conventional, are what we shall trace by means of this classification.

'Innovation and technology' is perhaps the most identifiable or perceivable attribute of sustainable architecture. In Juhani Pallasma's2 words, "In fact, the purely visual understanding of the art of architecture may never in history have been more dominant than in today's architecture of the commercialised image, reinforced by the digital media and world-wide journalism. Even sustainability is most often judged by the eye as an aesthetic and symbolic aspiration rather than through an analysis of the actual performance." By 'innovation' we refer to breakthrough technologies, systems and methods of construction which can be implemented in order to reduce the ecological impact of a building.

'Transferability' is the adaptability/scalability of these innovations through bigger modules or more easily replicable elements, concepts, techniques and systems. Together 'innovation and transferability' can be classified into: (1) **Intelligent planning concepts**, (2) **Innovative systems and technologies**, and (3) **Alternate methods of construction**.

Intelligent planning: The Kanchanjunga Apartments in Mumbai by Charles Correa Associates makes use of double-height balconies, a reinterpretation of verandahs, for a layered reading of space that creates comfortable living conditions in the units.

(Image: courtesy Charles Correa Associates)

"Even sustainability is most often judged by the eye as an aesthetic and symbolic aspiration rather than through an analysis of the actual performance."

Design decisions made at the inception, later define the entire ecological ethos of the building falling under the classification of **intelligent planning concepts**. Most of these design interventions are usually derivatives or adaptations of traditional wisdom which help reduce the energy consumption of buildings through passive methods. **Kanchenjunga Apartments** by Charles Correa Associates is an apt example of an architectural idea that was way ahead of its time. Kanchenjunga was a breakthrough in unconventional approaches to housing, revolutionary when it was built. It not only rearticulated the layered protectiveness of the verandahs, a post-colonial design influence, and double height balconies, an innovation of the architect, but also referred to an escalating urbanisation and the changing climatic conditions of the sprawling city of the then Bombay. "A building has to be rooted in the ground on which it is built" as Correa said in one of his recent lectures, planning itself can make a building viable for the environment it is built in.

Later examples of planning such as the Oberoi Udayvilas by Abhikram and the Islamic Study Centre by Yashwant Mistry also display forethought in innovation. While the former makes use of indigenous and traditional concepts like clustered planning with numerous interconnected courtyards and lime-based mortar and plaster instead of cement mortar for binding; combining a traditional style of architecture with modern functions, in not just the aesthetics but also the wisdom of designing passive climatically responsive systems, thus reducing the embodied and the consumed energy of the hotel; the latter uses structural principles in tandem with design such as the use of mortar-less brick vaults held by their own compressive strength, the use of semi-circular wind turrets for inlets regulating the ventilation and microclimate of the buildings through passive cooling and water moats which run around one of the structures for evaporative cooling. They both reduce the materials needed to run and maintain the structures thus effectively enhancing the economic and ecological performance of the building better than so-called 'advanced' buildings.

However, it is important at this juncture to understand that efficient and innovative planning alone cannot address the entire ecological responsibilities of a building. In most cases, including the above mentioned examples, intelligent planning works in tandem with innovative systems and technologies or alternate methods of construction in order to build upon what has already been achieved by planning. For instance the Pearl Academy of Fashion in Jaipur by Morphogenesis uses orientation to the sun, usage of a louvered façade based on shadow analysis, appropriate buffering of usable spaces through corridors and enveloping verandahs that cut off the heat transfer, circulation of natural air through self-shaded courtyards and staircases, for maintaining a healthy environment inside the institute.

Intelligent planning: At The Pearl Academy of Fashion in Jaipur, by Morphogenesis, self-shading sliver courtyards keep the sun out and help regulate temperature and day-lighting of the study areas. The perforated outer skin is derived from computational shadow analysis, based on the orientation of the façades.

(Image: © Edmund Sumner)

Similar projects that satisfy intelligent planning as well as innovative structural systems and technologies and combine the two to formulate buildings that sit lightly on the earth are the Healthcare Centre at Dharmapuri by Flying Elephant Studio and the Centre of Hope by Hundred hands which we shall elaborate in detail, further in the essay.

Intelligent Planning + Innovative Systems: The Primary Healthcare Centre at Dharmapuri by Flying Elephant Studio combines the universal design principle of favourable orientation with the subtle layering of spaces, providing a louvered verandah enveloping the inner building to buffer the heat and sun out. An inverted roof further helps collect rainwater.

(Image: courtesy Flying Elephant Studios)

In 'Reinventing Technology Locally Hansjurg Leibundgut articulates, ***"We have to accept the progress of technology, but we also need a new technological revolution, one based on local materials, manufacturing, and energy resources. There neither is a uniform global policy that will effectively achieve sustainable development, nor should such an approach exist for sustainable development."***

It caters to the aspirational needs or the greed and thirst of the consumer who feels a misplaced sense of pride and sophistication in owning a property in one of the many 'greenest luxury towers of the world', with almost no background on the impact of their investments in wasteful designs or the word 'sustainability'.

It is a common observation that the architecture of office buildings has somewhat been reduced to a play of façade and lighting design and repetition of a wrongly perceived 'sophisticated' glass façade that negates buildings into towering greenhouses. Unsuitable for our country, and more so because of the pretense of modernity put in front of the society, the fully transparent commercial and office towers devoid of sunshield act as solar collectors. The heat collected is then thrown out with air conditioning instead of any amount of evaporative or passive cooling, depending mostly on mechanical systems making these towers expensive and heavy. The export of these glass towers from the West to Asia, and especially the gulf countries is one of the most unhealthy and unsustainable developments of the last century. They consume far more energy and stand dumbly before the issues of environmental depletion.
However, office buildings like the KMC Corporate Office in Hyderabad by Rahul Mehrotra and Associates break this stereotype of office architecture. Its steel and glass structure with an RCC framework, uses a double layered façade, a cast aluminium trellis with creepers growing a top with integrated mist irrigation, and a dedicated group of twenty gardeners employed for the regular upkeep of the façade. The entire system effectively cools the building and shows environmental and economic responsiveness as well as innovation, a positive approach to sustenance which is congruent with the region. 321 Tardeo, by sP+a (Sameep Padora and Associates), incline towards a more visibly 'technological' form but essentially implement the same concept of vertical landscaping with a slight variation. 321 Tardeo uses a double layer again, creating planters on each level which cover the outer façade of the building allowing the greens to grow over a period of time and cover the façade with creepers. This will, as in most such cases, reduce the heat transmission into the interiors of the building helping in keeping it cool naturally. Contextually however, the KMC Office Building reads as better fit in its own surroundings nevertheless 321 Tardeo, cannot be disregarded because of its visual semblance to a universal image of green architecture based on technology; both do their part efficiently in introducing an innovation in office towers. On the flipside, passively cooled buildings such as the Torrent Research Centre in Ahmedabad also set a benchmark in innovative sustainable practices. The Torrent Research Centre has a detailed and complex designated ventilation system, using wind towers on a project of such a scale as opposed to niche residences. These towers work as a series of inlets for channelising air and reducing energy consumption to such an extent that over the period of the past thirteen years, the project has saved enough energy in order to breakeven its cost of construction and maintenance.

Alternate Methods: The Samode Safari Lodge by Pradeep Sachdeva Design Associates adopts traditional vernacular systems of architecture from surrounding villages and combines this with a Ferrocement skin to reduce the brick and steel used for construction.
(Image: courtesy Pradeep Sachdeva Design Associates)

Innovation, in terms of not just new unconventional techniques of using traditional materials, but also **alternate techniques that use unconventional materials**, is necessary as they encourage a new thought process in sustainable building construction. The Samode Safari Lodge by Pradeep Sachdeva Design Associates and the Centre of Hope by Hundred hands do the same using familiar materials but in inventive ways to produce architecture of value. While the former hospitality project uses local timber roof with a structural framework on which Ferro-cement skin is laid, cutting down on the overall steel and cement used; the latter uses vaulted brick roofing and filler slabs to reduce the cost of construction and maintenance and increase the efficiency of this relatively low-budget facility for an NGO. The Healthcare Centre at Dharmapuri by Flying Elephant Studio (Holcim Award for Sustainable Construction, 2011) was also designed in a low budget, with a small footprint as a double layered building, wherein an airy verandah running around the 'building within the building' in conjunction with orientation to the sun cools the interiors, and an inverted pitched roof with a central gutter collects rainwater. These examples illustrate successful **alternate techniques** using familiar materials; systems with which some improvisation can be replicated on to projects of diverse scales and in similar regions.

Alternate Methods: The Centre of Hope Orphanage in Chennai is located in the hot and humid equatorial climate of Chennai. It uses shaded terraces, filler slabs and brick vaulted roofing to build within a low budget and yet produce well-ventilated spaces.

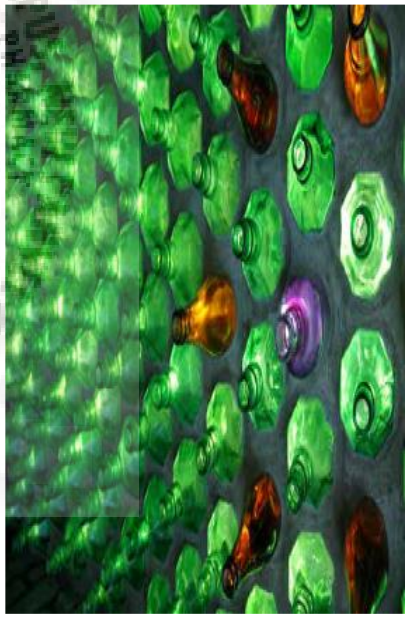
(Image: courtesy Hundred hands)
However, some **alternate construction methods** are still experimental and are restricted to projects of smaller scales because of issues of scalability and thus cannot be called 'transferable'. Nevertheless, it is critical to discuss them although they are not mainstream as yet, because of their potential with advancements in research and development. Stabilised earth blocks, compacted earth walls, bamboo posts and corrugated roofing sheets, bamboo prefabricated panels, thatch, terracotta hollow blocks and fly ash bricks are some alternate materials apart from recycled or reclaimed materials like wooden posts, panels, flooring, mosaics and tiles. The Anangpur Building Centre by Anil Laul is widely regarded as a work that made the paradigm shift towards exploring alternate methods of construction and successfully so, ahead of its time.

Built with respect for the natural contours, the use of local stone and twisted brickwork, masonry built furniture, space frames, arches, domes and vaults as structural systems and a cohesive attempt for minimisation of construction material longside an ecologically rational architecture, compel us to look towards it time and again and be inspired; as does the Manav Sadhna Activity Centre and Creche in Wadaj by Footprints E A R T H which ingeniously recycles municipal waste in order to create affordable housing and address environmental pollution. Filler slabs using glass bottles, plastic bottles and bricks, stone slabs, cement bonded particle boards, clay tile covers and roofs and G I Sheets for roofing and many such recycled materials have been used to create an open campus used by the people as a community space.

(Image: courtesy Anangpur Building Centre)

Alternate Methods: The Anangpur Building Centre has time and again been a source of inspiration for site planning and architecture that blends with the ecology of its site. The recycling of materials and alternate construction techniques like vaults, domes and arches rationalise the use and reuse of such architecture.

Alternate Methods: The Manav Sadhna Activity Centre embodies experimentation in sustainable architecture, using municipal waste to create filler slabs and walls, scientifically tested to be eco-friendly, providing economical solutions.



(Image: courtesy Footprints E A R T H)

However, some alternate construction methods are still experimental and are restricted to projects of smaller scales because of issues of scalability and thus cannot be called 'transferable'. Nevertheless, it is critical to discuss them although they are not mainstream as yet, because of their potential with advancements in research and development

With a more practice-centric approach to the discussion of sustainability let us consider **some practices that are dedicated to this exploration of alternate methods.** Mansaram, a Bengaluru-based firm, principally takes the approach of ’responsive creativity/creative

responsiveness' as they term it, using bamboo as their main material for construction. The Earth House at Bengaluru built in stabilised earth blocks, corrugated bamboo sheets and solar panels on the sloping roofs and Bamboo Symphony, reinventing bamboo as crete walls from prefabricated panels alongside stabilised earth block walls and a green roof made of bamboo lattice grid on supports, substantiate this effort of using the 'house as a research project' and a functional one at that. Inspiration, a Kochi-based practice, among other initiatives, also looks at 'bamboo prefab' as a system of construction using a combination of prefabricated bamboo panels alongside minimal steel and concrete to replace parts of the structure with bamboo. The Inspiration Office building implements engineered bamboo construction as a predominant system is perhaps one of the largest successfully executed cluster of contemporary buildings in bamboo, although not entirely. To counteract moisture and bio-attack in the tropical rainforest climate of Kerala, the buildings are compelled to stand on RCC stilts for protection and longevity, nevertheless reducing the use of steel and cement by 70-80 per cent and its own self-load by 50 per cent.

Alternate Methods: The Inspiration Office in Kochi employs a composite system with RCC stilts, combining bamboo and concrete in structures and using ecological materials as much as possible in the moisture and bio-attack prone region of Kerala.

(Image: courtesy Inspiration)

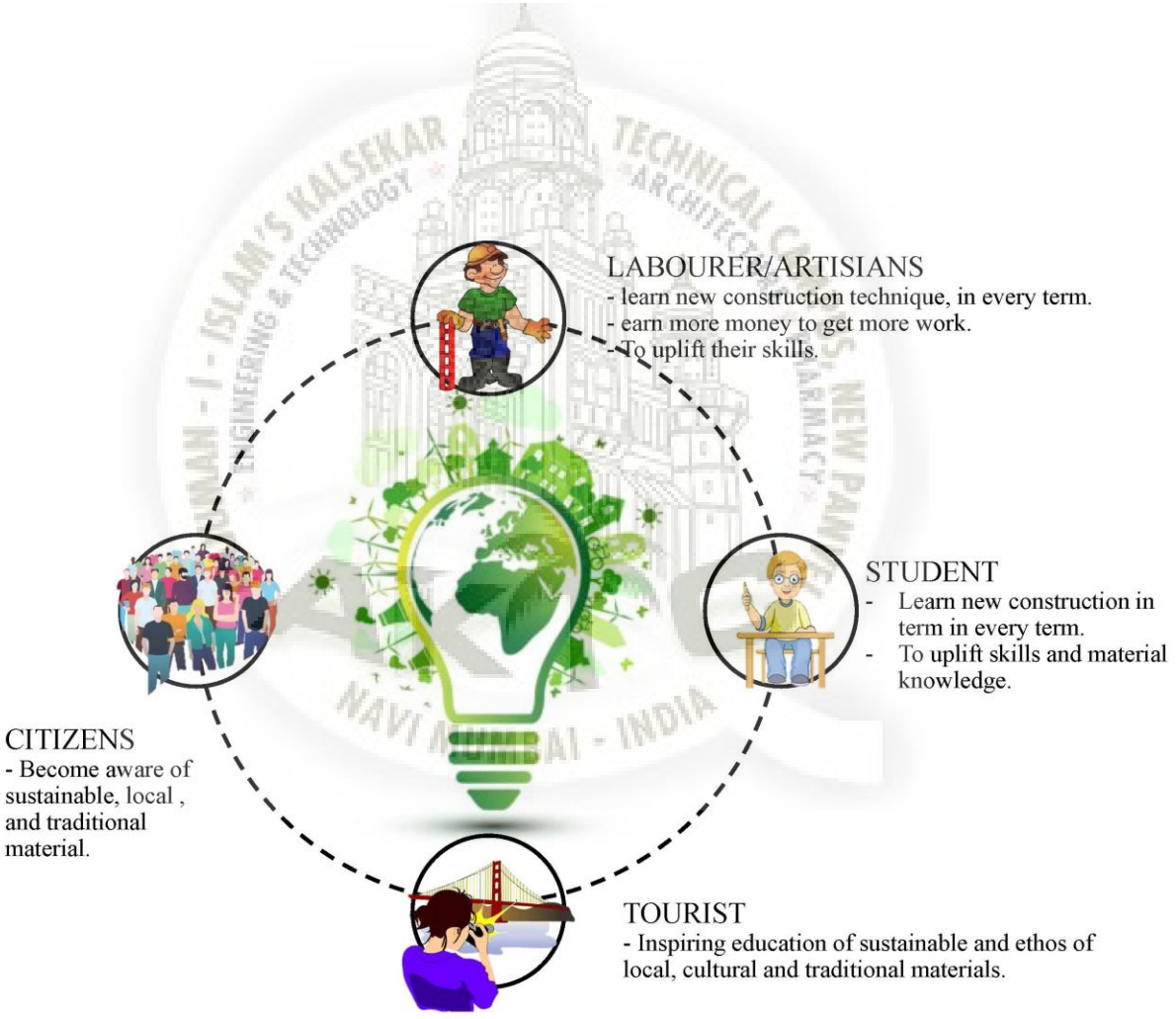
ABSTRACT

In India, most of the cities (urban fringe) have lost or losing their traditional usage of materials & architecture. Cities such as Delhi, Jaipur, Chennai, Hyderabad, Bangalore, & Mumbai have lost their essence of traditional architecture in the past. Konkan region which also includes Mumbai as a major city also acts as a financial hub of country, stretches from Palghar (North of Mumbai) to the sindhudurg & some parts of Goa. Although, Konkan has some great traditional architecture, local artisan's skills & its natural materials, it has not been blended into the urban frame of konkan divisions. Konkan is also associated with a very native local, common craftsmanship of people. Conserving the traditional method & merging or implementing with contemporary architecture into urban fringe, it will not only resemble traditional values but also give a characteristics to a city (urban area) lowering down carbon emissions in a sustainable way.

By creating a research centre & a learning hub which not only encourages local building craft but aspire enhancement of traditional & cultural domain through architecture. In this thesis, emphasis has been given to the exploration of materials & how the prevailing condition of urban fringe can be developed with the help of alternative method in architecture & encouragement of participatory design process. This has also originated to provide a platform for urban & traditional artisans (labourers), developers, consultants, green building professionals, researchers, environmentalists, students & common public to allow development & interaction at local, national & international levels & celebrate native building craft. This alternative centre will also generate the awareness about the materials in urban & traditional context and also create healthy scepticism towards what is happening & what should have happened. This centre will also help in conservation of material palette knowledge & its applications also giving a sustainable development in this region.

AIM

- To design a centre for material exploration in construction & product industry
- To conserve traditional (vernacular) architecture along with advance research & also to blend it with the contemporary architecture in urban fringe
- To create a cutting edge prototype to showcase environmentally sound solutions for contemporary workspace & living.
- To create public awareness about importance of using materials which are eco-sensitive.



OBJECTIVE

- To set an example across country for sustainable & environment friendly development in urban sprawl by using materials which is local & sustainable for building & product industry.
- To promote advance & alternate research in materials, by setting a standard for 'responsible construction practices' that will rely on the use of alternative , eco-friendly & cost-effective methods, technologies & solutions
- To help local people in doing sustainable development in their area.
- Making mass aware of importance of traditional materials & usage of it in an alternative way in urban context by blending with contemporary materials.
- Also promoting & using waste materials for building & product construction purpose or for any practical use in inventing, recycling & reusing

SCOPE

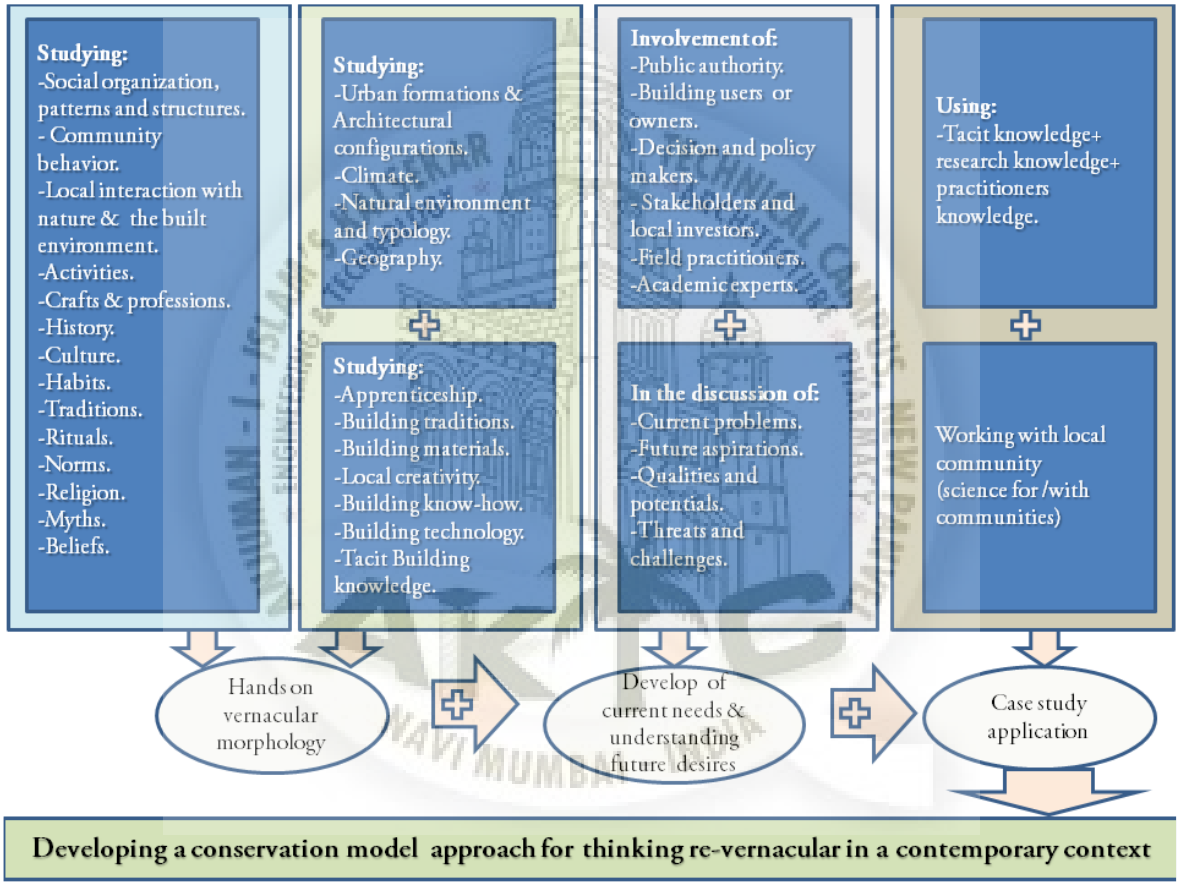
- Creating opportunities for making larger segment of people aware of 'alternative materials' and its various qualities.
- To create a design programme which inculcates the understanding of traditional materials of Konkan as ecologically sensitive construction material.
- Understanding various properties of traditional materials and its advantages and disadvantages in comparison to other contemporary materials
- Understanding / Exploring of various construction detail/ technique of traditional(local) & contemporary materials

LIMITATIONS

- Materials should be explored in building & product industry.
- Material palette for the research in alternative methods in construction should be from local region (konkan) which has its own city.
- The alternate methods which is implemented in research should be used of that particular regional traditional method

RESEARCH METHODOLOGY

- To study current condition of use of materials in all material industry.
- To understand the change it went through from past century.
- To study policies and control measures taken by government.
- To study parameters responsible for the change of the use of materials in building sector.
- To study similar projects will help to understand.
- To study the sustainable techniques for developing self-sustaining projects by the usage of local alternative materials & technology.
- Learn methods that helps create efficient designs with alternate materials.

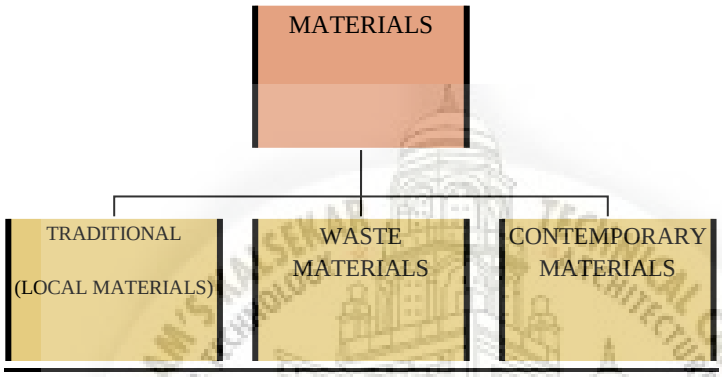


2. LITERATURE REVIEW:

2.1. Definitions & Descriptions:

Skill innovation centre –

A place where construction labourers, artisans, product making persons (craftsmens), students, construction industries & tourists can work parallel to learn, research & practice with Sustainable & Natural materials as well as Contemporary & Waste materials



Sustainable Buildings

"A building which can function using an optimum amount of energy, consume less water, conserve natural resources, generate less waste and create space for healthy and comfortable living, as compared to conventional buildings, is a green building"

These buildings have minimum adverse impacts on the built and natural environment, in terms of building themselves, their immediate surroundings and the broader regional and global setting. Thus, the rational use of natural resources and appropriate management of the building stock will contribute to saving scarce resources reducing energy consumption and improving environmental quality.

Objectives of sustainable buildings

- Social progress while recognizing the needs of everyone.
- Maintenance of high and stable levels of economic growth and employment
- Effective protection of the environment
- Prudent use of natural resources

Green Home

Green home is a type of house that is designed to be environmentally friendly and sustainable, focusing on the efficient use of "energy, water, and building materials."

An eco-friendly house is a house that has been built with green building materials and equipped with systems that minimize harmful impacts on the environment

Sustainable Design

Sustainable design is the thoughtful integration of architecture with electrical, mechanical, and structural engineering. In addition to concerns for the traditional aesthetics of massing, proportion, scale, texture, shadow, and light, the facility design team needs to be concerned with the long term costs- environmental, economic and human.

Skill Development

Skill development means: all the efforts that allow somebody to learn to do something better than before, or do something new that the person has not done before, and which results in concrete change in their livelihoods.

Operational Definitions

Skilled Workers- A skilled worker is any worker who has some special skill, knowledge, or (usually acquired) ability in their work. A skilled worker may have attended a college, university or technical school. Or, a skilled worker may have learned their skills on the job.

Unskilled worker- a worker without any formal training like supervisor, carpenter, mason, electrician, plumber, mazdoor, etc

Skill Development Initiative Schemes

The vocational training system under Ministry of Labour and Employment is one of the most comprehensive systems in the country. There are two aspects of this magnificent scheme-

- To provide vocational training to people through different MES (Modular Employable Skills) courses to horn their skills
- To register institutions as VTP (Vocational Training Provider) for giving training.

2.2 ARTICLES BY AUTHORS

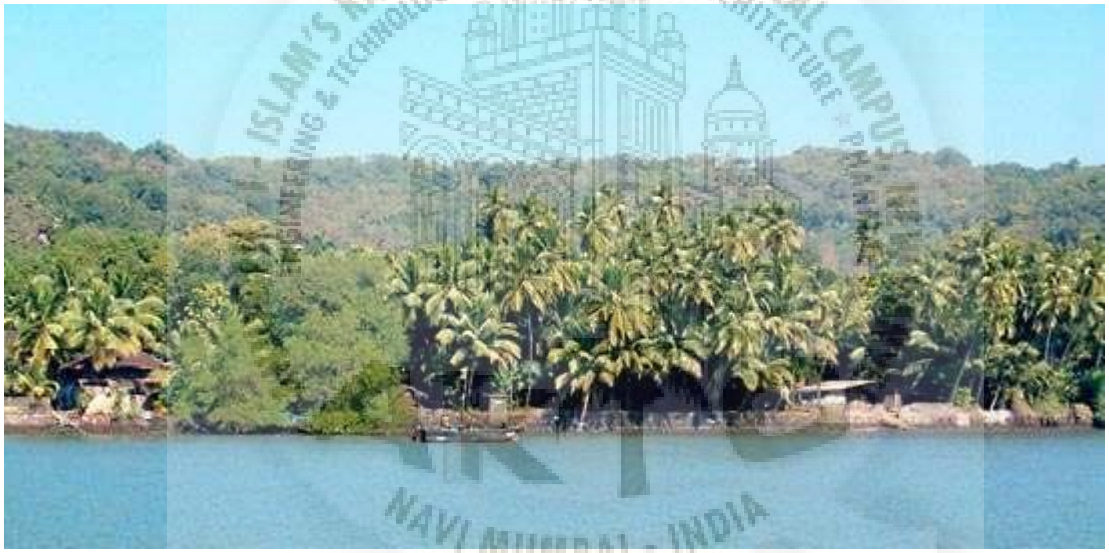
https://www.britannica.com/place/Konkan

Konkan

COASTAL PLAIN, INDIA

WRITTEN BY: The Editors of Encyclopaedia Britannica

Konkan, also called **Aparanta**, coastal plain of western India, lying between the Arabian Sea (west) and the Western Ghats (east). The plain stretches approximately 330 miles (530 km) from the Daman Ganga River north of Mumbai (Bombay) to the Terekhol River between Maharashtra and Goa states and Daman and Diu union territory in the south. Between 28 and 47 miles (45 and 76 km) in width, the Konkan includes the regions of Thane, Greater Mumbai, Raigarh, and Ratnagiri.



Konkan Dabhol beach, on the coast of the Konkan, western India.*Saish Gersappa*

The region is traversed by seasonal rivers that drain the heavy monsoonal rainfall from the crest of the Sahyadri Hills. The generally uneven terrain is composed of eroded remnant ranges of the Ghats that form low lateritic plateaus in the west and terminate in a coastline of alternating bays and headlands. Only about one-third of the land is cultivable, and the population lives mainly in the relatively fertile river valleys near the coast and in the newly developed industrial belts around Mumbai, Thane, Khopoli, and Panvel. The barren hills are occupied by the pastoral Bhil, Kathkari, and Kokana peoples. The main crops are rice, pulses (legumes), vegetables, fruits, and coconuts; fishing and salt manufacture are also important.

The industrial complex of Greater Mumbai is the primary economic focus of the region. Nearly all trade is carried on with Mumbai, and steady migration to the city has left rural Konkan depleted of manpower and skilled workers. Iron and manganese are mined and exported through the port of Reddi.

The ports of the Konkan were known to the ancient Greeks and Egyptians and to Arab traders. The spice trade brought prosperity to the ancient Hindu kingdoms of the area. The cave temples of Elephanta Island and Kanheri bear testimony to the prosperous culture of this era. With the advent of the Portuguese and British, the port cities were further developed and fortified but now have lost their former importance.

Sustainable materials for low carbon buildings

*B.V. Venkatarama Reddy**
Department of Civil Engineering, Indian Institute of Science, Bangalore 560 012, India

1 INTRODUCTION

Building materials and technologies, and building practices have evolved through ages. The art and science of building construction commenced with the use of natural materials like stones, soil, thatch/leaves, unprocessed timber, etc. Hardly any energy is spent in manufacturing and use of these natural materials for construction. Some problems associated with the durability of the natural materials like soil, thatch/leaves, timber, etc. lead to the exploration for durable building materials ever since the man started construction activity. Brick burning represents one of the earliest examples of using thermal energy to manufacture durable building materials. Metal products, lime and lime-based products represent the other manufactured energy-consuming materials used for the construction. Discovery of natural inorganic binders like pozzolanic materials resulted in lime-pozzolana (LP) cement and this paved the way for the invention of Portland cement in 1824. Portland cement and steel brought revolutionary changes in the construction practices since early part of twentieth century. Later on plastics and plastic products entered the construction industry. Thus, the journey through the developments in the building materials and technologies is traced in Table 1.

Table 1. *Energy consumption and developments in building materials.*

Prior to 4000 BC	4000 BC–1800 AD	1800 AD–to date
Soil, stones, reeds/ thatch, Sun dried bricks/adobe, unprocessed timber	Burnt clay bricks, lime, cast iron products, lime-pozzolana cement	Aluminium, steel, glass, Portland cement, plastics, other smart materials, nano-materials, etc.
Zero-energy materials	Medium-energy materials	High-energy materials

As we moved away from zero energy materials to more modern materials for the construction activities, it became imminent to spend more energy and natural resources. These modern materials are energy intensive and are hauled over long distances before being used for construction. In the context of carbon emission reductions and the issues of global warming, there is a need to pay attention to use of modern building materials with reference to (I) energy

intensity of materials, (ii) natural resources and raw materials consumed, (iii) recycling and safe disposal and (iv) impact on environment. Indiscriminate use of natural resources and energy-intensive process for the building materials will not lead to sustainable options. This paper focuses on certain issues pertaining to the energy, carbon emissions and sustainability of building construction with particular reference to Indian construction industry.

2 ENERGY AND MATERIAL RESOURCES IN THE INDIAN CONSTRUCTION SECTOR

Indian construction industry is one of the largest in terms of volume of raw materials/natural resources consumed and volume of construction materials/products manufactured. Large variety of materials are manufactured and consumed in the building industry. Materials produced and consumed in bulk quantities are listed in Table 2. Quantity of materials produced, their raw materials and energy expenditure are provided in the table. Currently, GHG emissions from construction sector could be 30%. Cement production and CO2 emissions for global and Indian conditions are displayed in Table 3. The figures indicate that during 20 years, the CO2 emissions from cement/clinker production have more than doubled, inspite of improvements in energy efficiency in the manufacturing process as well as the use of blended cements.

Table 2. *Construction materials produced in bulk quantities in India.*

Type of material	Annual Consumption	Raw materials	Energy
Burnt clay bricks	150×10^9 nos.	Fertile soil (500×10^6 tonnes)	600×10^6 GJ
Cement	187×10^6 tonnes	Lime stone, gypsum, oxides	650×10^6 GJ
Structural Steel	45×10^6 tonnes	Iron ore, lime stone	1800×10^6 GJ
Coarse Aggregates	250×10^6 m^3	Granite/basalt rock	30×10^6 GJ
Fine Aggregates	350×10^6 m^3	River sand/rocks	75×10^6 GJ

Table 3. *Cement production and CO_2 emissions (million tonnes per year).*

	1990	2005	2010 (projected)
Global			
Cement consumption/production	1040	2270	2800
CO_2 released	940	1700	2070
India			
Cement consumption/production	45	127	200
CO_2 released	41	94	148

Energy and raw materials are essential for the production of building materials and products. Basic raw material resources include soil, stones, sand, timber/tree products, minerals, chemicals, etc. Energy resources include electricity, coal, oil and gas, biomass, etc. Energy consumption in the manufacturing and transportation of building materials is directly related to GHG emissions and the related environmental consequences.

Indian construction industry is growing at an alarming rate (.8% per annum). Apart from meeting the energy demand, the material resources for the sustainable growth is another important aspect. It has been estimated that 300 mm depth of fertile top soil of the entire county will be consumed for burnt clay brick production in about 60 years (assuming a compounded growth rate of 5%). This is an alarming situation. Similar arguments arise for the case of aggregates (both coarse and fine aggregates) where natural stones and rocky outcrops as well as river beds are exploited indiscriminately. Sustainability of the present mode of production and consumption of building materials and currently adopted construction practices is questionable.

Over exploitation of raw material resources and extensive use of energy-intensive materials can drain the energy and material resources, and can adversely affect the environment. On the other hand, it is difficult to meet the ever-growing demand for buildings by adopting only energy efficient traditional materials (like mud, thatch, timber, etc.) and construction methods. There is a need for energy efficient, environment friendly and sustainable building alternatives. To achieve such objectives, optimum utilization of available energy resources and raw materials becomes imminent.

Some of the guiding principles in developing the sustainable alternative building technologies are:

(a) energy conservation, (b) minimizing the use of high-energy materials, (c) minimize transportation and maximize the use of local materials and resources, (d) decentralized production and maximum use of local skills, (e) utilization of industrial and mine wastes for the production of building materials, (f) recycling of building wastes and (g) use of renewable energy sources.

Building technologies manufactured by meeting these guiding principles could become sustainable and facilitate sharing the resources especially energy resources more efficiently, causing minimum damage to the environment.

3 EXAMPLES OF LOW CARBON BUILDING MATERIALS AND TECHNOLOGIES

Ideal building materials from the consideration of low carbon emissions, least carbon footprint and potential for recycling and reuse are the natural materials like soil, stones and timber/ biomass. Unprocessed or least processed natural materials have limitations particularly with reference to strength and durability aspects. Processing and transport of the natural materials involves energy expenditure resulting in carbon emissions. To minimize carbon emissions it will become essential to device technologies to produce building materials and products with minimum amount of energy expenditure. Brief details of some building materials and techniques are discussed below.

3.1 Blended cements

These are cements containing a high volume of one or more complementary cementing materials (CCM), such as coal fly ash, granulated slag, silica fume and reactive rice-husk ash. A large volume of CO2 is directly emitted during the cement manufacturing process (0.9 tonnes/tonne of clinker). Reduction in the quantity of clinker by substituting with CCM results in lesser CO2 emissions. There is a considerable amount of ongoing R&D in the direction of using CCM in Portland cements and up to 40% substitution by CCM is possible.

3.2 Stabilized mud blocks for masonry

https://www.thehindu.com/life-and-style/homes-and-gardens/basics-of-eco-construction/article24059338.ece

Basics of eco construction

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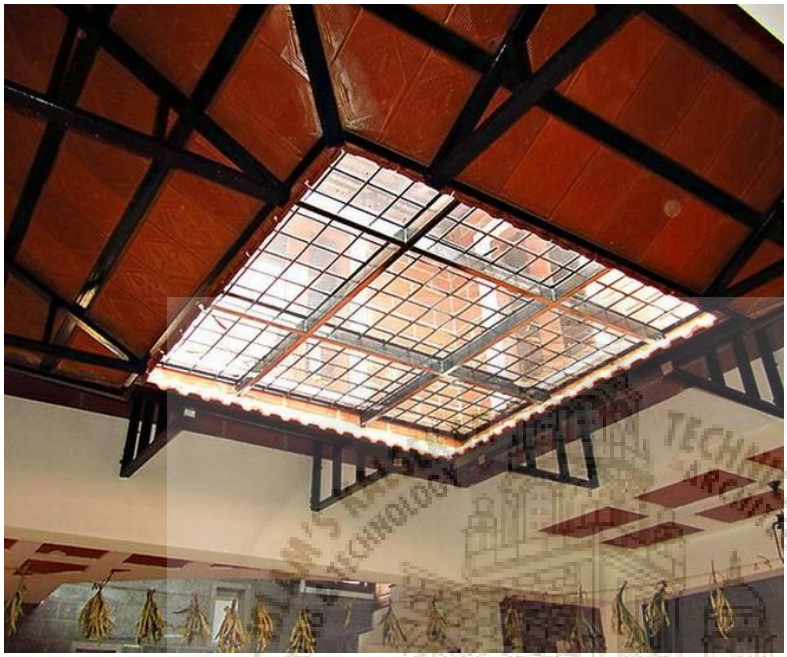


Measures that any builder can follow. By Sathya Prakash Varanashi

We see larger number of people today opting to live with organic food, less waste, zero preservatives, low carbon footprint and in architecture, with designs closer to nature. Unfortunately, there is no single source at present where one can learn about the basic applicable eco principles applicable to a project. This essay continues from the last, listing some simple applicable measures that anyone can follow.

Common sense can solve what creativity cannot: If we look for the common thought among sustainable buildings of the past, we notice they all had some common sense. Simple observations of what works and what does not, how to put diverse materials together and how to build easy contributed to design decisions. This is not to ridicule contemporary designs emerging from computer software, but to stress on the need to be sensible to a context.

The major impediment towards applying common sense is embedded in increasing professionalism. Young aspirants get academically trained to be part of the industry, with no accumulated knowledge. The construction field itself is being controlled by systems, standards,

procedures and formalities, keeping common sense out. If we can bring it in, many more buildings can become eco-friendly.

Build with local materials, not locally available materials: Among the major principles of sustainable buildings, emphasis on local materials is universally agreed upon. Every region inhabited by humans has the required construction materials to provide shelter and security, without which settling down would have been impossible. Invariably, they are economical, suited to the local climate and easy to work with no long distance transport.

In a large metropolitan city, the original local material might have disappeared, yet the regional options would be around. However, today the local materials are being replaced by locally available materials, thanks to the global marketing networks, which does more harm to ecology.

Minimise manufactured materials: With no major exception, most locally available materials are produced somewhere, transported to anywhere and belong to nowhere. They are rooted only to their factory, not to any climate, culture or history, unlike the local materials which have a context. Once built with, the character they give to the buildings also are not rooted in the context, but only in the perceived creativity, publicity and anonymity.

The greater reason to minimize manufactured materials lies in their very high embodied energy, a direct quantitative measure of the consumed Earth resources. Unfortunately, we are increasingly manufacturing and constructing with artificial factory made materials today than ever in our construction history.

Heritage buildings are by default eco-friendly buildings: The past did not permit us to build anyway we wished, but created constraints of wall stability, limited roof options, indoor comfort, maintenance matters, local appropriateness and such others. Most of these resulted in historic structures being climate and construction specific, hence by default energy efficient and sustainable.

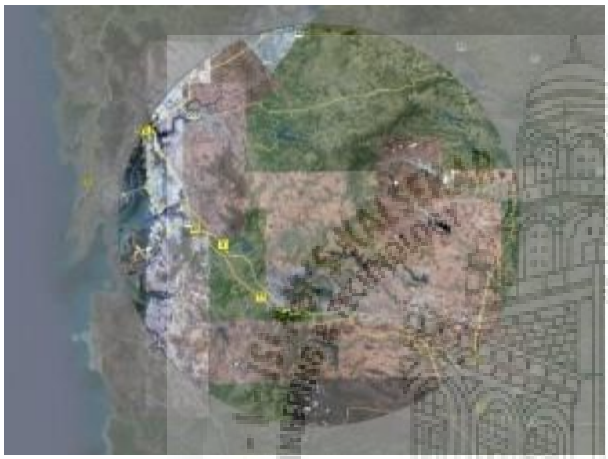
We tend to mainly observe beauty and monumentality in traditional buildings, sometimes the vernacular values, not realising how much is there to learn towards an eco-friendly future.

(The writer is an architect working for eco-friendly designs and can be contacted at varanashi@gmail.com)

http://www.btsquarepeg.com/sustainable/materials/local-materials/

Local Materials

One of the first principles of sustainable and environmentally friendly architecture is to reduce the embodied energy of the materials used in construction. Embodied energy is the sum of all energy inputs–for manufacturing, all transportation, human resources etc. that are needed to make a product. Transportation plays a major role here so, if a material can be sourced locally, it can reduce the embodied energy (and carbon footprint) quite substantially.



With services like Google Maps available to us, it has become very easy to get data like distance from source to site

Mahatma Gandhi–an instinctive environmentalist if ever there was one–exhorted people to build with materials that were available within a 50km radius. His reasoning may have had little to do with a scientific knowledge of embodied energy and more to do with his lifelong devotion to the concept of localisation and decentralisation. Regardless, if we keep the 50km limit in mind for most materials, we can prevent the burning of a lot of fossil fuel.

An additional advantage is that, as transportation costs are minimal for local materials, they are also usually more affordable than something that comes from a great distance. Besides, if you're planning on using local labour then, their familiarity with it leads to a sturdier and better finished project.

However, we must always weigh our options with an open mind. As an example, for corrugated roofing, I refuse to use asbestos sheets on principle. For a project outside Mumbai, I considered getting a non-asbestos alternative from Coimbatore. However, we eventually settled on a flat sheet made from bagasse by a Pune company even though it needed a heavier steel framework to support. Why was that?

The corrugated roofing system would have had less embodied energy even after transportation but, the sheets themselves could only be bought in bulk from the manufacturer so, if the project ever needed just a single extra sheet at any stage, we'd have to call for an entire truck — even if it was almost empty. That, in the end, tipped the scales in favour of the more readily available Eco-board.

Fly ash bricks can be made to look like traditional bricks if you add a little red-oxide in the mix. This is useful if you want to keep the wall un-plastered like we did for the Ra BV Bungalow.

Another time, for the [Ra BV] bungalow, the clients were willing to pay the extra transportation cost to bring in fly ash bricks, from Wada in Thane district, to Karjat — a distance of approximately 100km. Apart from the fact that manufacture of clay bricks leads to the loss of precious topsoil, the overall embodied energy is substantially lower despite the fuel burnt for carrying them over the distance. Here is the basic calculation:

Material	Embodied Energy in kWh / m³		
	Production	Transportation	Total
Burnt Clay Bricks	708	2	710
Flyash Bricks	335	55	390

So, as you can see, there are no hard and fast rules when it comes to distance. Each case has to be looked at individually and assessed on merit. We also don't always have ideal situations but we must, at the very least, aim to minimise the embodied energy of our structures.

https://yourstory.com/2017/06/climate-friendly-architecture/

Back to basics: when mud, bamboos, and timber houses help fight climate change

Areen Attari posted on 9th June 2017

From climate-friendly homes of yore to monotonous concrete and glass structures of today, we are losing out on aesthetics and warmth. Thankfully, there are people who are reviving the time-tested practices.

The beauty of living in a place like India is that after every few hundred kilometres, it seems we are in a completely new place. The people change—their clothes, their language, their lifestyle, everything changes. And so is true of the architecture of these places.

An ideal way to notice this would be to travel to the countryside. Moving from the dense cites to the rural parts of India, the houses seem thinly scattered. Their design, material, planning, and orientation changes; and one can sense the increasing influence of urbanization. And this influence has damning effects.

In our quest of globalisation, by transforming our cities to make them the next Shanghai and Dubai, we are leaving behind a very strong part of our cultural identity. The shift in architecture—from the traditional, unique, and contextual to the modern, monotonous, and general—has become more rapid than ever.

Home strengthens the man-nature bond.

If we sought inspiration from our roots, we would evolve our own unique forms of architecture instead of imitating others. In villages, people have successfully built their shelters and dwellings using local materials, through trial and error over time, with their own skill sets. They have done this in harmony with nature while understanding the climate. Now, a distinct change is evident—cement and concrete are replacing lime and stone, tin sheets are replacing clay tiles, buildings are replacing houses.

How people thrived

The obvious myth attached to local and traditional houses is that they are not strong, and are maintenance unfriendly. However, every possession of ours needs care and nurturing, and to understand this, we just need to look back at the 2001 Gujarat earthquake—where the only houses that did not fall were the circular bhungas of Kutch.What makes these houses so unique? The circular bhungas are mostly found spread across the banni grasslands of Kutch. This grassland sits on the most intensive earthquake zone 5. The houses are made round and small using a construction method called wattle and daub—wattle being the sticks/dried grasses that have been weaved together, and daub being the earth to bind it all together.

The circular bhungas of Kutch were the only structures that did not fall during 2001 Gujarat earthquake.

Some houses also have decorative bas-relief work done with earth plaster and tiny mirrors generally in the interiors. The entrance to the house is small, the floor is made from earth, and a layer of cow dung is poured on the floor. The walls too are layered with cow dung ‘lipai’ or ‘lipan’. The interiors are dark and the conical thatched roof prevents the entry of too much light. There are small circular openings towards the bottom of the walls that allow the air to be condensed before it enters, resulting in cool air flowing through the openings.

The combination of these materials, form, and design of the house results in greater climatic

comfort than one would experience otherwise. The circular shape of the house makes it earthquake resistant, and even if it does fall, it is light, harmless, and can be easily and cheaply built again.

Another interesting study would be of the traditional houses in the hills of Himachal Pradesh, which also lie between earthquake zone 4 and 5. Despite the climate, culture, geography, and lifestyle being so different from Kutch, the people here too have evolved a system of earthquake resistance. Using the local materials of stone and timber, the houses are built on a high plinth with a construction method called 'Kath-Kuni'. Alternate layers of stone and timber are laid without any mortar to make thick walls that can resist the forces of the earthquake.

The floors of these houses are made from timber, which does not get cold easily. Cattle reside in the bottom part of the house, and the houses are so designed that the heat generated from the cattle and from the kitchen can be used to warm the house. Features like these are unique to different regions of India.

From north to south, east to west

Bamboo house in Mawlynnong, Meghalya.

In Rajasthan, earth and stone buildings and systems of water conservation have existed for ages. In regions near the Aravalis, people build their houses using a technique called 'rammed earth'. All measurements of the house are calculated by the distance between the tip of the owner's hand till his elbow. This measurement unit is commonly called 'haath'.

Further up in Udaipur, one can find ancient stone havelis that are over 250 years old. In Jaisalmer the local yellow sandstone is abundantly used. The use of 'chuna'(lime) as mortar in stone buildings was prevalent and this lime has still retained its strength. The use of lime also allows buildings to breathe something that does not happen with the use of cement (the base of which is lime).

In Assam, Meghalaya, Tripura, and the rest of the North East, the use of bamboo has been predominant in all aspects of life—not just for homes. Furniture, cutlery, arts, crafts, and also houses are fully dependent on bamboo which is an easy material to work with. A mature, cured bamboo of the right species can last a lifetime.

In Kerala, some of the traditional homes— called Nalukettus—are built around courtyards that have a significant impact on the house not just architecturally but also socially. The courtyard is the heart of the house around which all other rooms are built giving light and life to every room.

It is also the place where the family gathers and women, especially, make the most use of these courtyards. As an exterior place within the house, women can be freer than they are outside. The courtyard also helps in the circulation of air by letting the hot air escape from the house and pulling in cooler breeze through the windows.

Courtyards are a common feature throughout the country and serve different purposes in different regions. Courtyards in Rajasthan, for example, are primarily used for ventilation and also for the collection and storage of rainwater. Along the coast of Kerala and further north towards Konkan, houses are built using red laterite stones called 'chira'. These stones, being semi-porous in nature, allow walls to breathe, thus having a direct positive impact on the humidity and temperature of the building.

Why the change is for worse

There are a few reasons why the paradigm has shifted from traditional, colourful, and practical to monotonous structures. For one, the people themselves are overwhelmed by what they see in cities, movies, and in the media. They now aspire to build concrete buildings, as it is an upgrade to a pucca house—a symbol of power, status, and respect in today's world.

Traditional green roof in Bihar,

Bamboo and mud are being looked down upon as a poor man's material. This notion has drastic effects on people as they find it difficult to get their children married if they live in a mud house. The true understanding of the word 'parampara' or 'tradition' is an evolution—of culture, lifestyle, and ritual—and if this evolution of our architecture had taken place through the years (rather than a jump), nobody would have looked down upon mud and bamboo.

However, in spite of intentionally choosing to build with modern materials today, the interesting thing about Indians is that they will happily, passionately, and even nostalgically give a list of benefits of traditional houses over the current ones.

Another reason for the decline of traditional architecture has been the promotion of industrialised materials. An example for this would be the galvanized iron sheets or tin sheets that have effectively transformed the landscape of villages all over the country.

At places where once country tiles, Mangalore tiles or thatched roofs could be seen, flat slabs and tin sheets rule today. These tin sheets are cheap to buy and easy to fix but they have huge disadvantages. Besides the fact that it is a processed, industrialised, and unnatural material, tin

sheet when not fixed properly can be easily uprooted by heavy winds causing severe damage. These tin sheets are extremely thin, and let through tremendous amount of heat during the day, making the temperature inside the house higher than outside. At night, the house is colder than the outside.

Cement, steel, etc. are easily available and marketed as materials that will last a lifetime with zero maintenance—but this is not true. The government has also adversely affected the situation. Instead of promoting vocational trainings, cultural arts and crafts, and traditional skills, it has envisioned a method of development that is based on the industries. This makes it difficult for anything but the industries to survive in the market, thus forcing several artisans to leave behind their age-old occupations and migrate to other areas in search for different, often menial jobs.

The government has also played a negative role after natural disasters when entire villages are wiped out. For instance, after the 2010 cloudburst in Ladakh, it provided prefabricated rooms made of galvanised iron to people. However, these rooms could not protect them against the severe Ladakhi winter as the traditional mud brick rooms which insulate houses from cold weather.

Some hope and efforts at revival

There is a slow movement in India and the rest of the world to bring traditional architecture to the forefront by using technology hand-in-hand with artisans who work with local and natural materials. In Himachal Pradesh, Didi Contractor is reviving the traditional earth and timber houses. In Gujarat, organisations like Hunnarshala Foundation, People in Centre, and Thumb Impressions have been instrumental in working with artisans and crafts-persons. Buildaur in Auroville, Malak Singh and Put Your Hands Together in Mumbai are also examples of people and organisations working towards a better, more sustainable architecture.

The government too has become more open to sustainable holistic development. Instead of building mass concrete house blocks after the 2008 Kosi floods in Bihar, it formed the owner driven rehabilitation collaborative (ODRC) with some of the above mentioned organisations. The main aim of ODRC was to promote bamboo (or brick) based houses depending on the needs of each of the affected families. The project was successfully tested with two pilot projects in 2010, and the government has continued this method of construction and rehabilitation till date.

Another example has been the development of houses under Indira Awas Yojana in Gujarat. The government has been studying various forms of traditional architecture all over the state and is exploring the idea of linking it with the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). The aim is to get people to build their own homes according to their choices by following certain technical guidelines.

Together with the initiatives of the government and the people, the possibility of creating more sustainable and humane architecture is a dream that can be turned into a reality.

Evolving Traditional Practices for Sustainable Construction in the Present

Paper presented at INTBAU International Conference 11th – 14th Jan. 2007

Abstract

In India we have entered a phase of urban growth and development which is unprecedented in its scale and impact.

As cities & towns expand and regenerate in response to the economic engines of transnational trade and finance, we see a sudden spurt in building construction. This burst of construction activity spread across a range of city activities and the socio-economic spectrum. Demand for built space for colonising new lands as well as for the upgradation and regeneration of existing built space to higher intensities of use will grow on all fronts.

This heralds a paradigm shift in the structure of the building trades, materials of construction and design practice. And, significantly, the increasing consumption of building materials such as glass , cements, metals and ceramics, which are energy intensive in their manufacture, combined with the sheer scale of construction activity, will cause an explosion of CO_2 emissions, significantly adding to the spectre of global warming.

For this process of accelerated urban development, to be socially and economically sustainable, while curtailing the impact of CO_2 emissions attributable to buildings, indicates a strategy of an evolution of traditional building practices in preference to a shift by default to ready-made global technologies and building types.

It is argued in this paper that application of the principles of industrial production to traditionally used construction materials, skills and trades, and adaptation of traditional principles would result in several benefits.

In the construction of buildings such a strategy would:

a) Include human resource of the semi-skilled and skilled personnel in the growth of the construction trade while enhancing knowledge and skill
b) Ensure a wider participation in economic processes and promote distribution of wealth.
c) Develop efficient utilisation of natural and low-process energy materials to meet contemporary demands – as an alternative to the current trend toward high process-energy materials such as glass and aluminium, thereby limiting the impact of building production on global warming.

In the design of the built-space planning & configuration a strategy of adapting climatically suitable models from traditional practices would:

a) Produce a more habitable public realm of the city
b) Produce an appropriate indoor-outdoor continuum in built space systems
c) Considerably reduce the impact of extreme weather on air-conditioning load, thereby curtailing the demand on energy on account of air conditioning.

These conclusions are derived theoretically and demonstrated by case-studies.

Ashok Lall
Dec 2006

Evolving Traditional Practices for Sustainbale Construction in the Present

Paper presented at INTBAU International Conference 11th – 14th Jan. 2007

Overview

The imminent acceleration of change and economic growth here in India brings us to a critical juncture in the evolution of our towns and cities. While the frenetic increase in financial investments in urban infrastructure and buildings has the potential of translating into a "better quality of life for all citizens", it has equally the potential of exacerbating, by default, our existing economic disparities and their consequent social tensions and conflicts. Important, too, though much more insidious, and therefore easily overlooked, is the impact of CO_2 emissions attributable to buildings and urban systems on climate change. The scale of construction activity compressed into a short period of time constitutes an "explosion" of CO_2 – which will undoubtedly hasten the advent of climate change.

Evidently, there is a need for strategic action on both fronts and it is in this context that I wish to discuss the potential of traditional practices of construction and design of built environments as platforms from which to construct a beneficial strategy.

Investment in Urban Development

The Jawaharlal Nehru National Urban Renewal Mission estimates investment of Rs. 120,536 crores at a rate of Rs. 17,219 crores per annum in basic infrastructure and services of 63 cities across India, spread over a seven year period. This is for the shift in the national economy toward urban services which would contribute 65% of the GDP by 2011 with 40% of the population living in cities by 2021 compared to 28% today. So we have the two overarching processes that will determine the development of our urban environments – Globalisation & Urbanisation.

CO_2 emissions explosion

If this scale of investment is predicted for urban infrastructure it may be safely assumed that at least an equivalent amount would be invested in built space in the extension of urban areas as well as in the upgradation and redeveloping the existing built space. Or else, if you consider the increase of urban population by say 30% of 2021, one can estimate the total area by built space that would be constructed to provide for it. Through either route you can convert these into quantities of aluminium, stainless steel, glass, ceramics, bricks… that would be consumed and CO_2 emissions that would result from the production of such materials. In relative terms, without going into calculations and numbers, I surmise that this phenomenon constitutes an explosive release of CO_2 into the atmosphere on account of embodied energy consumed in the production of buildings.

The strategy to limit or curtail the scale of this explosion would call, first, for efficiency in the utilisation of material resource (good engineering) and then, a preference for materials & systems that incur low processing energy, over those that are energy profligate. In other words – grasses, timbers, stones, earthen blocks, flyash blocks & ferrocement are to be preferred over stainless steel, aluminium, plate glass and ceramics. And, importantly, the technique of using the preferred materials must progressively rise to higher levels of productivity and performance efficiency.

The existing base of traditional materials and skills provides a ready platform to develop this strategy. The development of new production methods and building materials or components toward greater efficiency and performance can be achieved at relatively low capital investments, in a short time.

This process is already underway, as evidenced by the small & medium scale industrial operation for production of masonary blocks, cladding stones, timber boards & prefab-doors & windows. The most significant advantage of this approach is that it achieves progress without displacing or dispossessing employment, skills and knowledge. On the contrary, it would ensure a wider distribution of wealth while adding value to skill & knowledge of the building crafts.

All needs of construction for small span structures of upto 4 storeys can be met in these ways – if the professions of architecture and engineering actively promote them.

Even for tall or large-span structures which may necessarily require RCC frame construction, there are innovative possibilities to reduce the embodied energy of the structural system. And, in any case for infill & finishes – both internal and external, which would typically constitute 30% of the total embodied energy of the building – I would argue that techniques that utilise stone/timber, mud block etc. cannot serve as effective substitutes for the current preference for "modern" methods of aluminium & curtain glazing. There is a potential, to be creatively tapped for innovations by local industries, to meet the new needs of quicker construction and higher thermal performance of the building envelope. In addition fiscal incentives to promote these materials and innovation are urgently needed.

If the making of buildings for the urbanising & growing economy causes an explosion of CO_2 emissions, then a veritable bush fire ensues due to the energy demands for the operation of buildings. Here, I wish to focus on the single most energy profligate operational requirement of modern urban life – air-conditioning. In commercial buildings 60 to 70% of the energy bill is on account of air-conditioning.

As this "need" becomes a wide-spread norm it will be the most significant contributor to CO_2 emissions in the operation of buildings.

With an increase in disposable incomes and availability of "cheap" systems, air-conditioned comfort is becoming the norm for middle class life. This is creeping over the existing building stock, and will be expected in almost all new buildings.

In Delhi's climate, for example, where once we managed with the ceiling fans & the evaporative coolers, the transition to air-conditioning causes an eight to ten fold increase in the demand for electricity for an equivalent level of comfort. In the new commercial buildings 60 to 80% of the electricity consumption is attributable to airconditioning. New state-of-the-art and hugely expensive "western" technologies for comfort conditioning, though relevant, are not being looked at here. What is pertinent is the design of the built structures themselves to reduce the impact of extreme climates, and thereby effect a reduction in air-conditioning loads.

At the scale of the urban fabric this calls for a pattern of building that is derived from traditional practice. Speaking of this part of the country, for example, this means low-rise, high-density low-rise patterns producing a sheltered external space. From the traditional form of the desert city one would evolve to a modified form that integrates vegetation as a climate modifier, and finds the balance of open to built-space to obtain daylighting & ventilation, while achieving a sheltered open space. Models have been tried for various functions and at different scales based on this principle. This practice needs deliberate promotion in city planning, urban design & in framing building bye-laws. Many of the current city-planning systems and building bye-laws foreclose this potential and therefore need urgent revision. Studies show that by careful design of the external envelope of building – preferring small apertures and shading – as was traditional common sense – makes a difference of 15% in air-conditioning load.

And by design of appropriate buildings envelopes that incorporate insulation it is seen that air-conditioning loads can be reduced by 30% compared to a "business as usual". It is possible, at little additional costs to design the building fabric to give a service of 25 sq.mt. of conditioned area served by ITR of air-conditioning as compared to the industry norm of 15 sq.mt. per ITR.

This potential must be seen in opposition to the current dangerous practice gaining ground – buildings that reach out for the sun as monuments to "design", first constructed as a solar cookers and then modified at enormous energy and financial costs into a refrigerators! Intelligent evolution of traditional design principles for shelter from climatic extremes for building envelopes and spatial

design extended the scale of the urban fabric needs to be the first strategy toward reducing CO_2 emissions on account of air-conditioning.

In summary,

The threat of global warming is real. It will grow dramatically with urbanistaion and globalisation of the Indian economy.

The evolution of traditional building construction & design practices offers a platform that can help mitigate this threat.

This evolutionary strategy has two fronts:

In the construction of buildings:

It

a) Develops efficient utilisation of traditionally understood natural and low-process energy materials to meet contemporary demands – as an alternative to the current trend toward high process-energy materials such as glass and aluminium - thereby limiting the impact of building production on global warming.
b) Includes existing human resource of the skilled personnel in the construction trade, enhancing their knowledge, skill, productivity.
c) Ensures participation with higher economic status of the building crafts and trades in economic processes of construction leading to a wider distribution of wealth.

In the design of built-space:

It

a) Adapts principles of climatically appropriate building & urban fabric design to reduce the impact of climatic extremes on the built-space.
b) Produces a more habitable and continuum of indoor-outdoor continuum.
c) Reduces the demand on dependence on air-conditioning – a leading cause of the CO_2 bushfire.

https://www.reusethisbag.com/articles/creative-recycling-projects/

Creative Recycling Projects from Common Household Items

March 17th, 2018 Peter

The world produces 2.12 Billion TONS of waste every single year,

What things can be recycled?

If you're looking to make something useful out of something recycled, you may be surprised by just how many items you can reuse creatively. Even a simple plastic bottle can be turned into a garden sprinkler, a bird feeder or a watering can!

So never assume the only possible destination for an item is the trash. There are creative recycling projects out there for dozens of everyday items, including (but by no way limited to!) the following:

- Glass bottles
- Plastic bottles
- Paper rolls (from kitchen towel and toilet paper)
- Stale bread
- Clothes
- Books
- Vegetable peelings
- Plastic Pots
- Corks
- Dryer sheets
- Coffee grounds
- Egg cartons
- Shoe boxes
- Old and damaged tiles
- Bottle caps
- Mailing tubes
- CDs and DVDs
- Light bulbs
- Christmas trees
- Carpets

This is by no means an exhaustive list, but it gives a good idea of just how many things have plenty of uses beyond their original purpose.

Upcycling

Upcycling is a way of recycling creatively, turning items that would otherwise be unused into functional and useful things. An example often seen is when people reuse wooden pallets and **turn them into anything from outdoor seating areas to staircases**.

Upcycling is also possible with far smaller items than pallets! Wine corks, for example, have myriad uses in upcycling projects, with creative people turning them into anything from kitchen backboards to bathmats and plant labels.

Upcycling can produce striking decorative items, or items that are merely practical, such as an upturned plastic bottle used to irrigate a plant pot while someone is away on holiday. Either way, the items get used again rather than being treated as waste.

Down cycling

Upcycling, as described above, is something we hear a lot about these days, with some people even building businesses around upcycled items. Down cycling is just as useful but involves stripping down items to component parts, usually with less of an inherent value than the original item.

Downcycling usually happens on an industrial scale. However, anyone looking how to make creative things from waste material at home will also find examples of downcycling that work as personal projects, such as using old clothes as dusters or linings for pet beds or turning old CDs and DVDs into drinks coasters.

Creative Recycling for Common Household Items

This section looks at some of the common household items everyone tends to have lying around all the time, and discusses some of the ways they can be reused creatively.

Paper Rolls

Paper rolls from the middle of kitchen paper and toilet paper are something everyone has a constant stream of. While it may seem hard to think of many things to do with these, the abundance of them has caused many people to get really creative, and it turns out there are some really inspiring options!

A Toy Garage

You'd struggle to find any parent who wouldn't welcome an idea that help keep the house tidier, and this toy garage does just that with just a box and a pile of old paper rolls.

All you need to do is use a shoe box or something a bit larger, and fix in a series of used paper rolls in rows. Then, each roll can be used to contain an individual toy car or similar small toy. Not only is this a far tidier way of storing such items, putting the toys in place is a fun activity that even a young toddler may be persuaded to participate in.

More Paper Roll Recycling Ideas

Here are some more ways to recycle your paper rolls:

- Decorations, painted or coloured in, for Christmas, Easter or Halloween
- Small gift boxes for jewelry or soaps
- Marble run toys for kids
- Organisers for pens, crayons or makeup
- Starter pots for seedlings
- Pet toys
- Napkin rings

Toothbrushes

Toothbrushes are supposed to be replaced at least every three months, according to the recommendations of dentists and manufacturers, so they're something you're likely to end up with plenty of.

The most usual use for old toothbrushes is in household cleaning; Their bristles mean they are perfect for scrubbing surfaces and their size means they can get into places that are hard to reach. But there are plenty of other uses for old toothbrushes, including some that help with other upcycling projects.

A Toothbrush Bracelet

Making a bracelet out of an old toothbrush may not sound instantly appealing, but you cut off the bristles before doing so! Then, the use of boiling water should be sufficient for the plastic of the toothbrush to bend exactly as you require.

If you use a patterned toothbrush such as those popular with children, you can make an appealing and unique bracelet. And if your child has a character toothbrush featuring a superhero, it can become a superhero bracelet when it needs replacing!

More Toothbrush Recycling Ideas

Here are a few more ways to recycle your old toothbrushes:

- Paint brushes for children, or for flicking and spattering paint onto other creative projects

- Seed pollinator
- Sweetcorn brush – nothing's better for removing the stringy silks from corn-on-the-cob than a toothbrush, so long as it's clean

Stale bread

Stale bread may seem good for nothing but the bin, but there are actually plenty of uses for it. Many country's cuisines include recipes that actually work better if the bread is slightly stale, and even if you can't use it immediately, you can always freeze it.

Breadcrumbs

Fresh bread doesn't make good breadcrumbs – the bread glues together and the crumbs get sticky. It's far better to use stale bread for this, and it's easy to turn the bread into crumbs – all it takes is a whizz in a food processor. If you don't have access to a food processor, you can toast the bread in the oven and then bash it into crumbs with a rolling pin.

Breadcrumbs that you can't use straight away will keep in the freezer for several months in a sealed food bag. The crumbs just need defrosting before use. These crumbs will be far better than shop bought, and cost nothing!

More Stale Bread Recycling Ideas

- Make summer pudding – a fruit pudding that works far better with stale bread
- Oven bake the stale bread to make crispbreads or bread sticks
- Make souffles or French toast – both work fine with stale bread
- Use the bread to feed birds or other animals

While stale bread is fine to use, *moldy* bread really isn't. Therefore, be sure to check it's not deteriorated too much before use.

Plastic Bottle Recycling

Plastic bottles are causing a serious environmental problem at the moment, and there's lots of pressure to reduce the use of them. Thankfully there are multitudes of things you can do with them to keep them out of your household waste.

Jet Pack Costume

There are dozens of *way* more practical ways to upcycle plastic bottles, but the jet pack costume is sure to be irresistible to anyone with children and is really easy to make!

A cardboard backboard is all that's needed to form the center of the costume. Straps are attached to one side, and two downward-facing large plastic bottles attached to the other. With orange tissue paper for flames and a little paint, these are easy to build and customize – and quick enough to make to build several for a party.

More Plastic Bottle Recycling Ideas

Here are some more plastic bottle recycling projects you can try at home:

- Garden sprinklers
- Mailing tubes – send sweets, crayons or papers in the mail
- Bird feeders
- Organisers for pens or makeup
- Scoops and trowels
- Piggy banks
- Garden Pots

Some Additional Creative Recycling Ideas

Here is a selection of ideas of ways to upcycle or downcycle some other items:

- Turn wine bottles into sparkly garden lights by dropping in inexpensive battery powered fairy lights
- Make bags out of scraps of carpet
- Use all kinds of containers and boxes to organise children's toys
- Turn old buttons into bold earrings
- Use old dryer sheets as air fresheners for cupboards and closets
- Use wine corks as kindling for starting fires and barbecues
- Make puppet toys from old (clean!) socks
- Use egg boxes as propagators for seedlings
- Make oven-baked vegetable chips from peelings
- Use old coffee grounds to repel garden pests

Creative Recycling Projects Recap

This article gives a mere sneak preview of just how much can be done with the household items so many people throw away.

There are thousands more creative ideas out there. As mentioned above, some people go on to build businesses around the incredible things they make from what would otherwise be waste items.

It is great for the environment to do something creative with these items. Also, it potentially saves money when you can build something that you otherwise would have paid for – in turn creating more clutter and more waste.

Many of these projects are so simple that they don't even require much creative skill.

What are the traditional products of India?

Our India is known for our traditions and culture throughout the world, India is also famous for our traditional products like hand-loom items, handicrafts and traditional food items.

As we all know our India is a land of "Unity in Diversity", every state of our India as its own different traditions and culture. The handicrafts and traditional products made in every state are according to their culture and traditions.

Our Every State has their own different types of traditional products,

Here are some traditional products which are famous in India

Handicrafts of India
The crafts of India have been valued throughout time; their existence today proves the efforts put into their preservation.

Some of the numerous tribal crafts manufactured in India include: *Antiques*, *Art*, *Baskets*, Paper Mache, Ceramics, Clock Making, *Embroidery*, Block *Printing*, Decorative *Painting*, *Glass* Work, Fabric, *Furniture*, Gifts, Home Décor, *Jewellery*, *Leather Crafts*, *Metal Crafts*, *Paper Crafts*, *Pottery*, Puppets, Stone and *Wood* Works.

The handicrafts in India is divided as a state wise as shown below:

- Crafts of Bihar
- Crafts of Rajasthan
- Crafts of Gujarat
- Crafts of Assam
- Crafts of South India

https://www.holidify.com/pages/handicrafts-of-india-183.html

Handicrafts of India -

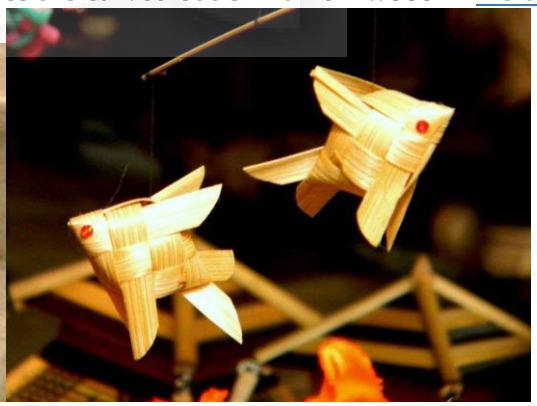
Handicrafts commonly referred to as handmade crafts or artisan. In this process, skilled people create different types of items from goods and convert them into decorative pieces out of paper, clay, wood, rock, stone, and many more using simple and cheap tools. These types of items produced are known as handicrafts as they are prepared solely by hands, and do not involve the use of any machinery. From time immemorial, India is known for its customs. As far as art and culture is concerned, India features amongst the topmost rated culturally rich countries in the

world. Our country is privileged enough to possess some very highly skilled artisans. Time and again, these artisans have added to the fame of Indian handicrafts all over the world. The handicrafts of India have been loved and respected by everyone and have left everyone awestruck. Many rural people still earn their livelihood from their creative pieces of art and India has still managed to preserve its artisans, its art and its handicrafts. India is a manufacturing core of varied kinds of handicrafts, which are popular even in international markets. Every state in India has its speciality.

In the following article, we will read about some of the handicrafts of India that you can take back:

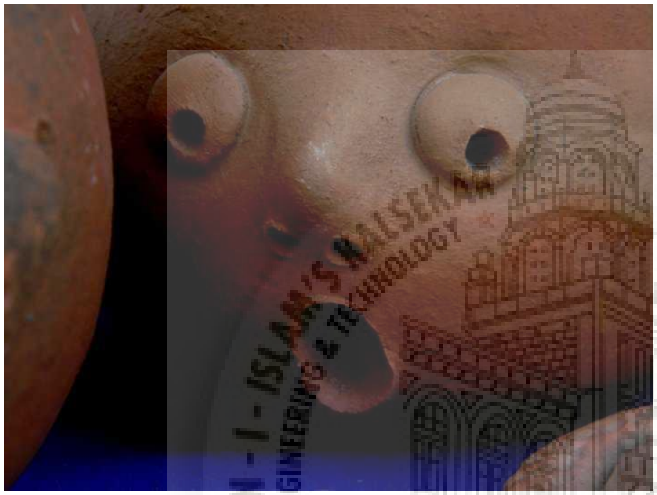
Woodwork

The northern states of India have a rich tradition of the woodwork. Regions in Punjab are famous for its exquisite wooden furniture. Kashmir is famous for its artefacts made from the walnut trees. The artisans of Chhattisgarhspecialise in wooden crafts like masks, doors, window frames and sculptures. Jharkhand is famous for its wooden toys which are always in a pair. The woodcarvings of Goa are an aesthetic blend of Portuguese and Indian cultures, and the designs are primarily floral, animal and human figures. Endowed with abundant forests, woodwork is a popular craft in South India. It is mainly done on rosewood and sandalwood. Red sandalwood from Andhra Pradeshis used to make cutlery, dainty boxes and paper knives in various designs. Madurai (a city in Tamil Nadu), is popular for its rosewood carvings. Karnataka is famous for beautiful elephants, images and furniture made from rosewood. Sandalwood is also used to make utility and decorative items, which are etched with designs of flowers, creepers, birds and animals. Magnificent figurines of females are carved out of *Kumbli* wood in Kerala.



Pottery

Pottery is considered to be the most sensual form of all arts. The tradition of handmade pottery is prevailing in India since the time of Harappan Civilisation. North India is also known for various kinds of pottery designs, ranging from colours like orange, brown and light red in Uttar Pradesh to black and dark red in Himachal Pradesh. In Rajasthan, Bikaner is famous for its painted pottery, Pokhran for its pottery with geometrical patterns and Alwar for its *Kagzi*pottery. The blue pottery of Jaipur is also very famous. The potter occupies a unique position in the craft traditions of India.



Leather

The age-old convention of leather skill in India is proved by ancient sages and ascetics. In the past, leather was not only used in making clothes and footwear but also in making caps, bags, saddles, shield etc. India is famous worldwide for its leather products. Madhya Pradesh is also known for its leather craft. Various leather items are produced like shoes, bags and garments. Maharashtra is also famous for its leather shoes called Kolhapuri chappals.

Jute

Jute craftsmen have created a worldwide position in the field of jute handicrafts. The huge range of jute crafts includes bags, office stationeries, bangles and other jewellery, footwear, wall-hangings and many more. India is a centre for jute handicrafts and people all over from the globe visit the jute handicrafts fairs to buy these works of perfection. West Bengal, Assam and Bihar, being the leading jute producers, pilot the jute handicrafts market in India.

6. Shell

There are three kinds of shell from which shell handicrafts are made in India ? conch shells, tortoiseshell and seashell. Different kinds of goods like bangles, forks, decorative bowls, lockets, curtains, chandeliers, mirror frames, table mats, etc. are the products of shell handicrafts. In general, the places located on the seashore like Gulf of Mannar, Goa, Odisha, etc. are the places for shell handicraft and these art pieces are found in abundance here at a lower price.

7. Brass Handicrafts

Brass is known for its durability, and this feature adds to its advantage when used as handicrafts. Different items made of brass like Lord Ganesha's figure in different postures, vases, table tops, perforated lamps, ornament boxes, wine glasses, and many more are widely used in many Indian

houses even today. These artisans dealing with brass handicrafts are distinctively known as "Kansaris". The manufacturing of brass handicrafts is mainly done in Rajasthan.

8. Bamboo Handicrafts

Handicrafts that are made by using bamboo are the most eco-friendly crafts made in India. The diverse items made from bamboo are baskets, dolls, toys, furniture, mats, wall-hangings, crossbows, jewellery boxes and many more. Bamboo handicrafts are predominantly prepared in West Bengal, Assam and Tripura.


Source

On the whole; we can see that each region of India is endowed with unique handicraft that adds charm to the state and the country as a whole. The tradition of craft has evolved through generations, and there is a quest for innovation and invention that continues to give each craft a contemporary look but at the same time preserving the Indian heritage and culture.

.Zardozi

Zardozi embroidery work involves making elaborate designs, using gold and silver threads along with studded pearls and precious stones. Intricate designs in gold are made of silk, velvet and even tissue materials famous in the state of Uttar Pradesh. Initially, the embroidery was done with pure silver wires and real gold leaves. However, today, craftsmen make use of a combination of copper wire, with a golden or silver polish, and a silk thread. This embroidery work is mainly a speciality of Lucknow, Bhopal, Hyderabad, Delhi, Agra, Kashmir, Mumbai, Ajmer and Chennai.

Source

Carpet Weaving

Carpet weaving is also an important craft in North India. Uttar Pradesh has the largest carpet weaving industries in the country, and the carpets are incredibly beautiful with designs such as the Taj Mahal woven on them. More than 500 carpet manufacturing factories spotted the city of Bidohi, which made the city home to the leading hand-knotted carpet weaving industry hubs in South Asia. Also, Jammu and Kashmir is known for the silk carpets, which are mostly woven in Srinagar.

Government Approved Handicraft Shops in India

- DilliHaat in Delhi
- Kala Madhyam in Bangalore
- MESH in Hyderabad and Delhi
- Khazana in Taj Group of Hotels
- Ekamra Haat in Bhubaneshwar
- Rajasthali in Jaipur

So the next time, you visit any of the cities mentioned above in India, do not forget to buy one of these artistic productions which will surely make your home even more decorative.

On the whole; we can see that each region of India is endowed with unique handicraft that adds charm to the state and the country as a whole. The tradition of craft has evolved through generations, and there is a quest for innovation and invention that continues to give each craft a contemporary look but at the same time preserving the Indian heritage and culture.

NATIONAL NETWORK OF BUILDING CENTRES - GUIDELINES

GOVERNMENT OF INDIA
MINISTRY OF **URBAN DEVELOPMENT**

New Delhi 110001
12th August, 1988
No. N-16012/7/87.H.I

TO,
The Chief Secretaries, (By name)
All States and UT Governments
Subject: CENTRALLY SPONSORED SCHEME FOR SETTING UP OF BUILDING CENTRES- GUIDELINES

Sir,
1) The National Housing Policy which was placed before the Parliament in May, 1988 has laid great emphasis on encouraging and production **and** use of building materials based on local resources and of standardised low cost building materials and components, as also on improving and upgrading construction skills. Under the rubric of 'Building Materials' (paragraph 12) in the National Housing Policy document, inter alia the following policy guidelines have been laid down:-
"To meet the large demand for housing, maintain quality and speed up construction, production of standardised low-cost building materials and components will be encouraged, preferably on a decentralised basis. Building material production estates will be established, wherever necessary, for this purpose.'
"To provide for easy access to standardised building materials and components, establishment of supply centres on a decentralised basis will be promoted."
"To propagate and promote the use of low-cost and standardised building materials and components and appropriate technologies and design, demonstration **extension-cum-training centres will be set up."**
2) The extension of relevant low-cost building technologies to the grass root level is a new and difficult area. The Nirmithi Kendra at Quilon in Kerala State has demonstrated that one of the effective methods is of training local artisans in handling these technologies. Spurred by the success of the Quilon experiment, the **Government of India have decided to launch a national** programme of setting up of a network of building centres in all the districts of the country.
The Finance Minister, in his Budget speech delivered on 29the February, 1988, had announced as follows:-
"There is great scope for using local low-cost materials in housing. Our scientists and engineers have also developed considerable experience in low-cost housing technology. It has been decided to set up a national network of Nirman or Nirmithi Kendras which will provide easy access to low-cost housing materials and techniques. It is proposed to set up one Kendra in each district. In the coming year, 100 Kendras will be set up.'
3) Accordingly, a Centrally Sponsored Scheme for establishment of Building Centres has been sanctioned by the Central Government. The Scheme will be implemented and operated through the Housing and Urban Development Corporation. The following will be the general guidelines of this scheme:-

i) **Objectives:** The Setting up of Building Centres is an institutional development approach for the extension of improved low-cost building technologies through skill upgradation of local artisans and training of urban and rural youth, at State, district and block levels. Low-cost building technologies to be propagated through these Building Centres will have to be carefully identified on the basis of local needs, resources and environment, The following will be the broad areas of action :.

a) Upgradation of traditional technologies will be one of the major concerns of the Building Centres. Development and manufacture of established mud-blocks by using small quantity of lime and cement, making the traditional thatched roofs in the rural areas water proof and fire resistant by adopting various methods and such other measures will be propagated by the Centres.

(b) Development of skills for pre-fabricating low-cost building components with efficient utilisation of steel and cement, like RCC sanitation rings and Ferro cement water tanks, hollow blocks, stone blocks, channel roofing system, fibre concrete tiles etc. would be the major thrust area in these Centres.

c) Encouraging building components using wastes and recycled materials would be another major concern of these Centres.

d) Various manufactured low-cost building materials like asphaltic roofing sheet, Sulabh Sanitary wares, siporex components etc. can be stocked by the Building Centres and sold to home builders at reasonable prices.

e) The local artisans and unemployed youth will be trained in the use of low-cost building components and improved tools and equipment developed by building research institutions etc. so as to' upgrade their skills.

f) The Centres will also promote low-cost house designs which relate to the life style of the local people.

ii) **Financing pattern: The Ministry of Urban Development will sanction a grant of Rs. 2 lakhs to each Building Centre through HUDCO.**

This grant-in-aid may be utilised as follows:-

a) Construction of workshed, training centre, godown and office Rs.1 .OO lakh

b) Purchase of equipment, training material etc. Rs.1 .OO lakh

Within the overall ceiling of Rs. 2 lakhs, minor variation in the grant-in-aid for the two items mentioned above will be permissible. Since this scheme aims at promoting gainful employment to young men and women from urban and rural areas by training them in the use of low-cost building materials and technologies, thereby giving an impetus to low cost constructions.

Similarly, funds earmarked for research and development under Indira Awas Yojana can be legitimately utilised for developing these Kendras. Funds can also be tapped for these Kendras from various schemes sponsored by the Ministry of Labour and Department of Industries. Financial support from the Department of non-conventional energy sources and the Department of Environment could also be enlisted.

In addition to the grant from the Ministry of Urban Development and financial assistance which may come from the various rural development programmes and the schemes of Department of Labour, Department of Industry, Department of Environment etc., additional loan assistance will be made available to the Centres by the Housing and Urban Development Corporation to the extent of Rs.4 lakhs per Centre.

iii) **Land**: Each Centre will be set up on a plot of land preferable admeasuring one-and-a-half acres to two acres. The land earmarked for the purpose should be easily accessible and have a fair degree of infrastructural facilities like transport, water supply and power. The land may be made available to the centre by the State Government/U.T Administration/local body/ development agency/housing agency/voluntary agency, free of cost or on nominal rent, Land available with promoting agencies such as Cooperatives Sugar Factories and Industrial Cooperatives could also be used for this purpose.

iv) **Involvement of non-governmental organisation**: Non-governmental organisation can make a significant contribution in the development of the Building Centres. They could be contacted for managing some of these Centres. Dedicated professionals and social workers can also provide the required leadership and directed to this programme. Social/voluntary organisations may be able to also provide financial support. Involvement of such non-governmental organisations would be a good supporting strategy for the success of the programme.

NATIONAL NETWORK OF BUILDING CENTRES REVISED GUIDELINES
Implementation and Administrative Aspects of the Scheme

1. The Eighth Plan accords priority to building centres and envisages budget provision for support to Building Centres and the National Housing Policy also advocates that the programme be supported as part of the policy for technology extension and building materials and environmental conservation. However, there should be no effort to set up the centres on the basis of annual state wise targets. Thrust should be to consolidate and strengthen the centres already in existence and promote convergent use of available resources for technology extension and skill upgrading.
2. The programme should be demand driven and related to express local needs. In order to achieve early viability in the operations of the Centres, there is a need to modify the guidelines envisaged in the original scheme covering following aspects. The revised guidelines will relate to:

- Organisational set up of Building Centre depending on the sponsor and the role assumed by it whether the centres should concentrate on production or execution of projects.
- procedure for approval and sanction
- thrust areas of the Centre in the context of NHP
- Financial sources of the Centres in the interest of long term viability.
- responsiveness to shelter needs of the people and adoption of innovative materials
- involvement of leading architects I engineers / public construction agencies / NGO'S

3. The Action Plan Manual will be separately circulated by HUDCO in the light of these guidelines. The modified manual should then be circulated widely in different languages to all state agencies, technical institutions and users. It has to be followed by simple know how pamphlets in local languages and training hints of the type devised for the construction of earthquake affected houses in U P or calamity affected houses in Tamil Nadu and Kerala. The

recommended technologies and the building centres should be widely disseminated through the media and the coherence with professional bodies.

4. The scheme could cover villages, small and medium towns, depending on initiatives taken by the state and local agencies, research and professional bodies. It could be related to rural development schemes, and to activities of DRDA for employment generation, skill upgradation, small enterprises, support to NGO's, women and youth associations etc.

5. Each State Govt. may identify a Nodal Agency to facilitate speedy implementation of scheme and to support local initiatives, This could be state planning/housing department, linked to DRDA'S (DRDA'S at district level) and laterally to agencies in charge of housing, public construction and technology immediate aim should be to incorporate new materials into PWD codes and tender documents and to disseminate them to all user agencies and households. The polytechnics and local bodies should support the centres.

6. Prominent local architects and engineers can sponsor the centres as patrons to lend them greater status and popular acceptability. Programme should be projected through media and enforced through State agencies to encourage increased participation of professionals, architects and engineers, entrepreneurs, industry associations and NGOs. The associations of teachers like Indian Society for Technical Education as well as contractor association can be involved. Legal tax incentives could be considered, apart from excise concessions for materials produced in Building Centres. Manufacturing enterprises could concentrate on activities related to materials made out of their waste products such as fly-ash, or efficient brick kilns and other units for captive consumption. Financial institutions could insist on the use of cost-effective technology and new materials, and extend finance for their production. The changes in provisions of Building Codes are significant in this regard, as also adoption of innovative technologies and alternate materials by CPWD and State PWD's. The Centres should aim at assisting individual builders to use cost effective technology without confining the use only to demonstration Govt. schemes. The Centres should not overemphasize production or marketing of building materials to the exclusion of training and shelter guidance.

7. The proper evaluation, validation and documentation of technologies would be undertaken by BMTPC to permit their propagation after vetting by the BIS in the form of working standards or inclusion in the building codes. Their adoption by CPWD and state PWDs will ensure respectability to the materials and technologies to be propagated through Building Centres.

While HUDCO would continue to operate the programme it would be guided by the national committee in the Ministry of Urban Development having, representative of concerned agencies on technology transfer. The Committee would co-opt state representatives and NGO's. As envisaged under NHP, the public agencies should lead the way by earmarking at least 10% of turnover for new technologies after including them in the schedules. Funds can be given to state level nodal agencies and research institutions to document and disseminate technologies in understandable and adoptable form. HUDCO and BMTPC would ensure that the Centres

propagate only tested technology, are staffed with good professionals, exercise quality checks over production of materials and construction, and do not overextend themselves.

8. It is essential that the scheme should be widely publicised for the benefit of local users and households in local languages through various media for which technical help can be given by HUDCO / BMPTC.

Public buildings of high visibility should be constructed using innovative cost-effective technologies such as primary schools, village and municipal offices, health care centres and staff housing. The Building Centres may first be rated by BMTPC and HUDCO for taking up construction projects of different levels of sophistication and then the State Govt. induced to award works to them on deposit basis. Similarly, the association of Building Centres, in guiding private builders or organisations in the use of cost-effective technology and new materials can be promoted with the help of architects, engineers and builder association.

Recommended Action for Existing *Centres*

9. All existing proposals for building centres already approved would be evaluated by HUDCO and unviable Centres weeded out from the list after consulting State Govts. There should be no effort to continue the Centres at any cost even if they show continuously poor commitment and performance Where the Centres are not taking off for want of land or other local constraints time limit for sorting them out would be given and then a decision taken for continuance or closure. HUDCO would examine if the Centres can be assisted by help to induct fulltime professionals or in securing support of local research bodies/professional associations/ builders association. The state govt. should be asked to provide land, power, water supply, access roads etc., to help the Centres work .The Nirmithi Kendra would be encouraged to pursue different technologies based on rural agro materials, energy conservation and industrial wastes, prefab components, upgraded use of mud, ferrocement etc. based on locally available resources so as to become viable in terms of production by themselves or franchise to entrepreneurs.

Objectives & Scope of Activities

10. Each Building Centres while operating on market oriented, demand driven principles should provide an integrated range of services depending upon the area needs and promoters' interest. Based on The local needs, a Centre should evolve appropriate mix of its activities in keeping with its objective and may gradually enlarge its scope of work compatible with its selected thrust areas and professional capabilities. Various tasks expected to be undertaken by the Centres may fall under following major catagories.

a) Technology transfer from 'lab' to 'land' by disseminating information on cost effective technologies in urban and rural areas.

b) Skill upgradation and training of masons, artisans, carpenters, other building related work force Including professionals and entrepreneurs in production and practice of various cost effective building materials, techniques and systems.

c) Manufacturing/production of cost effective building materials/components based on local natural or waste resources and providing distribution outlet for the various user groups,
d) Creating a pool of trained rural/urban construction workforce to meet the diverse needs of housing and building construction and other developmental activities undertaken by individual households or public housing/development agencies utilising appropriate and cost effective building technologies.
e) Housing and building guidance, information and counselling
The criteria for successful operation would be different for rural and urban Centres. However: all Centres should be geared for construction guidance on design and engineering side, artisan training and technology dissemination for both public and private bodies, cooperatives, individuals and low income communities. The thrust has primarily to be on objectives (a), (b) and (c)

Organisational Pattern
11. The organisational pattern will largely depend on the nature and initiative of the sponsoring institution/agency / individual. The setting up of the Building Centres may be encouraged through one or more of the following initiatives:
i) By State Govt., District Administration, Local Bodies, Block Development Offices, Rural Development agencies;
ii) By the State/Central housing agencies / undertakings;
iii) By the Research and Development institutions
iv) By Educational, Training, Management organisations engaged in teaching, training, skill/ entrepreneurship development in the areas of housing, building and construction;
v) By Non-Governmental Organisations, voluntary bodies and Charitable Trusts/Societies;
vi) By professionals, developers, builders and entrepreneurs individually or severally
vii) By Construction workers' cooperatives, Contractors/ Builders Associations, Cooperative housing societies.

12. All possible organisational patterns should be widely publicised to encourage different types of initiatives. Essentially the programme has to be demand driven and support felt needs of community for technical assistance in cheaper construction or upgradation, or deal with shortage of conventional materials, or help in improved use of locally available resources and biomass, or in helping to disseminate better technologies. It has, however, to be ensured that the technologies promoted through the Centres are seen to carry the advocacy of opinion leaders like architects, engineers, contractor associations and PWD'S while the technologies themselves carry authentication by BMTPC/HUDCO/BIS and State PWDs.
13. The Centres can be registered under Societies Act, Cooperatives Act, Companies Act
Also the views of State Governments would be kept in wow while proposing change in the present set up under the guidelines. It is necessary, however, to make the organisational form of the Building Centres more flexible, in favour of an entrepreneurial, non-bureaucratic set up.

14. Each Building Centre should evolve its own management pattern and no rigid guidelines can be laid down regarding the governing body or executive committee and only the performance requirements would be suggested in the Action Plan Manual.

Techno-Financial Viability of Building Centres

15. Tie-up in training activities of Centres and State Agencies for NRY, JRY, TRYSEM etc. should be strengthened to facilitate adequate funds for training at Building Centres, while at the same time helping to use the Centres for skill upgradation and income support.

16. Building Centres should be encouraged to have continuous interaction with R&D and engineering educational institutions. At the same time, Dept of Education and State Govts should be requested to restructure the curriculum for incubations better appreciation of technology transfer. The associations of Architects and Engineers should be persuaded to appreciate the role of Building Centres. The associations of Architects and Engineers should be persuaded to appreciate the role of Building Centres. The concept of few Building Centres as Centres of national excellence can be considered to support dissemination of technology to other Centres, training of professional for other Centres etc.

Funding Pattern

17. Central grant-in-aid for the new building centres would be considered on a graded basis from Rs.3 lakhs to Rs.5 lakhs depending upon the nature of activities and subject to availability of funds. The detailed guidelines in this regard will be separately issued. The central grants will be supplemented through HUDCO with k f w grants subject ot availability and HUDCO loans for designated purposes. Additional grants would be available from central schemes of Ministry of Rural Development and Ministry of Urban Development.

Monitoring & Evaluation

18. Detailed procedure for periodic monitoring and evaluation of progress of each Building Centre at local and progress of scheme at State level should be laid down.The monitoring can be done by State nodal agency, HUDCO and national level committee under Secretary (Urban Development). Periodic evaluation of Building Centres would be done through outside experts to lay the basis for continuance, remedial action and further support.

Fiscal Incentives

19. It is suggested to State Govts that exemption of Sales Tax, Octroi should be given by State Governments for products manufactured by Building Centres and they may utilise the Centres for construction undertaken by their agencies.

20. With a view to integrating cost effective technologies on a continuing basis in the housing and building programmes, it is strongly recommended that a R&D fund be set-up by drawing 1 to 1.5% of the funds being spent on housing projects by the housing, urban and rural development agencies to be utilised for strengthening the technology transfer activities being

pursued by the Building Centres. The utilisation of the fund should be managed jointly by state nodal agency, HUDCO and BMTPC.

Role of State Governments & Agencies

21. There are certain supporting actions which the State Governments may consider taking in the interest of achieving the technology transfer objectives of National Housing Policy.

21 .1 The State housing and building agencies should be advised / directed to involve capable Building Centres in execution of housing and other building schemes based on new materials and technologies.

21.2 Necessary modifications should be introduced in Schedules of Specifications &contract documents of housing development agencies.

21.3 Procedures for awarding "Turn-Key' or Performance &tracts should be formalised and accepted by State Govts. / Housing & Development Agencies till schedules are modified.

21.4 The private builders and architects and engineers should be induced to accept and introduce innovative technologies and materials in the national interest. The private entrepreneurs in small and large sector should be given the feasibility reports of the new materials and induced to take up their manufacture and open retail outlets with the support of state industries departments, SSI agencies etc.

22 a) Recurring funds for training in construction related trades should be made available to Building Centres by State Governments.b) Capable Building Centres should be recognised by Govt., Contractors associations, Polytechnics, IT is for awarding proficiency certificates.

23. A state level committee will be set up under the Chief Secretary as part of the monitoring arrangements under National Housing Policy. This can monitor the building centres and the linked activities proposed here. The committee can be assisted in this regard by the state level nodal agency.

Sustainability of Building Centre's Operations

24. Building Centres may be encouraged to have their own associations, organise seminars/get together to establish a system of information and experience sharing in concert with BMTPC, HUDCO and State agencies.

Financial guideline for the proposed centre:

Centre income 20% from activities such as:

- **training programs**
- **visitor admission fees**
- **seminars**

Membership fees 10% (corporate, academic, government agencies)
Private Sector sponsorship 25% (award programs, project sponsorship)
Government sponsorship 45%

CASE STUDIES

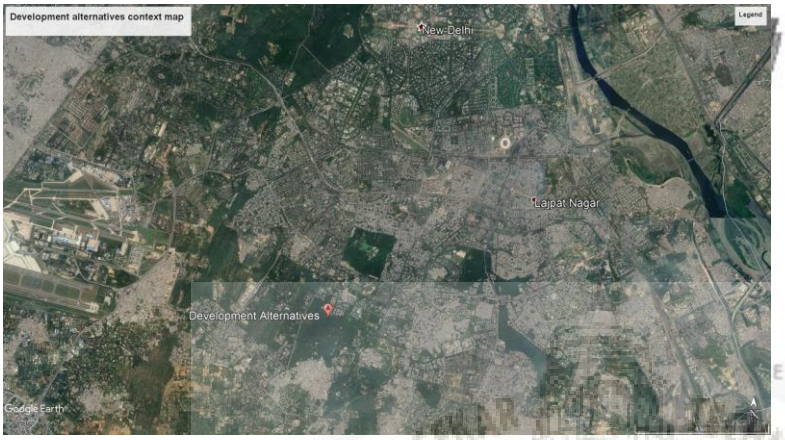
LIVE CASE STUDY

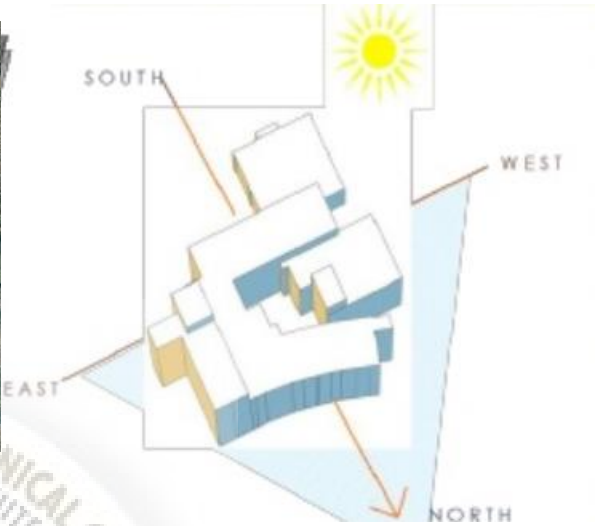
- Bamboo research & learning centre
- Development Alternatives world headquarters – New Delhi

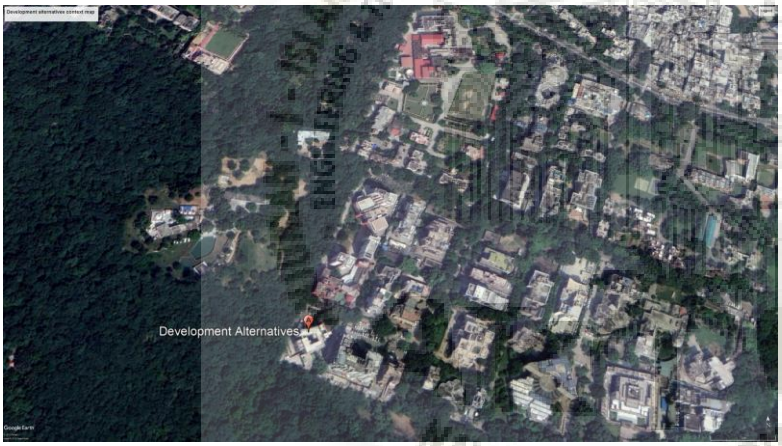
NET CASE STUDY

- Anangpur building centre & residence of Ar. Anil Laul - Haryana
- Hunnarshala foundation – Kutch, Gujarat.
- Khamir craft park- kukma, kutch
- Makers Asylum- Mumbai

DEVELOPMENT ALTERNATIVES HQ –NEW DELHI

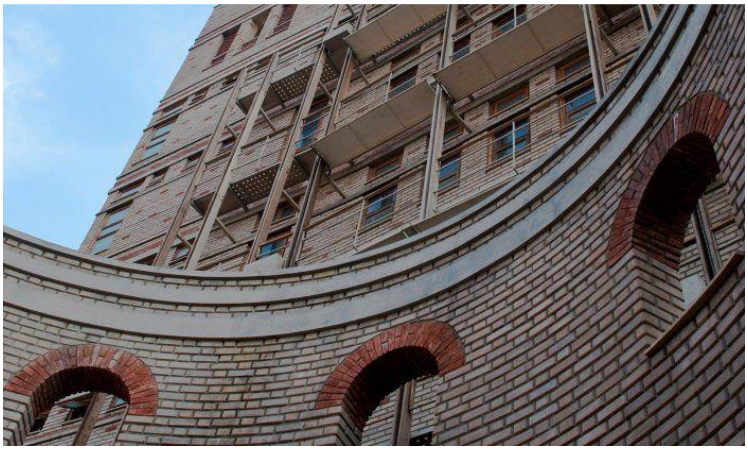




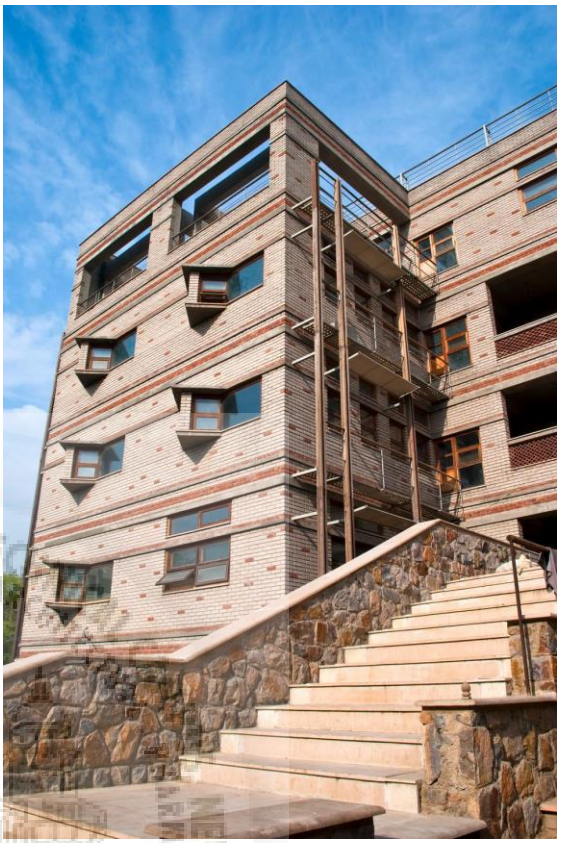


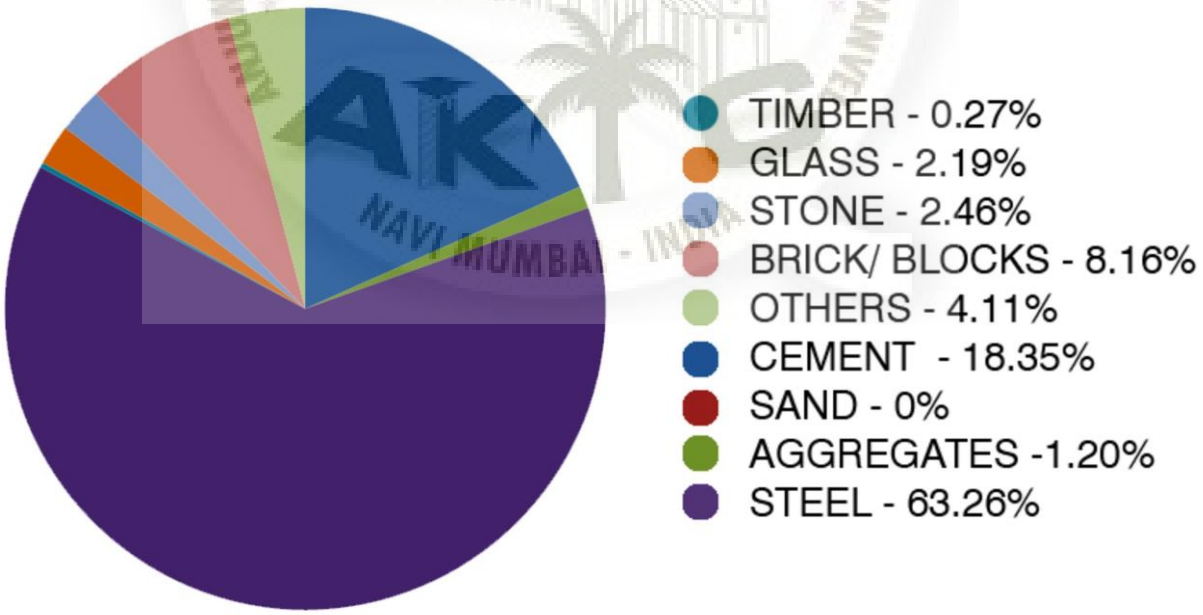
Responding to its physical setting, Development Alternatives world headquarters forms a visual anchor at the end of the city street on one side and shows reverence to the calm forest on the other. The significance of the historic city forest as an ecological asset is heightened by how the building embraces the forest.

It is designed to demonstrate **alternatives for achieving sustainable urban development.**



RESOUCE CENTRE INTERIOR





The client and the architects jointly sought alternative means of achieving these aims through the project.

The building illustrates seldom-seen yet reasonable ways of reducing embodied energy in buildings, equitably distributing wealth through the construction project, updating vernacular materials and forms, and curtailing energy consumption and CO2 emissions.

The design, materials, and techniques of Development Alternatives world headquarters demonstrate a fundamental alternative for the construction of comfortable, green, and affordable buildings of many types.

The project tests innovative, specially designed elements and components such as a hybrid air-handling unit that incorporates available components in a new way to achieve great energy savings.

Nearly all interior and exterior walls are built of cement-stabilized compressed-earth block and cement-stabilized fly-ash lime-gypsum block, the manufacture of which recycles plentiful local materials in processes that use local labor and low energy.

Efficiently built in reinforced concrete and masonry, Development Alternatives world headquarters uses less than half the reinforcing steel used in comparable structures of conventional design.

The approach holds significant potential for reducing resource consumption and greenhouse-gas emissions.

The building uses predominantly natural, recycled, renewable, and reusable materials embodying low process energy.

Highly energy intensive materials like aluminum are shunned; others, such as glass and steel, are used frugally.

Eighty percent (by volume) of the building materials were sourced within 500 kilometers of the site, thus holding down CO2 emissions of transport.

All rainwater that falls on the site is used to recharge the groundwater. All wastewater is recycled, treated on site and used for irrigation and flushing toilets.

The client, Development Alternatives, makes the case for a way of building using natural, low-CO2 materials and for sensibly adjusting expectations of indoor thermal comfort in buildings, for the sake of planetary health. Architect Ashok Lall draws on building traditions that industrialization and commercialization has neglected. He seeks not to revive tradition, but to redefine old methods in the contemporary context. He embraces tradition not because of the past, but for the sake of the future.

Sustainable construction

Quantum change and transferability

Ethical standards and social equity

Ecological quality and energy conservation

Economic performance and compatibility

Contextual response and aesthetic impact

Sustainable buildings conserve finite material and energy resources and minimize greenhouse gas emissions. Good built environments are healthful for humans, animals, and plants. Green buildings help keep the natural environment and ecosystems healthy by reducing waste, controlling pollution, and treating land, air, and water as precious resources.

Ecological quality and energy conservation. Efficiently built in reinforced concrete and masonry, Development Alternatives world headquarters uses less than half the reinforcing steel used in comparable structures of conventional design. The approach holds significant potential for reducing resource consumption and greenhouse-gas emissions. The building uses predominantly natural, recycled, renewable, and reusable materials embodying low process energy. Highly energy intensive materials like aluminium are shunned; others, such as glass and steel, are used frugally. Eighty percent (by volume) of the building materials were sourced within 500 kilometers of the site, thus holding down CO2 emissions of transport. All rainwater that falls on the site is used to recharge the groundwater. All wastewater is recycled, treated on site and used for irrigation and flushing toilets. Hybrid air-handling units integrate evaporative cooling and

refrigerant- based cooling to reduce energy consumption for air conditioning by thirty percent, and to reduce water consumption.

Ethical standards and social equity

In many communities, sustainable construction principally involves supplying urgent basic needs such as shelter, water, schools, and access to goods, services, and medical care. Towns and buildings must respond to emotional and psychological needs of people by providing stimulating

Land Area: 3116 sq. m

Built Area: 3096 sq. m superstructure

: 1526 sq. m basement

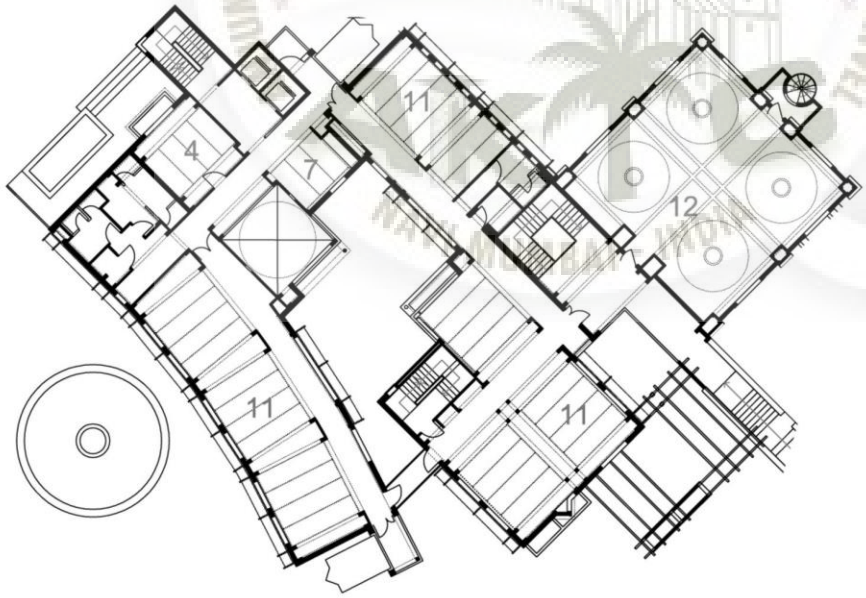
Population: 300 persons

Functions: Offices

: Resource & Workshop Centres

: Conference Facilities

Architect: Ashok B. Lall – Architects



- The ground floor & the outdoor areas of Development Alternatives world headquarters are open to public, inviting public participation in the programs & activities of the organization.

- Operating cost is kept low by natural lighting of all workspaces & efficient hybrid cooling

- The project illustrates traditional, environmentally efficient construction materials & systems that can be economically developed for low-energy mass production & adopted by mainstream building industry, especially in developing countries
- . The project used simple local materials and local labour to direct money into the pockets of local workers and local construction trade. Traditional construction skills and fine craftsmanship were integral to the design

Economic performance and compatibility

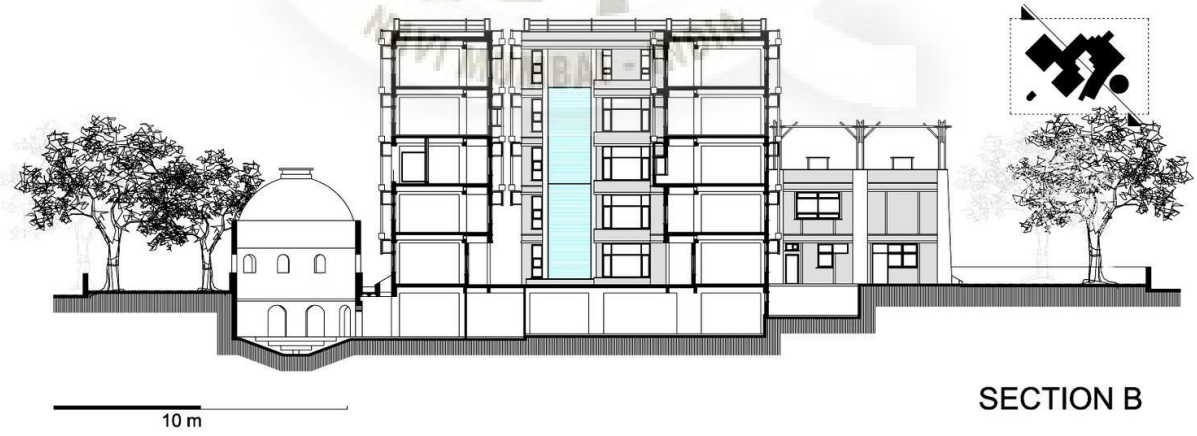
The environmentally friendly construction techniques and mechanical systems used in the building cost no more than their conventional energy-intensive counterparts.

Economical local materials, simple technology, and local labour were employed to keep construction costs low.

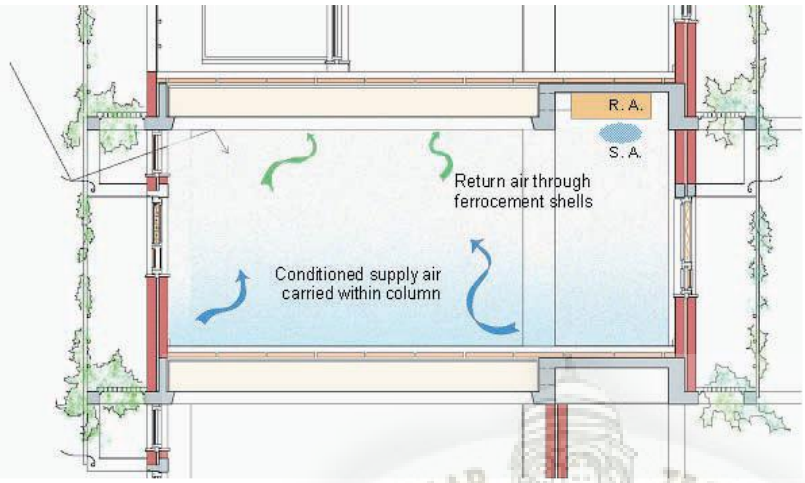
Maintenance costs are minimized by using unfinished, durable, natural materials selected to age with grace.

Operating cost is kept low by natural lighting of all workspaces and a flexible and efficient hybrid cooling system

The project illustrates traditional, environmentally efficient construction materials and systems that can be economically developed for low-energy mass production and adopted by the mainstream building industry, especially in developing countries.



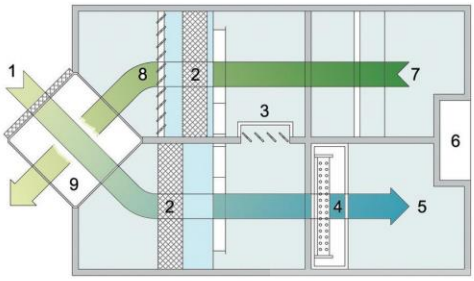
SECTION B



The new DA World Headquarters is probably the most sustainable building on the Indian subcontinent, its construction involving a wide range of resource conserving strategies that include:

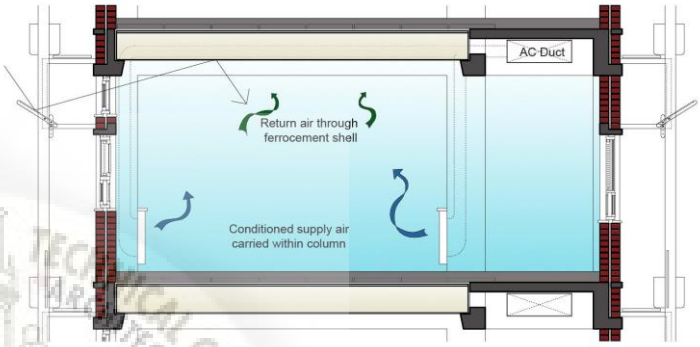
- User defined norms and standards for thermal comfort, ventilation, lighting, waste management and water use for high worker performance while minimizing resource consumption, for example: acceptance of indoor temperature range from 16o to 30o C (vs. the international norm of 18o to 28o C) that is relevant for tropical regions maximum use of natural lighting and installation of high-efficiency lighting systems
- Conservation measures that harvest, reduce, reuse, recycle and recharge the scarcest resources – energy and water – through maximum reuse of material from the previous HQ maximum use of local materials total rainwater harvesting and ground water recharging innovative hybrid cooling system to minimize use of energy and water
- The construction systems used are an inventory of innovative and green building materials and techniques that are easy to replicate in both urban and rural areas and therefore ideal for the mass market which:
- Employ production systems for easy-to-use, quality prefabricated elements for roofs, doors and walls which are eco-friendly
- Use decentralized and even onsite production methods innovated by DA such as utilizing debris from demolished buildings to make _y-ash and mud blocks
- Use advanced, environment-friendly construction systems that conventional contractors can easily adopt, such as ferro-cement channels and _y-ash blocks

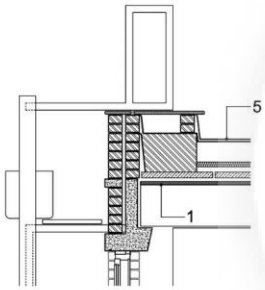
- Provide a template of building management systems such as for water, energy and waste that can be adopted by urban neighbourhoods to reduce their ecological foot-print.



Hybrid Air Handling unit

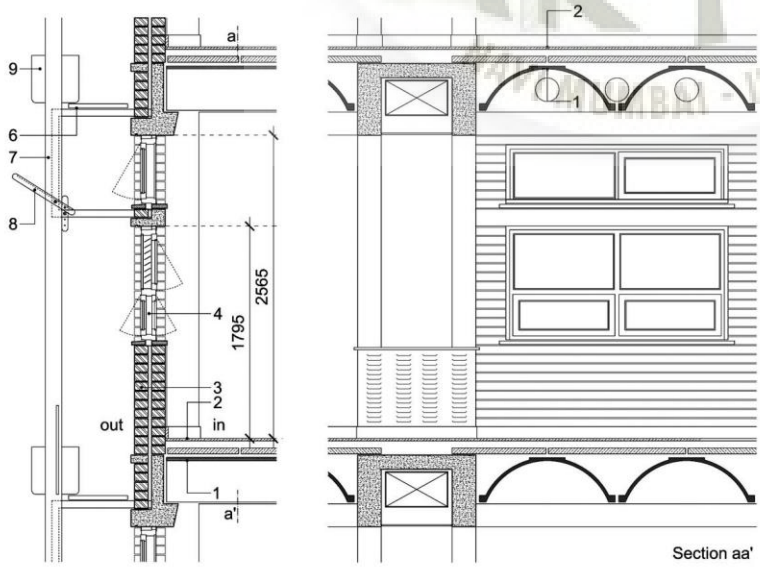
1. Fresh air intake
2. Evaporative cooling pads
3. By-pass dampers
4. Chilled water coil
5. Supply air
6. Control panel
7. Return air blower
8. Exhaust dampers
9. Plate heat exchanger





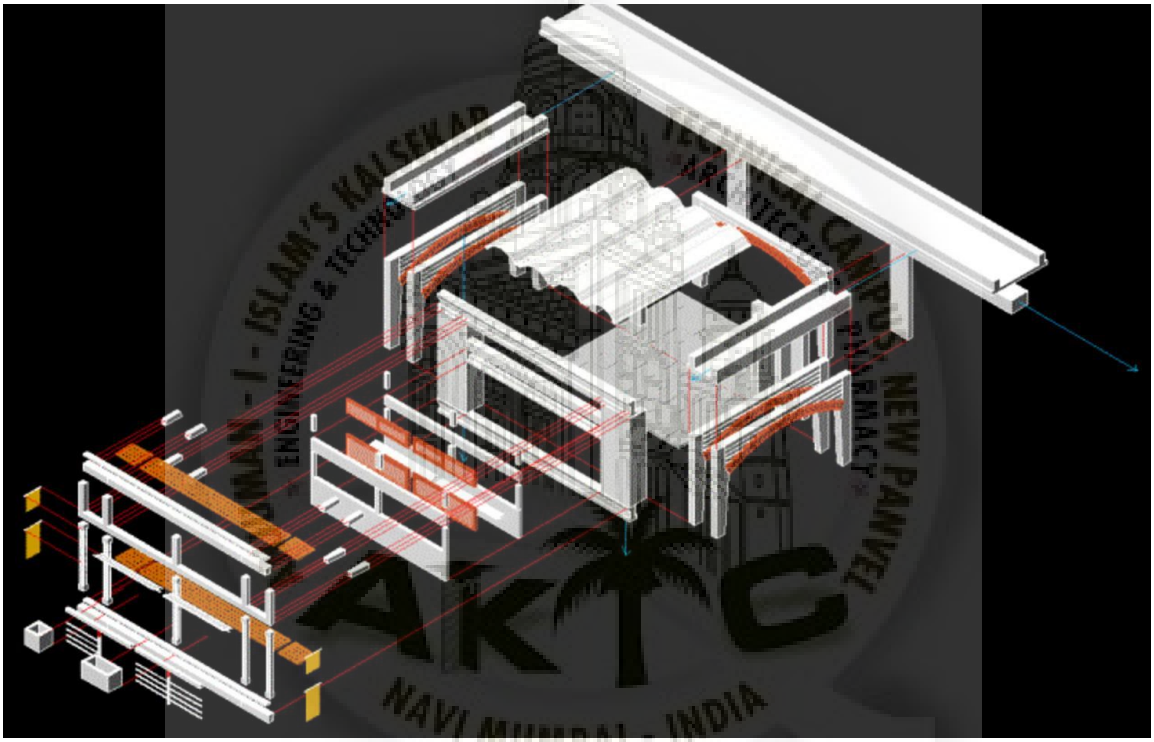
External wall section,
scale 1:50

1. Ferrocement vault
2. Kota stone floor finish
   50mm budhpur stone spanning between ridge line of vaults
3. Flyash cement blocks
   Expanded polystyrene from industrial waste
   Compressed earth block
4. Teakwood window frame and shutters
5. Broken ceramic tile flooring from waste tiles
   40mm polyurethane insulation
6. Concrete shelf
7. Meranti wood frame
8. Daylight reflector
9. Planter

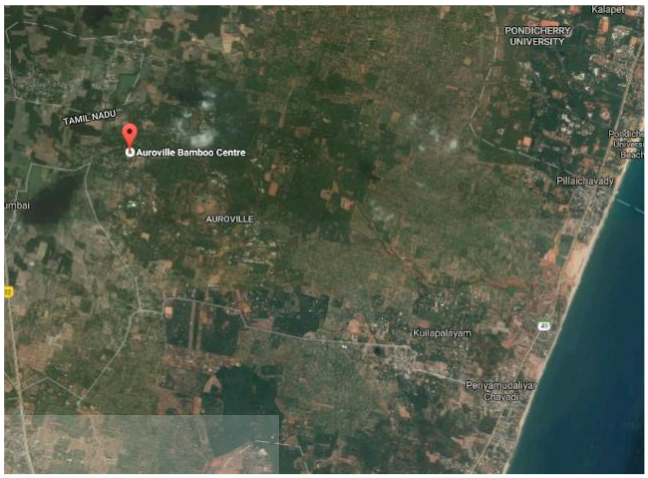


Section aa'

- Responsibility towards use of scarce natural resources all wood work and furniture uses timber from certified managed plantations all rainwater at the site will be collected for recharging the ground aquifer
- Recognition and promotion of local crafts in various building elements, e.g. terracotta elements for fenestration artisan based carpentry works
- Promotion of sustainable livelihoods and local rural and peri-urban economies by using building elements made by technology and skill-based small enterprises

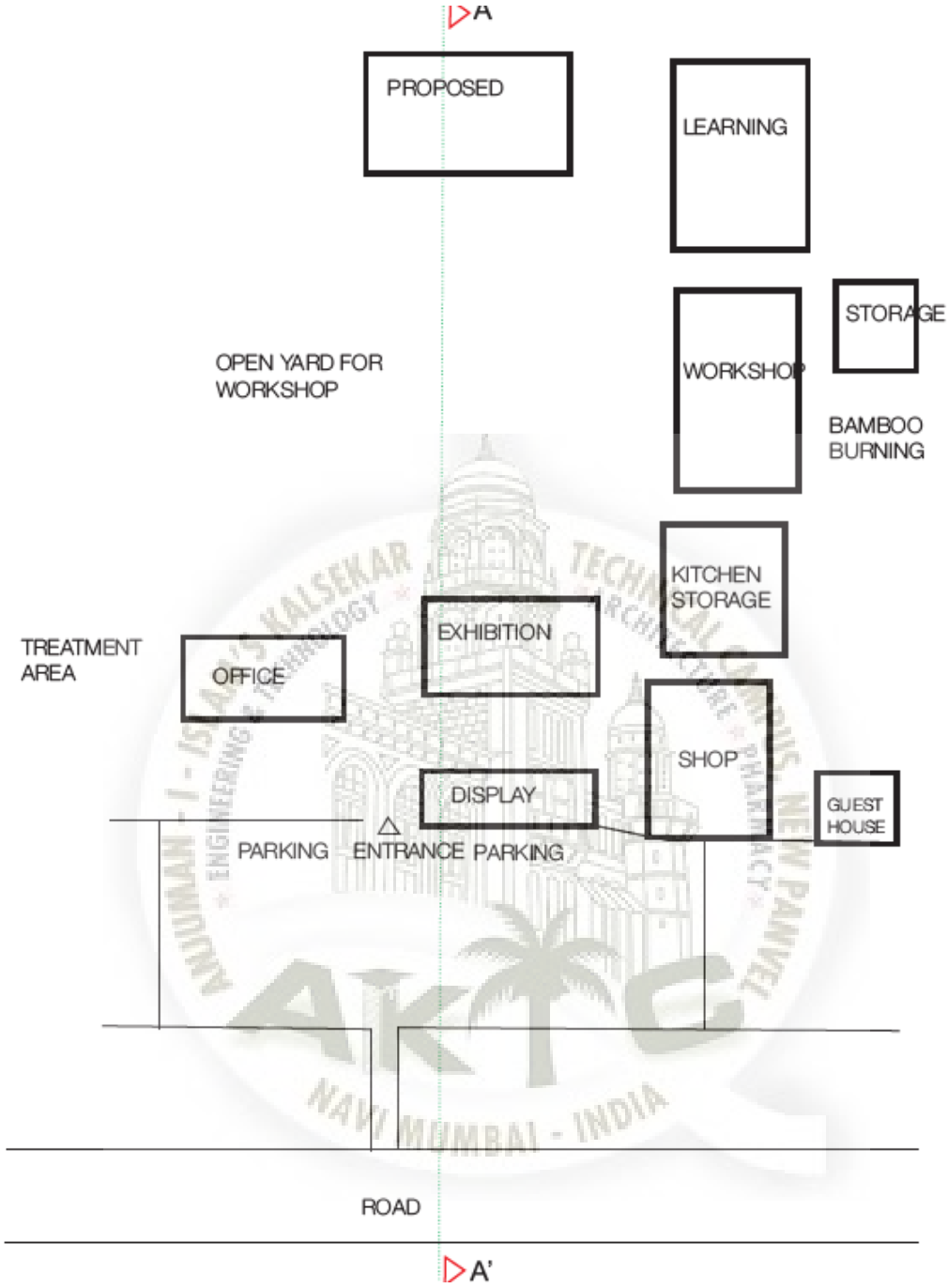


AUROVILLE BAMBOO RESEARCH CENTRE (ABRC), Auroville, Pondicherry.



Auroville Bamboo Research Centre was established in February 2007, with the aim to merge Indian traditional craft with contemporary design. It is focused on production and marketing of Bamboo craft for income generation and building stronger communities for sustainable living. Its objective is to transfer technology, knowledge and skills through Training and workshop for the environmental conservation. Training programs are conducted, upon request to students of Schools of Architecture or engineering, Government and NGO's, etc. There is a regular demand for the bamboo based training programs, especially from Schools of Architecture. Special courses can be scheduled upon request. The Auroville Bamboo Research Centre explores and develops sustainable techniques for using bamboo in construction, products, furniture and handicrafts. It hosts workshops and training year-round Auroville Bamboo Research Centre supports students who want to study bamboo more extensively, by hosting them as interns and volunteers and providing access to its workshops, knowledge and network. To fulfil its mission, Auroville Bamboo Centre conducts workshops and seminars for students, artisans, farmers, professionals and any other persons interested in bamboo products, construction and design.

Apart from its awareness program and workshops, the Auroville Bamboo Centre is also involved in research and development in terms of new bamboo products and finding sustainable and eco-friendly alternatives to housing needs, interior and furniture design and household products by incorporating bamboo and it's derivatives



Master Plan of Auroville Bamboo Research Centre

Section AA'(ABRC)

Parking Space

Treatment Area

learning area

The learning Area, where the knowledge of bamboo(growth patter, different species available, typology, growth cycle, etc) and its advantage, benefits, application, strength etc. are thought to the people(visitors). also thought the basic technique of joinery used for the furniture and construction.
This semi open structure is made with combination of adobe and bamboo, the half wall is made of adobe and bamboos are placed over the bamboo randomly, the roof cover they used for the structure is simple galvanized sheet with bamboo as a rafter for that.

learning area, Interior

In treatment area they explain about how bamboo must be treated, methods, what is the solution used to do. Also the advantages and necessary of treatment before get used in the application

Workshop

Workshops which is filled with machines and tools After the Knowledge get from learning center. the cutting, sizing of bamboo, techniques and the joinery. This structure is simply made by placing bamboo poles. for wall they placed weaving bamboo and the roof with galvanized sheet

Workshop

Office

The Office space, where registration happens whoever want to take part in a bamboo workshop. Also the maintenance of website entries.

Exhibition

In exhibition space, a prepared handicraft, material, toy, a small bamboo prototypes are exhibits in the exhibition space.

Shop

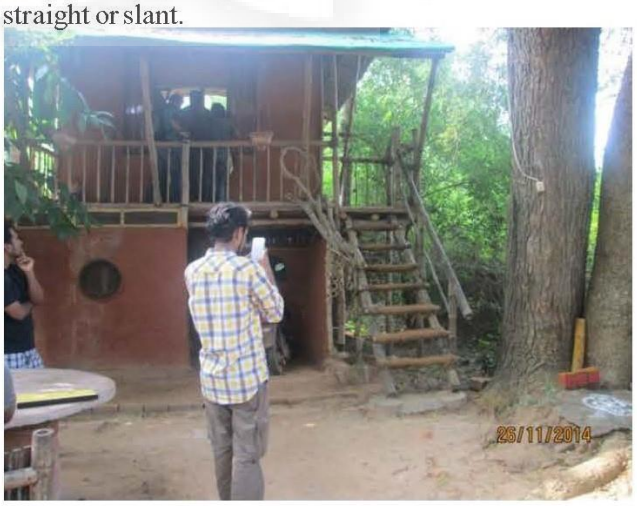
In shop, the jewellery is made by the artisan and craftmans are put to sale for the visitors. Machines like nano driller are used to made jewellery.
In this structure, some parts of the wall are made with bamboo frame and adobe. They built this structure with lot of experiment in it.

Toilet for guest

Guest house, front view

Guest house back view

The every guest houses in Auroville are made with experiment technique. the combination of the adobe and the bamboo.
In some parts of the wall, whole bamboo used simply and in some parts , the bamboo strips are used either straight or slant.



Trainers house

CASE STUDY- HUNNARSHALA, BHUJ-KUTCH

Image showing location of hunnarshala and landmarks near it. I.e, shan-e-punjab dhaba and shiv mandir

HISTORY:

2002- The land was not occupied. No construction took place. The land in neighbourhood were also unoccupied.

2015-The project got completed and even neighborhood got developed.

WHY HUNNARSHALA CAME INTO PICTURE?

- After 2001, earthquake, 300 thousand people lost their homes and their earning sources.
- Hence, there was a need to teach people and to empower them, to build their own homes.
- Hunnarshala with the help of local artisans and nav nirman abhiyan, came into picture.

CLIMATIC CONDITION OF KUTCH:

- Kutch has hot and dry climate.
- After 2002 earthquake, the whole zone has experienced earthquake tremors multiple time.
- As the summers are extreme, using passive cooling technique are important.
- The materials used are locally available and are used based on their properties.

SUSTAINABLE ASPECTS:

MATERIALS USED IN THE STRUCTURE:

- Mud roll technique.
- Mangalore tiles.
- Thatch roofing.
- Stone rubble masonry.
- Rammed earth.
- Ships old wood.

Image showing the roof made by using mud roll technique

Image showing the roofing made from waste timber, which is collected from old ships from mandhvi port

Image showing the stone rubble masonry

Image showing the roofing made from thatch. Which is supported on timber and steel members.

Image showing the Mangalore tiles used as a roof cladding.

Image showing the entrance to the structure.

Image showing the workshop area

Image showing the karigharshala

Image showing the experimentation done on the roofing using type rubber.

Image showing the rammed earth mould

Image showing the column made from wooden log used as a structural member joined with concrete base

Image showing the precast column.

FLOOR PLAN AND SECTIONS:

Image showing the site plan of hunnarshala and the pedestrian and vehicular entry to the structure.

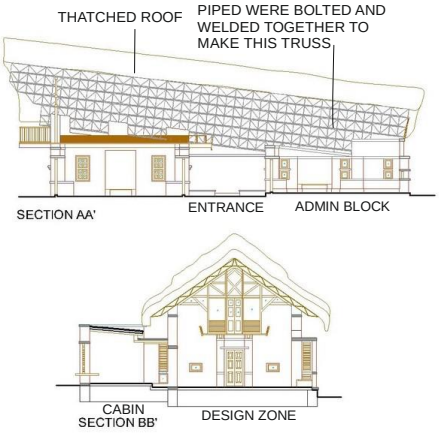


Image showing the sections.

SECTION BB

SPACE PROGRAM OF THE PROJECT:

- Admin block
- Karigharshala
- Reception
- Pantry
- Toilets
- Manager office
- Design cell
- Workshop area

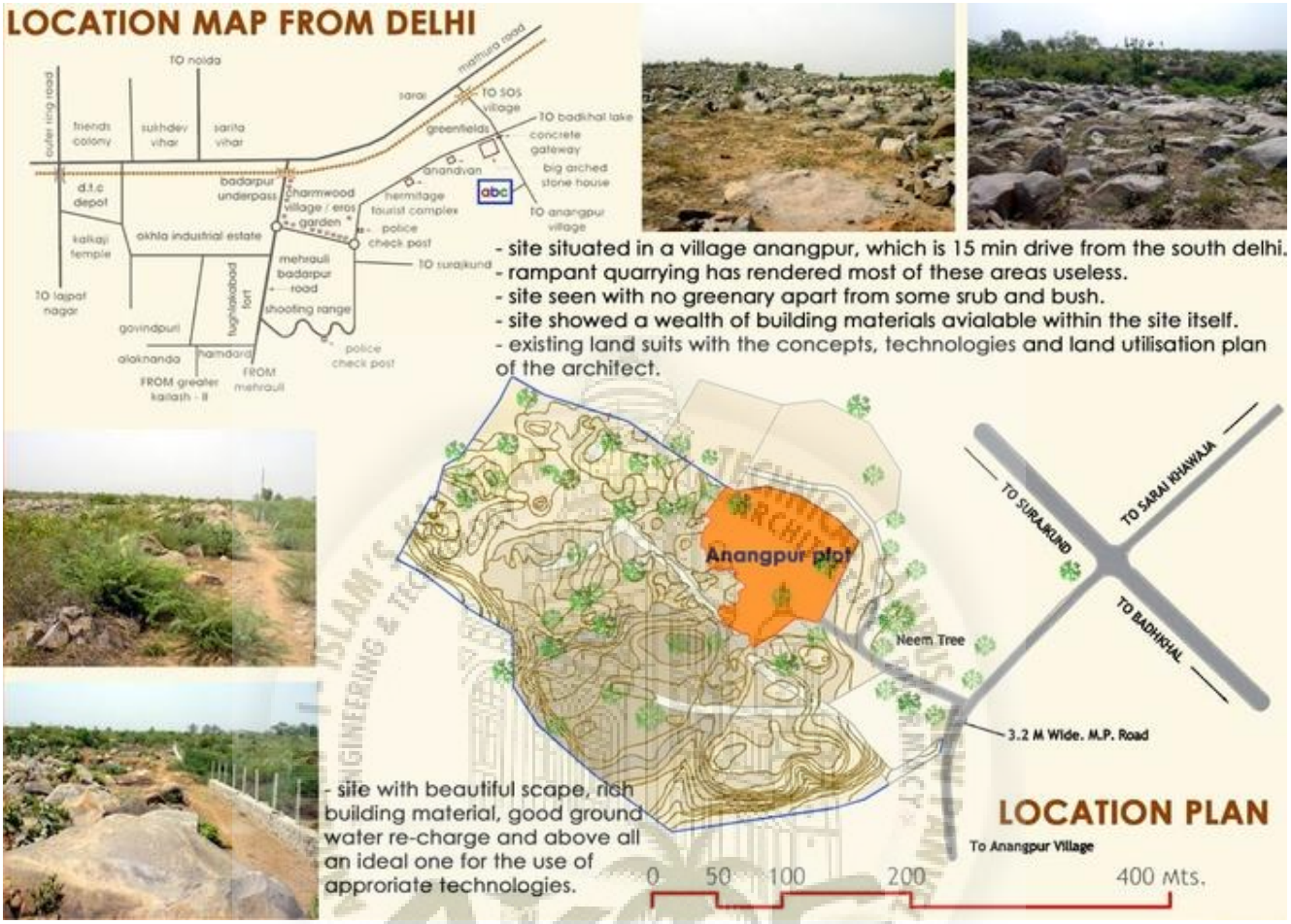
PURPOSE OF THE CASE STUDY:

As hunnarshala focuses on the use of locally available material for construction, the prime focus was to understand these construction techniques, and to understand how climatic conditions, traditional architecture is merged with the contemporary architecture & materials are taken into considerations.

INFERENCE:

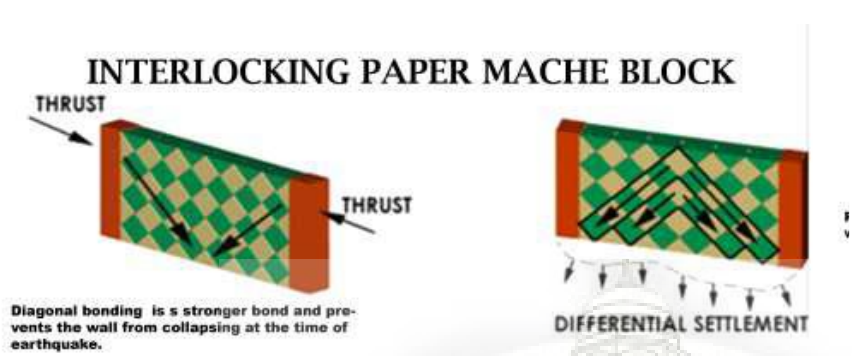
- The structure doesn't have residential facilities for the interns or trainees.
- The pantry is small as compared
- The parking area is there only for staff and not for the visitors.
- No signage available within the structure.

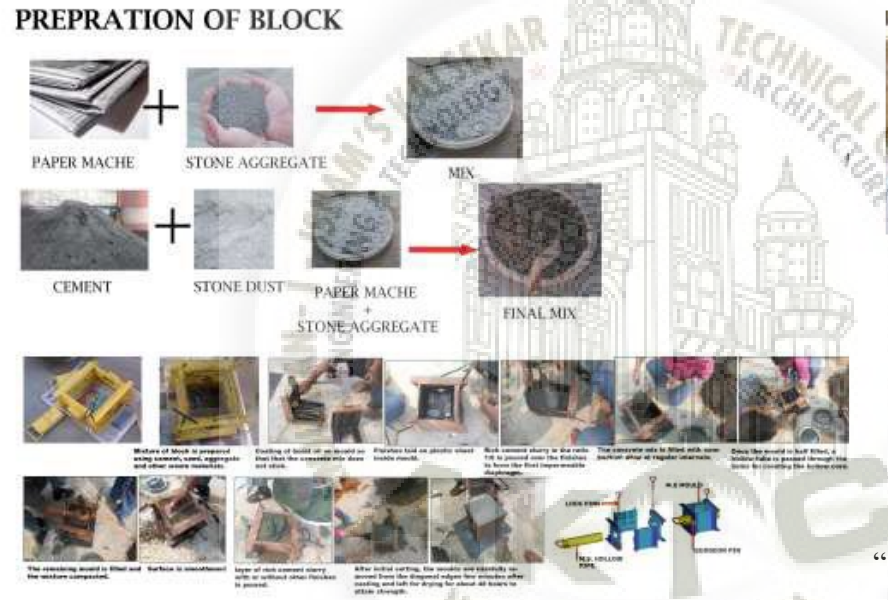
ANANGPUR BUILDING CENTRE:

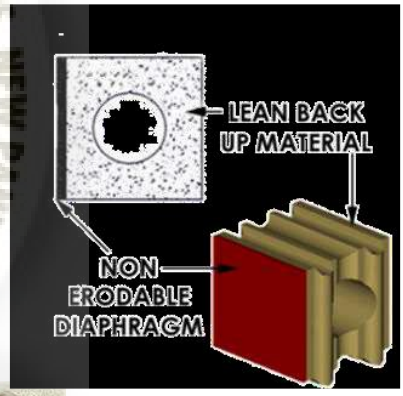


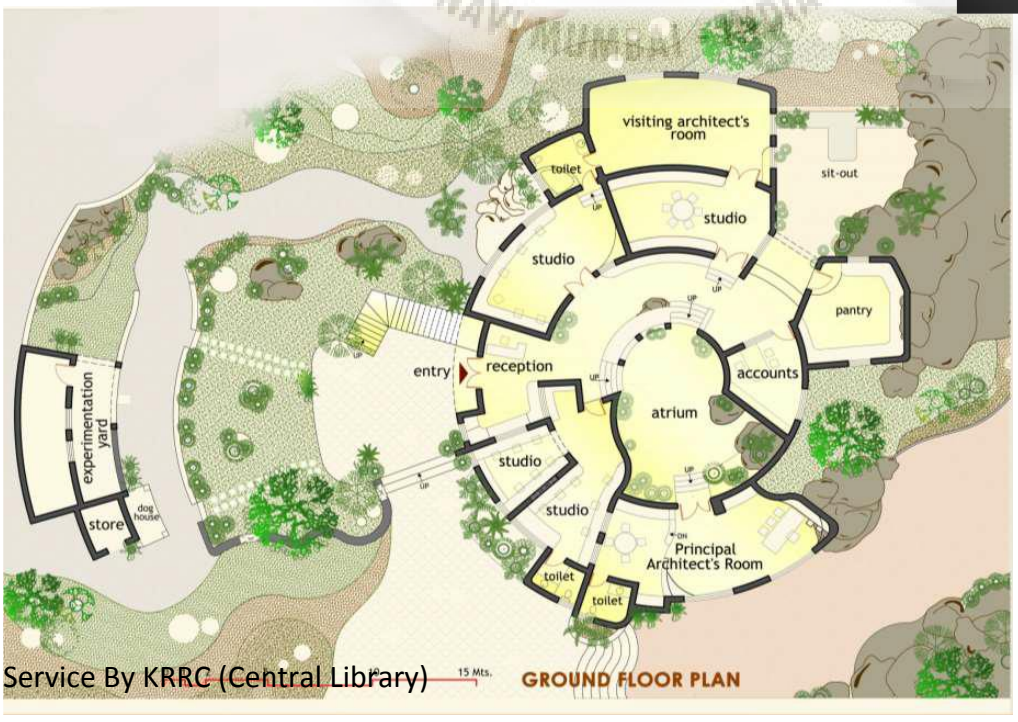
In all their wisdom, would architects, engineers, planners, or the key political and administrative decision makers, live in homes built with the technologies, logic and values that they propagate for the not-so privileged –Ar. Anil Laul

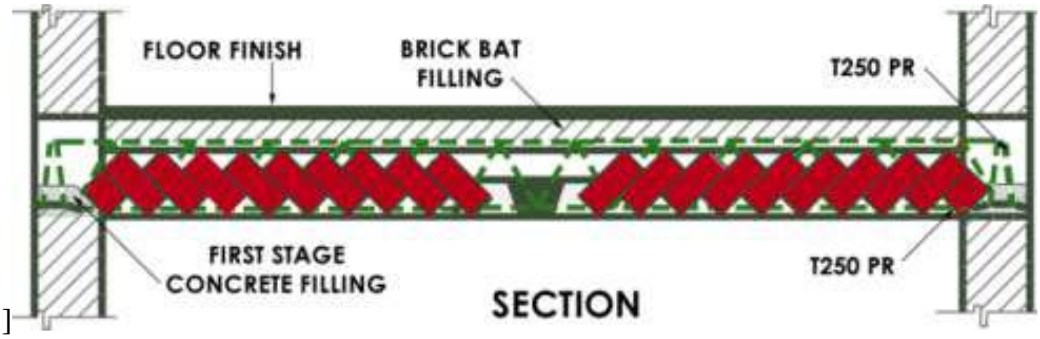
(Pdf-Think Tank Broken Civilization Looking within)]


INTERLOCKING PAPER MACHE BLOCK
THRUST
THRUST
Diagonal bonding is s stronger bond and prevents the wall from collapsing at the time of earthquake.
DIFFERENTIAL SETTLEMENT

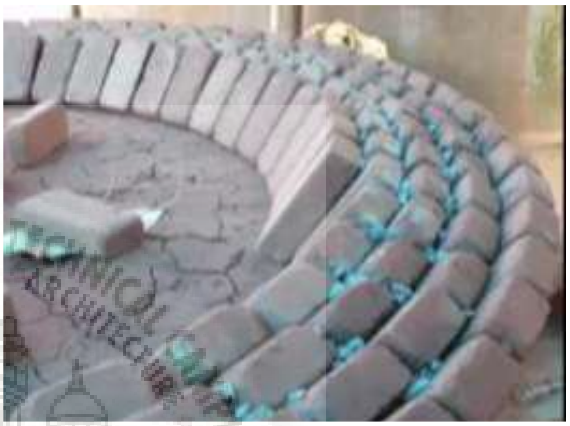

PREPRATION OF BLOCK
PAPER MACHE
STONE AGGREGATE
MIX
CEMENT
STONE DUST
PAPER MACHE
+
STONE AGGREGATE
FINAL MIX

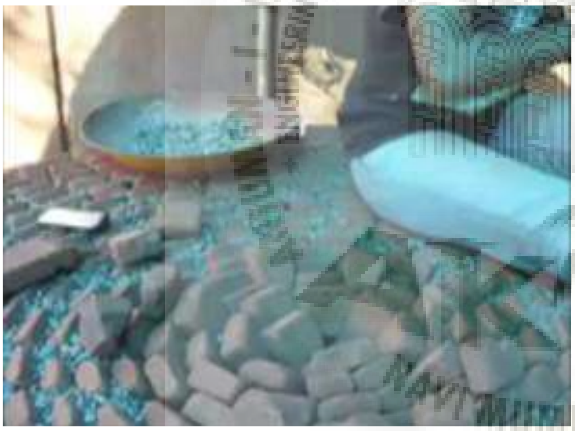

LEAN BACK UP MATERIAL
NON ERODABLE DIAPHRAGM


visiting architect's room
toilet
sit-out
studio
studio
pantry
entry
reception
accounts
atrium
experimentation yard
studio
store
dog house
studio
Principal Architect's Room
toilet
toilet
15 Mts.
GROUND FLOOR PLAN

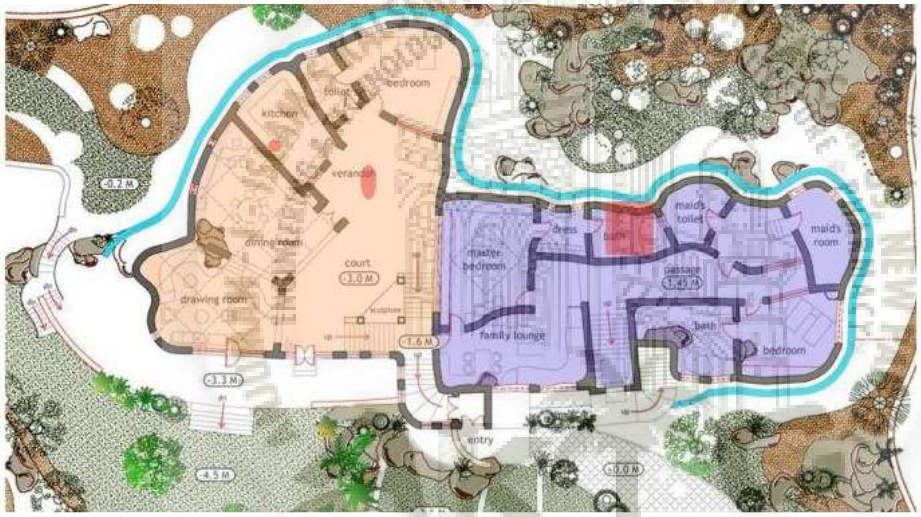

FLOOR FINISH
BRICK BAT FILLING
T250 PR
FIRST STAGE CONCRETE FILLING
T250 PR
SECTION

]






twin leech pits
kitchen
path
bedroom
seating
dining room
court
drawing room
master bedroom
dress
bath
maid's toilet
maid's room
family lounge
bath
bedroom
entry
rain water harvesting
waste water disposal
banana plantation
towards cottages
GROUND FLOOR PLAN
showing sun path, breeze direction and sewage disposal



ZONING

- public zone
- private zone
- drain running around the house
- onion and garlic storage places in the court-yard and over the toilet


bath
bedroom
kitchen
seating
0.2 M
dining room
court
-3.0 M
drawing room
sculpture
master bedroom
dress
bath
maid's toilet
maid's room
passage
-1.45 M
rain water harvesting
-1.6 M
family lounge
bath
bedroom
-3.3 M
entry


PUBLIC ZONE: The Drawingroom,kitchen, a guest bedroom with a attached toilet together constitute of Public zone
stone arch separting drawing and dining rooms
bedroom
toilet
kitchen
verandah
dining room
court
-3.0 M
drawing room
sculpture
-1.6 M
-3.3 M
entry
DINING ROOM
LIVING ROOM
STEPS TO COURTYARD
east sun filtering in
courtyard


ROOFING SYSTEM - FUNICULAR SHELLS - using no steel in the shells
OUT OF BUILDING WASTE

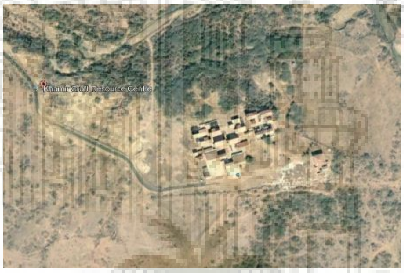
CASE STUDY- KHAMIR CRAFT PARK-KUKMA, KUTCH

Image showing location of Khamir craft park (kukma-kutch), main bhuj-bhachau highway and the internal kutcha road

Image showing the important landmark i.e., lldc (ajrakhpur) and ajrakhpur mosque

HISTORY:

2005-The land was not occupied. No construction took place. The land in neighbourhood were also



2008- The land was under development. Construction for the center was in process.

2015-The project got completed.

TOPOGRAPHY AND LANDSCAPE:

- Khamir craft park is situated at village kukma, which is around 20km from bhuj.
- Situated on a hill and having no other buildings nearby, this institute marks its presence in its context from the distance.

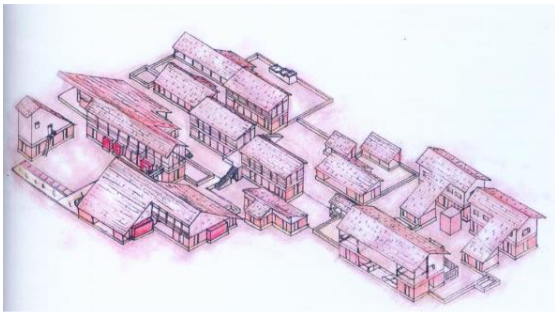


Image showing the aerial view of the complete structure.

ABOUT THE SITE:

CLIENT: kachchh nav nirman abhiyan And the nehru foundation for Development.
ARCHITECTS: Ar. Neelkanth chhaya.
COMPLETION YEAR: 2015

CLIMATIC CONDITION:

- Kutch has hot and dry climate.
- After 2001 earthquake, the whole zone has experienced earthquake tremors multiple times.
- As the summers are extreme, using passive cooling technique are important.
- The materials used are locally available and are used based on their properties.

SUSTAINABLE ASPECTS:

MATERIALS USED:

- Rammed earth.
- Mangalore tile.
- CSEB
- Steel columns.
- POP as in-fill rafters.
- Bamboo.
- Wooden twigs.

EARTH CONSTRUCTION TECHNIQUE:

- Rammed earth.
- Stabilized earth block.
- Wattle and daub.

Pop and compressed earth blocks wall during construction.

Pop and compressed earth blocks wall after finishing.

RAIN WATER HARVESTING:

- gable steel roofs were constructed.
- Roofs were constructed in three layers I.e, GI sheets were laid with maintaining a slope. And these sheets were then covered with 30mm perlite filling and then Mangalore tiles are placed.
- Water channels are provided at the end of the roof, which collects the rain water which is later transferred to the tank and can be used throughout the year.

Image showing the gabbled roof construction with layer of 30mm perlite filling and Mangalore tiles as a final finish

PLANNING CONCEPT

- The pattern of Mohalla has been followed to design the craft centre.
- The functions of the building are arranged as public, semi public and private areas.
- Two or three modules share one common open space

SPACE PROGRAM:

- Four craft resource centers.
- Six workshops.
- 3 residential units for senior artisans.
- Shops
- Cafeteria
- Toilets.

FORM AND SHAPE:

- The institute requires variety of spaces as per the functional needs.
- As the construction technique used in his structure is rammed earth, hence only squares and rectangles are used.
- The reason behind this is that shuttering can be re-used multiple times which reduces the construction cost.
- Each unit has been built with having a module on the corners that encloses semi open spaces in between and acts as a column making the corners stronger enough to take the load of the roof.

Image showing various spaces

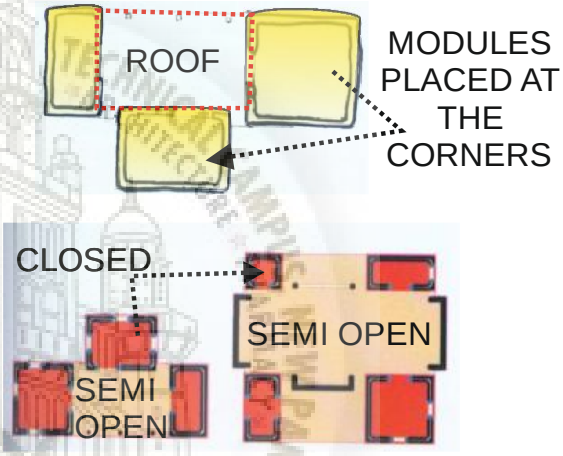
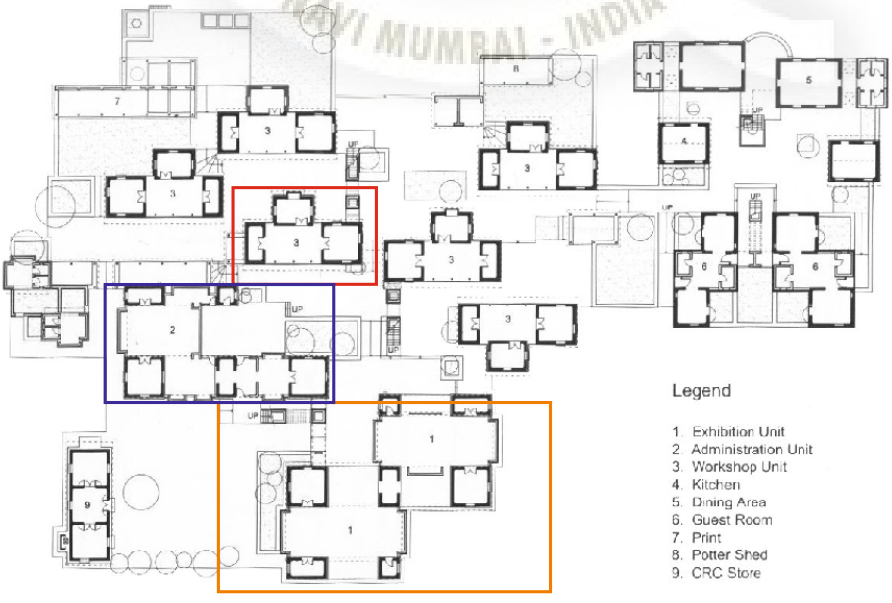
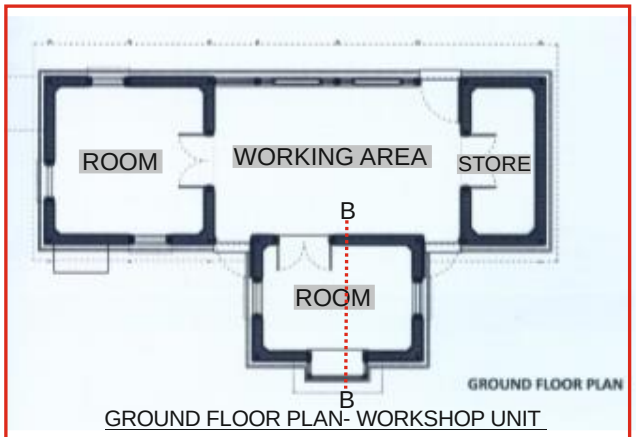


Image showing various modules

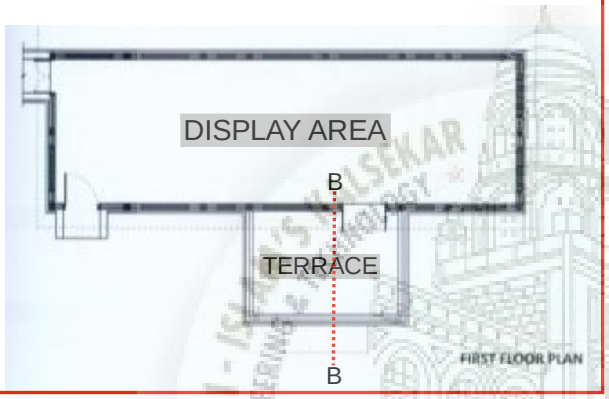
FLOOR PLANS AND CONSTRUCTION DETAIL:

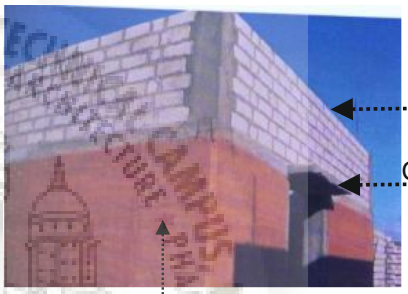


Site plan-Khamir

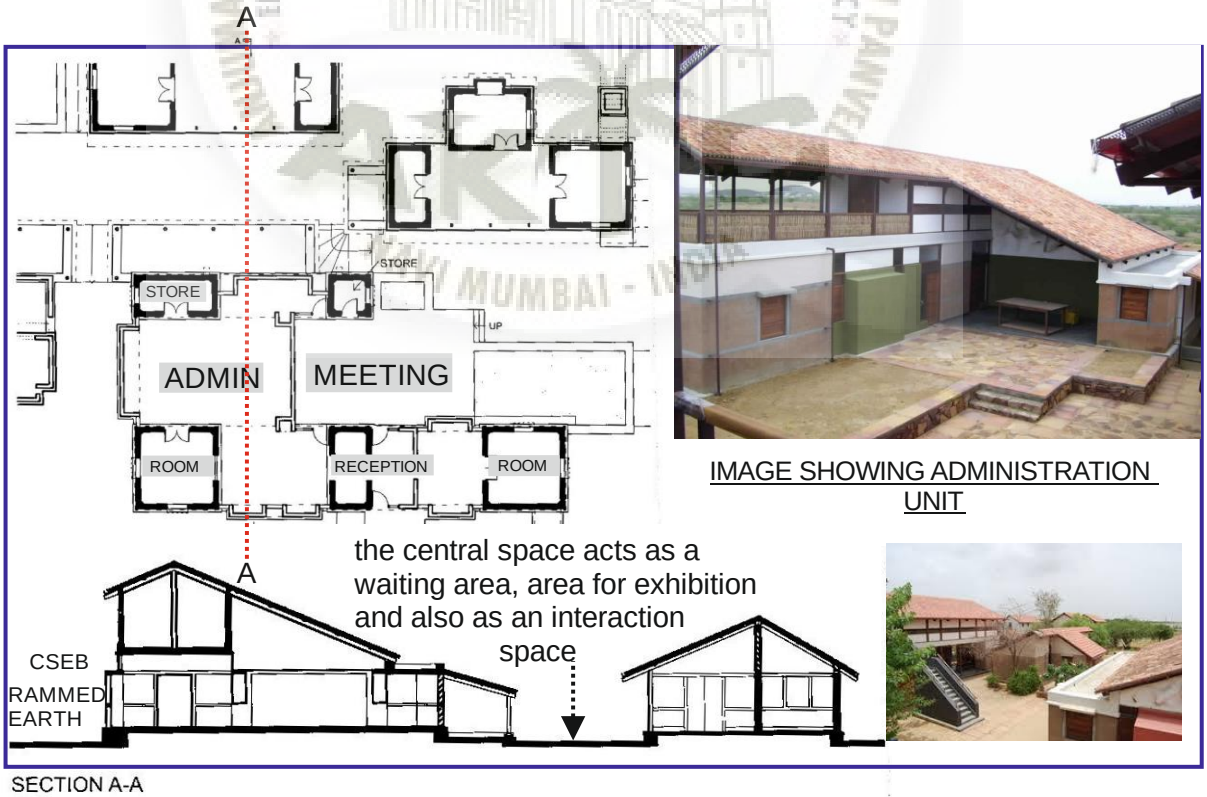


GROUND FLOOR PLAN- WORKSHOP UNIT



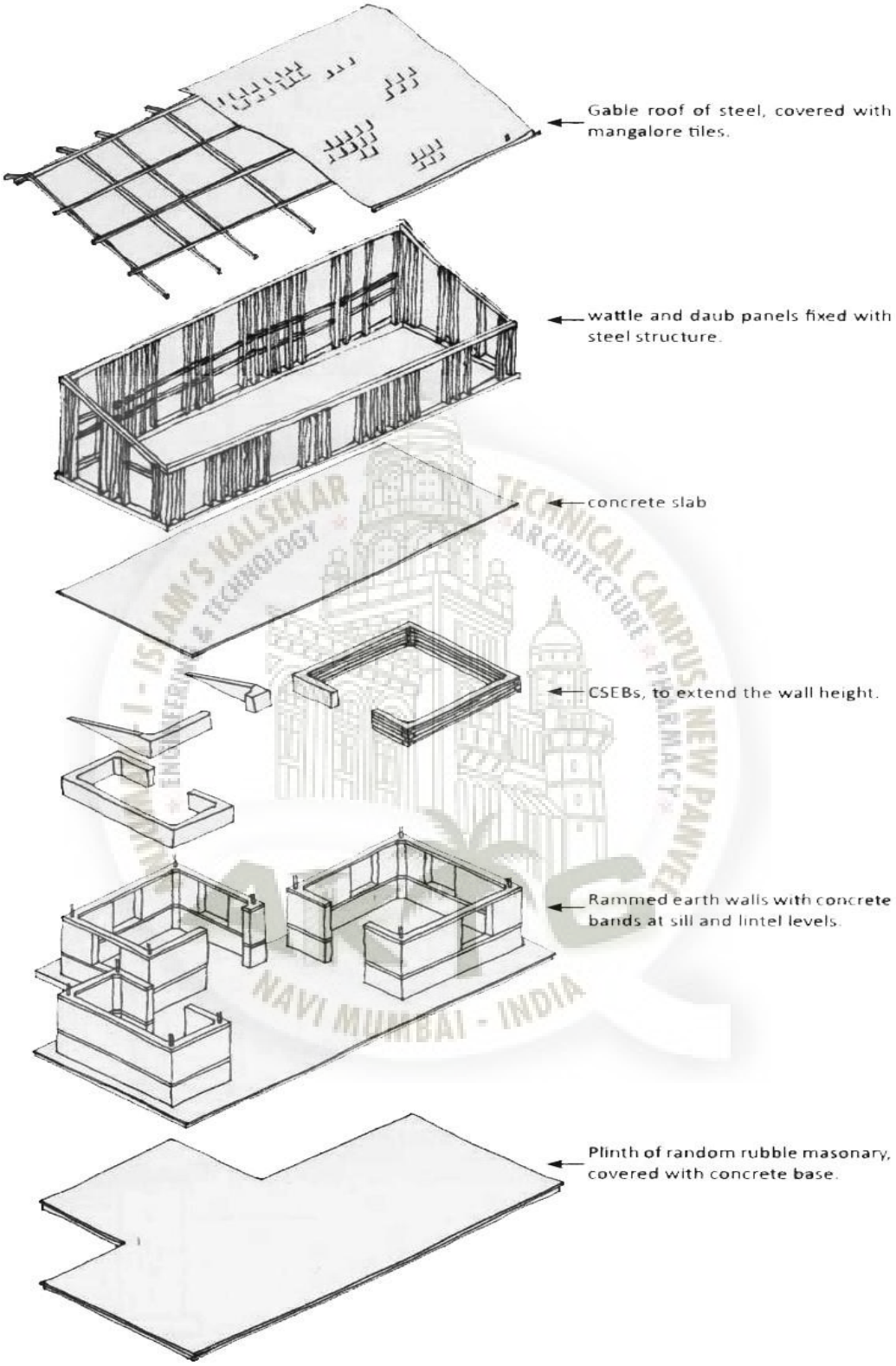


RAMMED EARTH TILL
LINTEL LEVEL

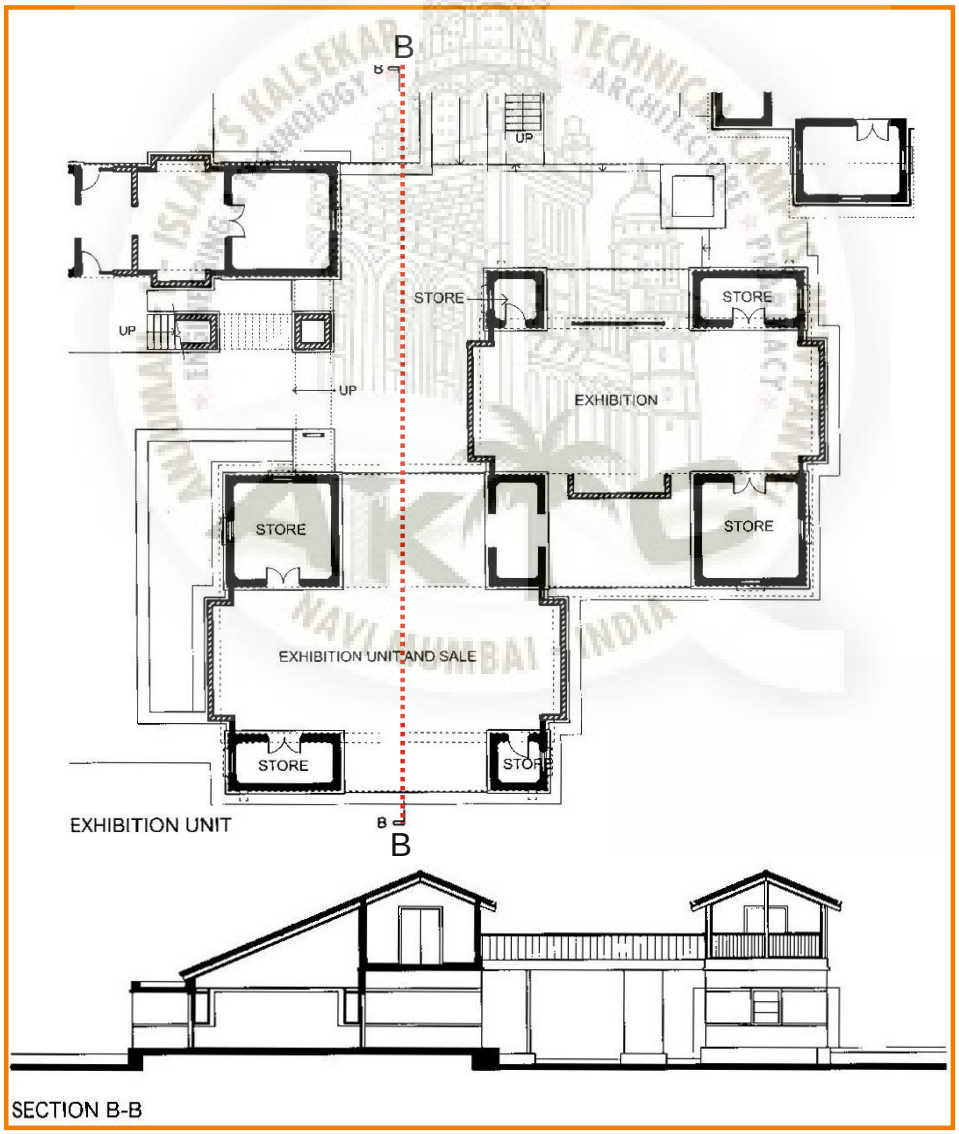


SECTION A-A

IMAGE SHOWING ADMINISTRATION UNIT



Extruded axonometric view


B
UP
STORE
STORE
UP
UP
EXHIBITION
STORE
STORE
EXHIBITION UNIT AND SALE
STORE
STORE
EXHIBITION UNIT
B
B
SECTION B-B

- Wattle and daub technique were used on the first floor at certain places.
- To use this technique firstly bamboos are woven between the wooden members and then daub made of soil, cow dung and rice husk with proportionate water was applied over it.
- They were then plastered with lime.

INFERENCE:

- There is no parking facility. Hence that needs to be added in design program.
- Residential units are only for major crafts, hence more residential units are needed.
- The structure lacks landmark.
- The structure lacks signage.
- The accessibility to the structure is not easy.
- Cafeteria is not enough to cater the crowd, during festivals and rann of kutch festival.

MAKER'S ASYLUM

Maker's Asylum is a community makerspace to get your hands dirty and make your ideas happen.

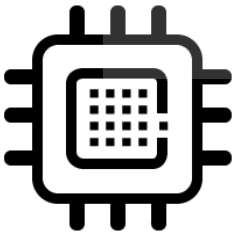
LABS

6,000 sq.ft. of space, wifi, work tables, rooftop, a pantry with a fridge full of drinks and some kickass labs for work and fun.

Woodworking

Powered By

Bosch & Dremel

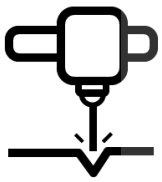


Electronics

3D Printing

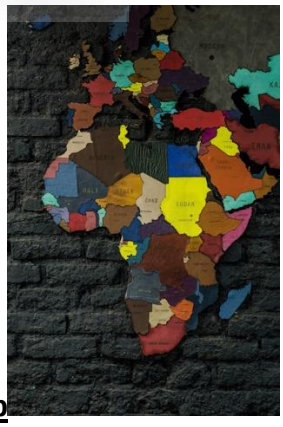
Powered By

Imaginarium



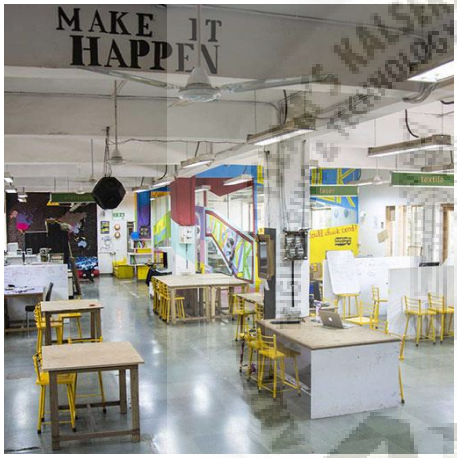
Laser Cutting

Maker Auto



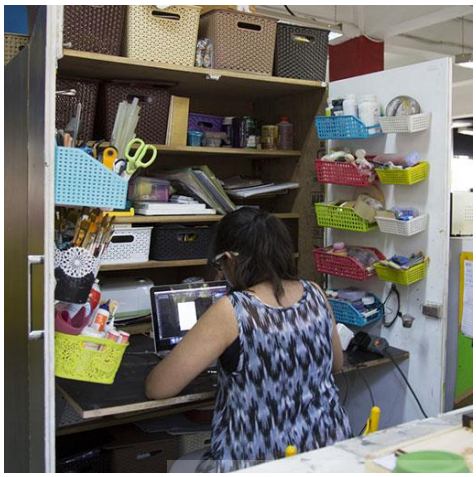
Leather World Map

Game Arcade



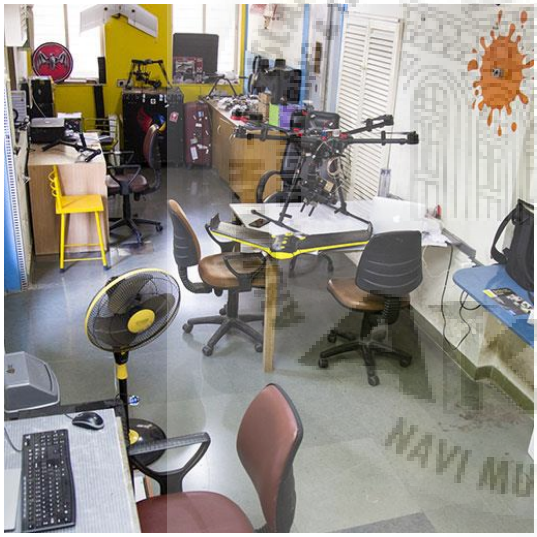
REGULAR

Ideal for individual makers, students, or professionals who need a space to work or make a mess.



STUDIO

Ideal for small teams or even individual designers, artists or anyone else who needs a small, dedicated booth.



PRIVATE

Ideal for large teams working on hardware, software, social innovation or architecture.

About MAKERS ASYLUM

Maker's Asylum is a community space focussed on fostering innovation through hands on learning. It also provides access to an ecosystem of stakeholders which includes Governments, Businesses, Incubators/Accelerators, Investors and subject matter experts. The space houses various labs that are co-located in order facilitate prototyping of ideas that are interdisciplinary in nature.

This space started out of a garage in Bandra (Mumbai) 5 years ago, in fact one of the first makerspaces in the country and has now become a popular community space to build prototypes, products etc and also houses the community of artists, designers, engineers who are building indigenous products.

Maker's Asylum has its flagship spaces located in Mumbai and Delhi and in October 2018 it launched the third space in collaboration with the French Embassy in Jaipur. The Jaipur Textile Lab for Women as the name suggests is created to support the women artisans in and around Jaipur and will focus on research on smart textiles, sustainable textiles, natural/organic dyes and integration of digital fabrication tools in traditional processes.

Maker's Asylum has also been running its annual flagship program STEAM School - a project based learning program in collaboration with its French partners, the Center of Research & Interdisciplinarity and the French Embassy since 2016 in India which is focussed on bringing together various stakeholders which include, entrepreneurs, students, universities and corporate organisations, to work on solving problems that aligned to the United Nations Sustainable Development Goals. Every year this program hosts about 100 young leaders from across the world and Maker's Asylum will be hosting the same in different countries starting 2019. The STEAM School was also one of the 14 initiatives that was presented to the French President and his wife, Emmanuel & Brigitte Macron, during their recent visit to India in May 2018.

Maker's Asylum has also been engaged in working with the differently abled community through its program STEAM Fabrikarium. Projects such as Flying wheelchairs for paraplegics have been designed during this program and are now being tested in other countries currently. In February 2018, 15 differently abled individuals came together as participants for this program and spent 5 days working with the other participants on projects such as bionic hands, braille printer and cosmetic prosthetic hands.

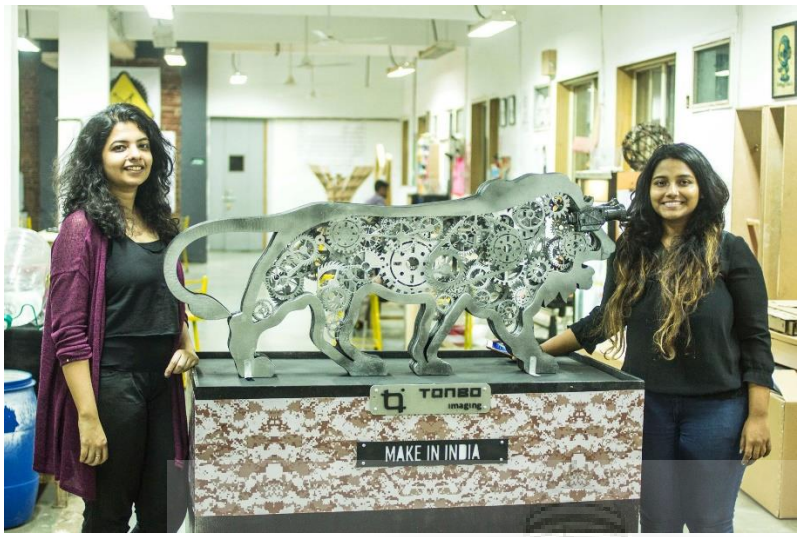
Maker's Asylum will be focussed on driving community engagement under our two verticals - Access to Infrastructure (via tools/equipments) and Access to Education (under the brand of STEAM School). Maker's Asylum Junior will also be integrated as part of our community space (which has already started) and will focus on alternative learning for kids. Our goal is to eventually become an Open University where crazy ideas can thrive and break the barriers of traditional thought/methodology of education.

FujiFilm Photo Wheel

The photo wheel was made using the laser cutter for FujiFilm. It is designed to hold Polaroid images taken by their camera. Made by Utkarsh Gupta and Premankan Seal in New Delhi, Maker's Asylum.

Make in India Installation

Make In India Installation made using Laser by 2 architects -



gMotion sensing lamp

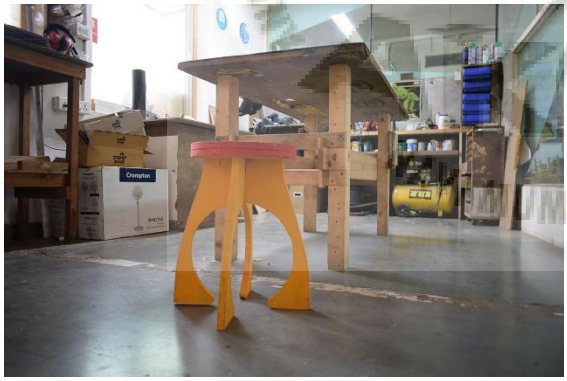
This was designed and made at the Asylum in 48 hours, by our resident makers - Coby and Ankush. The lamp was designed on Autodesk Fusion 360. Then laser cut using the laser cutter at the Asylum. It houses an Arduino connected to a motion sensor, that greets visitors coming into the Asylum by turning on the lights.

Team: Coby Unger, Ankush Mishra

flat pack stools

Here at the asylum , we have a workshop , where the stools have been made by one of our members . Viren Vaz has designed space saving , compact stools , these stools are made of components that fit into each other .

Team:
Viren Vaz



3D printed Prosthetics

Claire's prosthetic arm is finally ready to be tested. It took a couple iterations, but luckily for us 3D printing makes it relatively easy to try out ideas to see if they work, and move on if they don't. Between experimenting with supports, very precise measurements, and hacking together PVC pipes, this has been an interesting project.

C3PO Installation

The C3PO is an interactive origami based installation that was built at the Asylum. The outside was all origami, while on the inside, it had electronic sensors and 3D printed parts that allowed it to move. This was showcased at GLF 2015 - Godrej's annual leadership event in their campus in Vikroli, Mumbai. This was built by Himanshu Agrawal (Origami artist), Hemal Chelvi (Electronics engineer), Rupin Chedda(Maker Educator), Vaibhav Chhabra (Mechanical Engineer), Sunil Gogia(Spray painting artist)

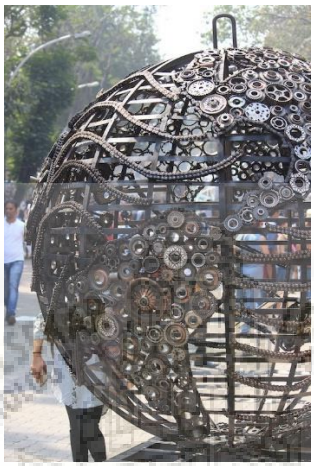
Red Bull Installation

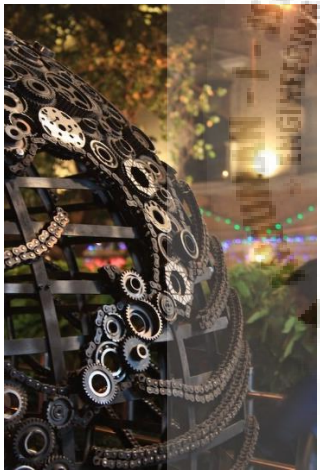
We built an installation for Red Bull India at Maker's Asylum in New Delhi. This installation was made using recycled Redbull cans and then showcased at the Coalition in 2015. The Installation was made by Utkarsh Gupta, Antriksh Nangia and Deepanshu Sharma.

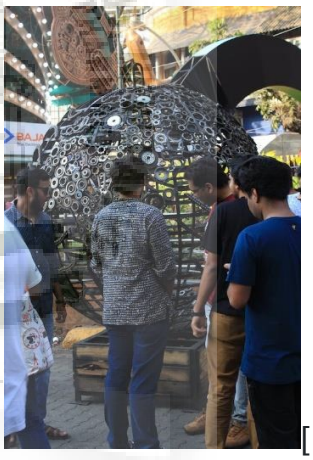
The Elemental Earth

In this installation the artist depicts the simplicities as well as the complexities of mother earth through the use of various abstract elements. The towering installation provokes viewers to think about how focused the world is on material objects, in this day and age. We are merely a combination of gears; we can move around, but humanity is now cold, devoid of empathy, and not really interacting.

The artist, Priyank Rangparia from 'BEFUSE' has detailed out the metal world map using automobile scrap parts, thus upcycling and giving purpose to scrap elements which are otherwise covered in grease and not given a second thought as they rust away at the bottom of a scrapyard. The installation was made at Maker's Asylum, Mumbai, and was displayed at the Kala Ghoda Festival.





Maker Auto

The excitement and energy about innovation and building things within the maker culture is palpable. But how can we bring that creativity energy to to the streets of

Mumbai in collaborative workshops and projects? Can we show the greater community that making and building things by is an essential part of some of the best innovations?

The goal of the Maker Auto is to bring the tools, materials, mentorship, and creative energy of the maker culture to the streets of Mumbai.

We are currently facilitating collaborative workshops & projects with various community groups, educational institutions, non-profits and corporates across the city.

Team:
Coby Unger, Namita Mohandas

Fly Point

Given the natural tendency of people to throw waste in already littered areas especially due to the sever lack of dumpsters and dustbins, Fly Point is a system that helps mark out appropriate dump spots by placing tall markers called Fly Points. These will be easy to spot and intelligently spread out, thereby preventing the creation of new litter spots. Once people adopt the concept and the behavioral change is noticeable, the number of Fly Points can be reduced, as people will know to look for the markers rather than throw their waste wherever they see fit.

Team:
Shruthi Esther, Natasha Sharma, Kairav Shah, Etienne Wersonwig, Preet

Bijli

Bijli is a low cost device that can be retrofitted to existing bicycles, which transforms kinetic energy from the wheels into electric energy that can be stored in a battery pack or can be used to

charge small electronic gadgets like mobile phones. The device can be used on the go or while the bicycle is stationary.

Team:
Yashika Tijoriwala, Amit Sachan, Balu V., Shrita Pathak, Rushabh Jain, Ishaanee Pandey

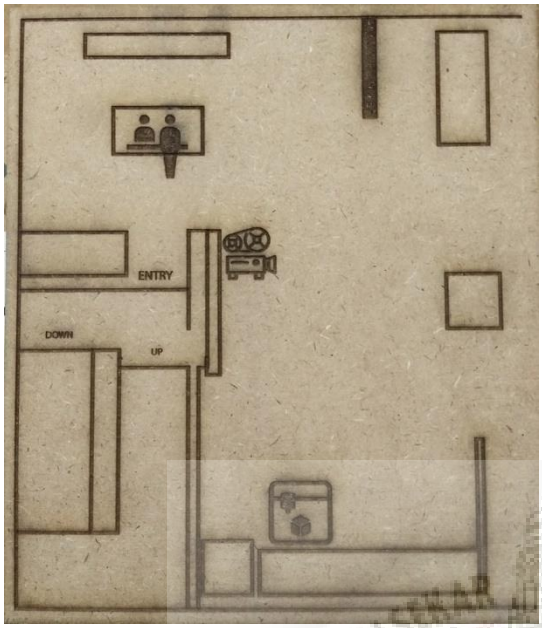
Game Arcade

The game arcade has been a mergence between wood-working and design. A project revived and fixed having games like contra, roadrash, super mario, doom, duke nukem, wolfenstein 3D etc. Now, it is under-going its final touches at the Asylum.

Team:
Girish Malage, Viren Vaz

BrailleRap STEAM

This team converted a 3D printer into a braille embosser that was then used to solve the objective of creating a braille map of Maker's Asylum. It took the team and its mentors several iterations to figure out the perfect hack to make the map. The final map got very accurate feedback thanks to the combination of laser cut elevations, different textures, and braille engravings



Team:

Ananya Priya, Damiya Jaswani, Anantika Sethi

Leather World Map

When Khyati lost a chance to travel to one of her favorite places, she made up for it by designing a whole range of leather world-map products. This was when we approached her and asked her to create her first installation. What started out as a completely rustic, plain red brick wall turned out to become a 11 ft x 10 ft black brick wall with a massive world map made out of colourful reclaimed leather and MDF boards.

Team:
Khyati Dodhia

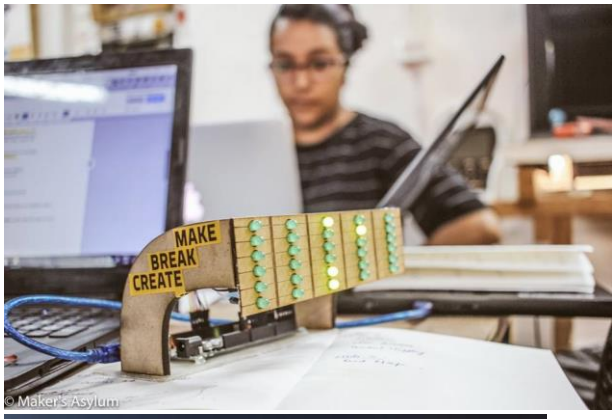
VAT 69 Installation

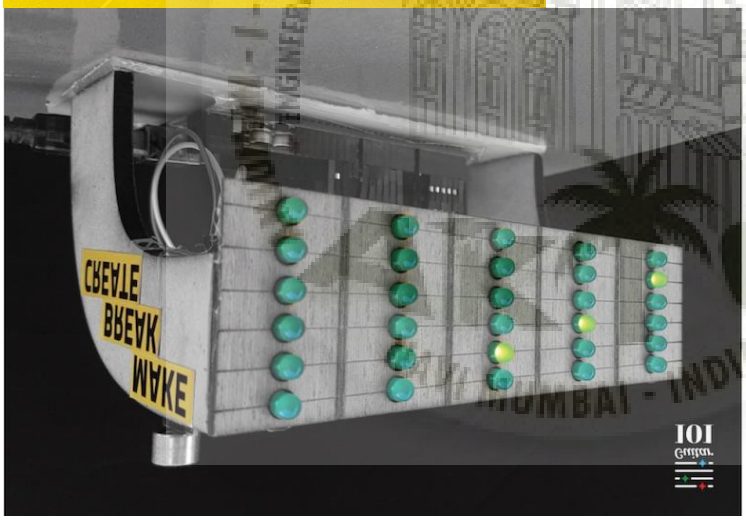
We built an installation for VAT 69 using Laser etched Acrylic and LED lights. Check out the video to understand how it looks. It has a matrix of leds that light up in a sequence and the the etched Acrylic diffracts the light to create this effect. This installation was made for homegrown magazine for the international scotch day party in Mumbai. The project was made by Jezreel Nathan, Jesal Mehta and Vaibhav Chhabra

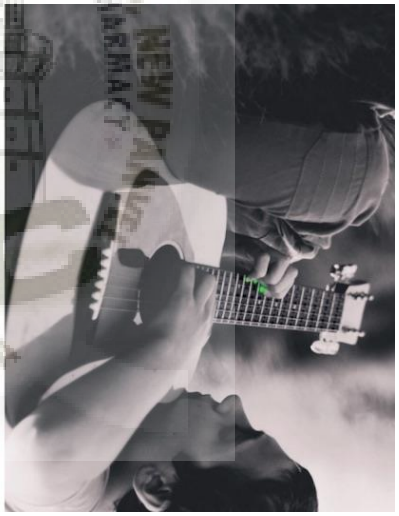
Guitar 101

Guitar 101 is a low cost guitar tutor that can be retrofitted onto existing guitars, which will guide first time users on basic chord construction by the use of LEDs that light up on the correct fret positions.

Team:
Satyam Baranwal, Tanwi Agarwal, Amanpreet Kaur, Sanket Thakur, Praanshu Gupta, Hemang Vellore


MAKE
BREAK
CREATE
© Maker's Asylum


CREATE
BREAK
MAKE



RESEARCH DESIGN

STANDARD & DATA COLLECTION

Museum and art galleries:

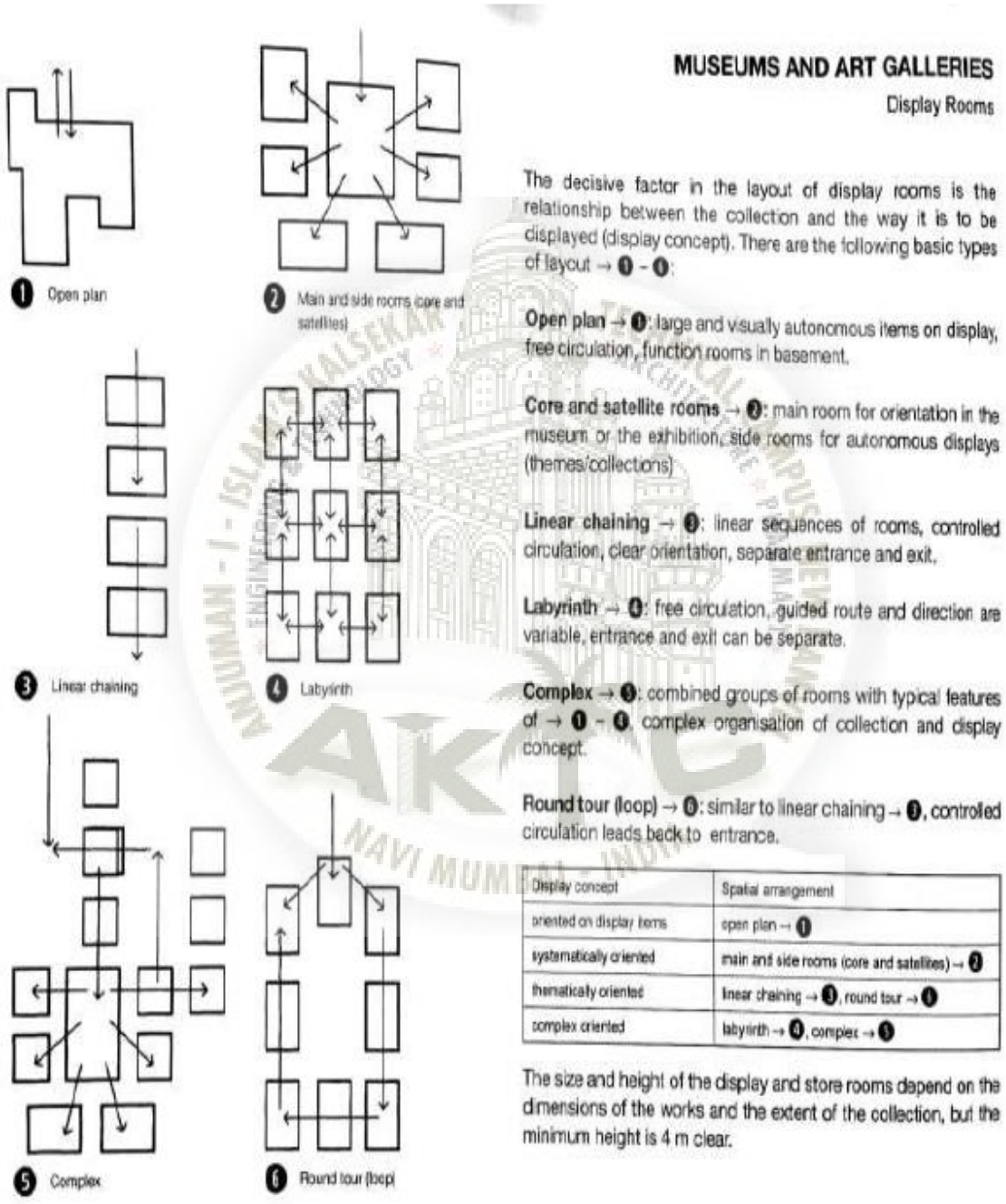


Figure 115: Displaying the standards for art museum and galleries, and the circulation pattern

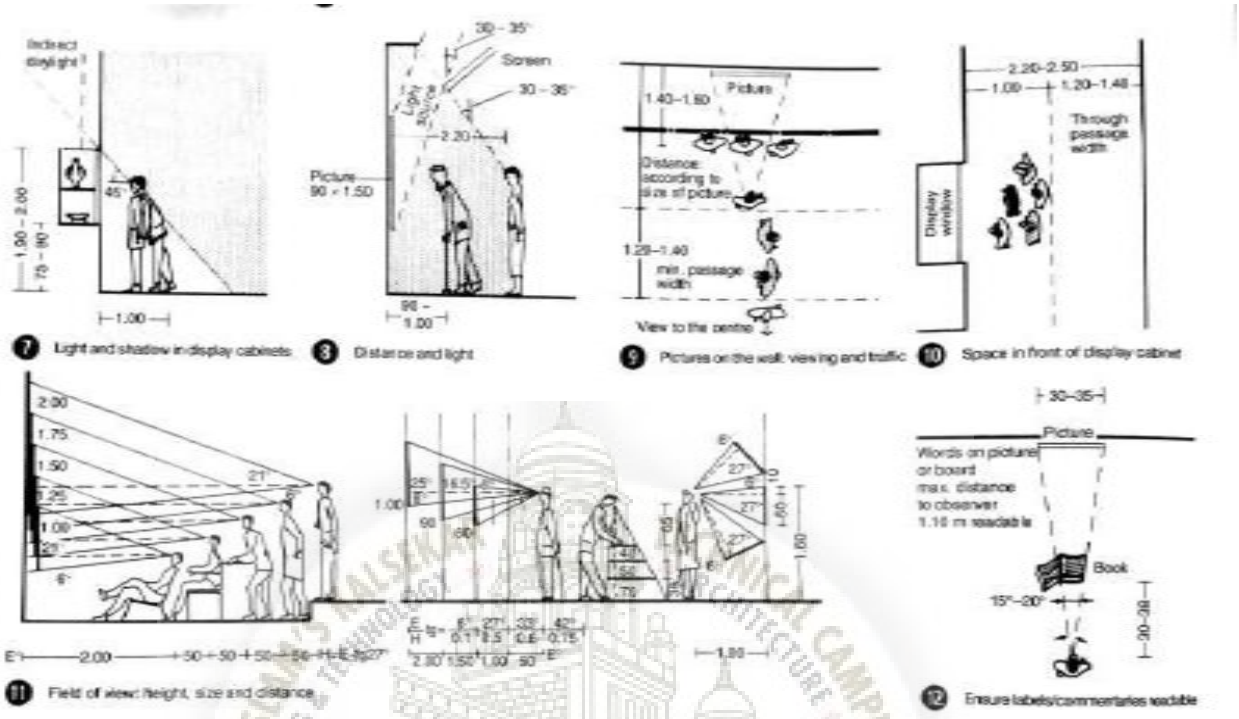
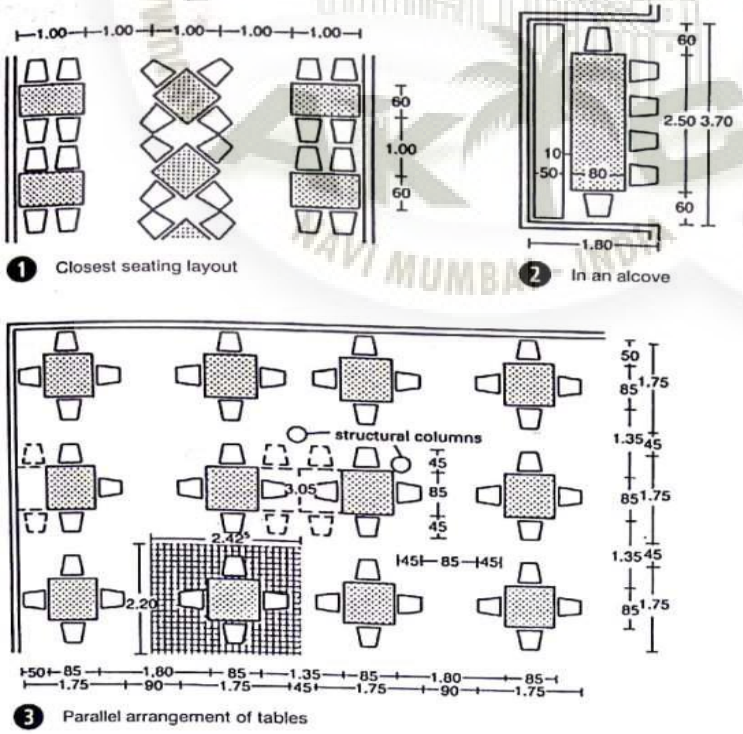
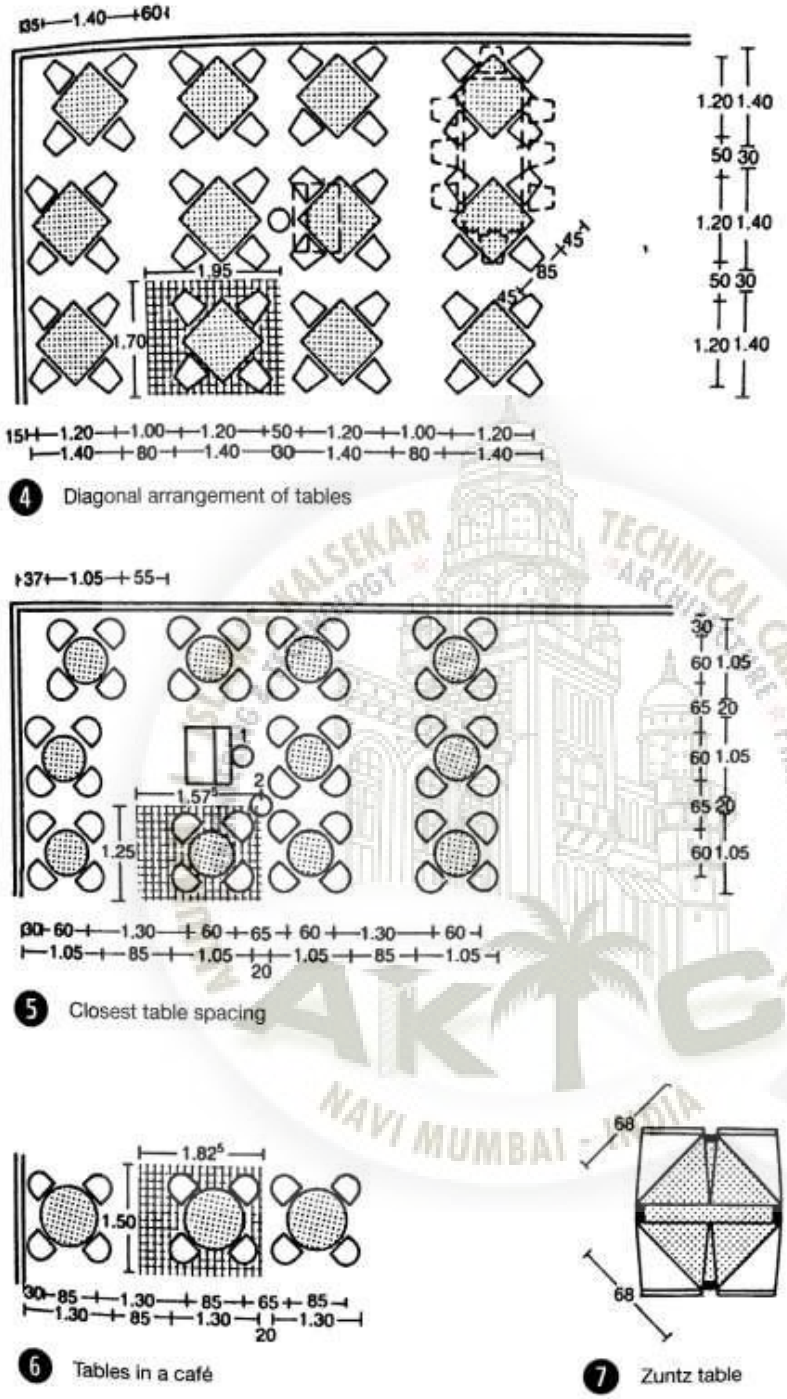


Figure 116: standard of displaying work in the exhibition room and their angles.

<u>Café and restaurant:</u>



: seating layouts.



4 Diagonal arrangement of tables

5 Closest table spacing

6 Tables in a café

7 Zuntz table

Figure: seating layouts

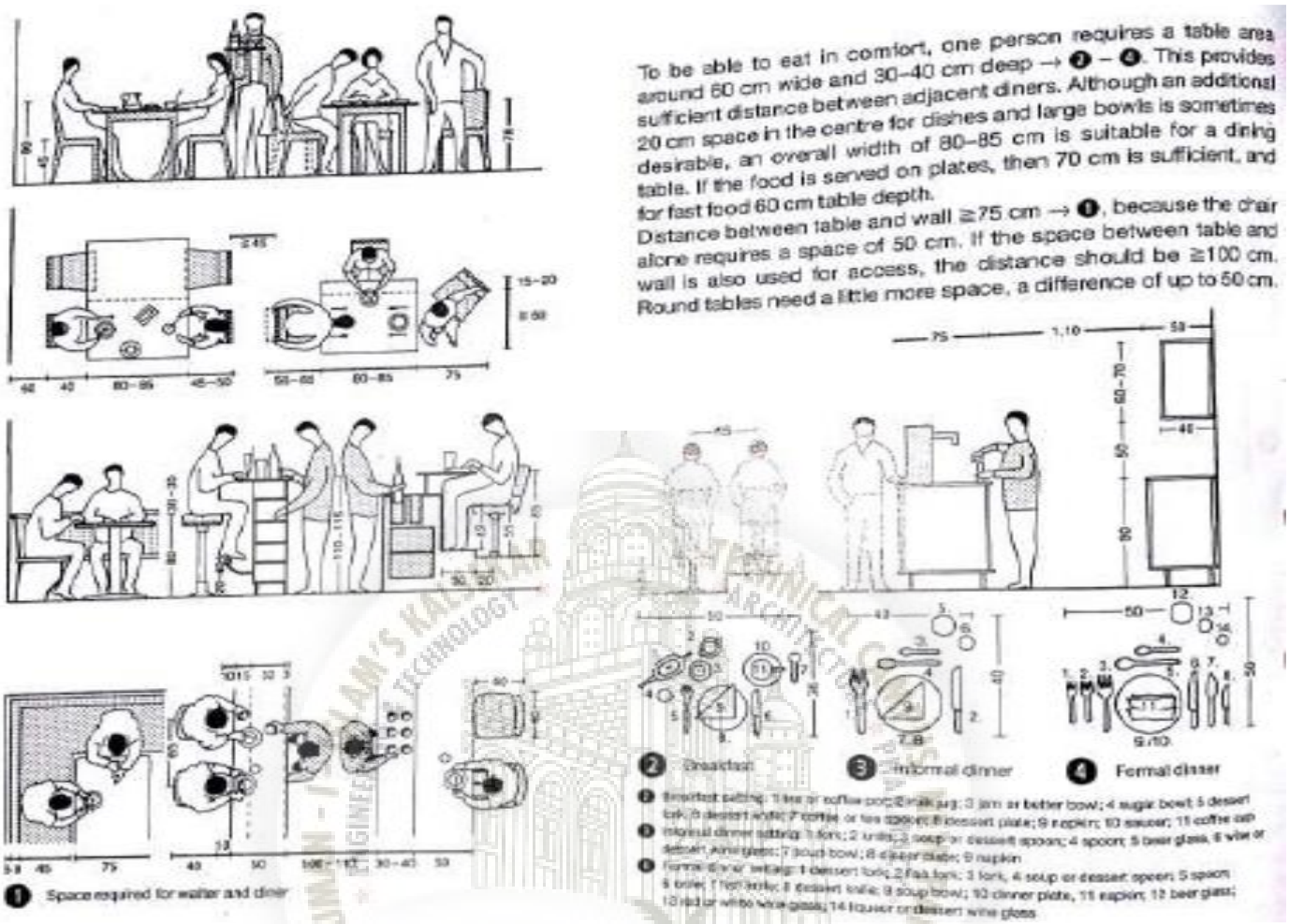
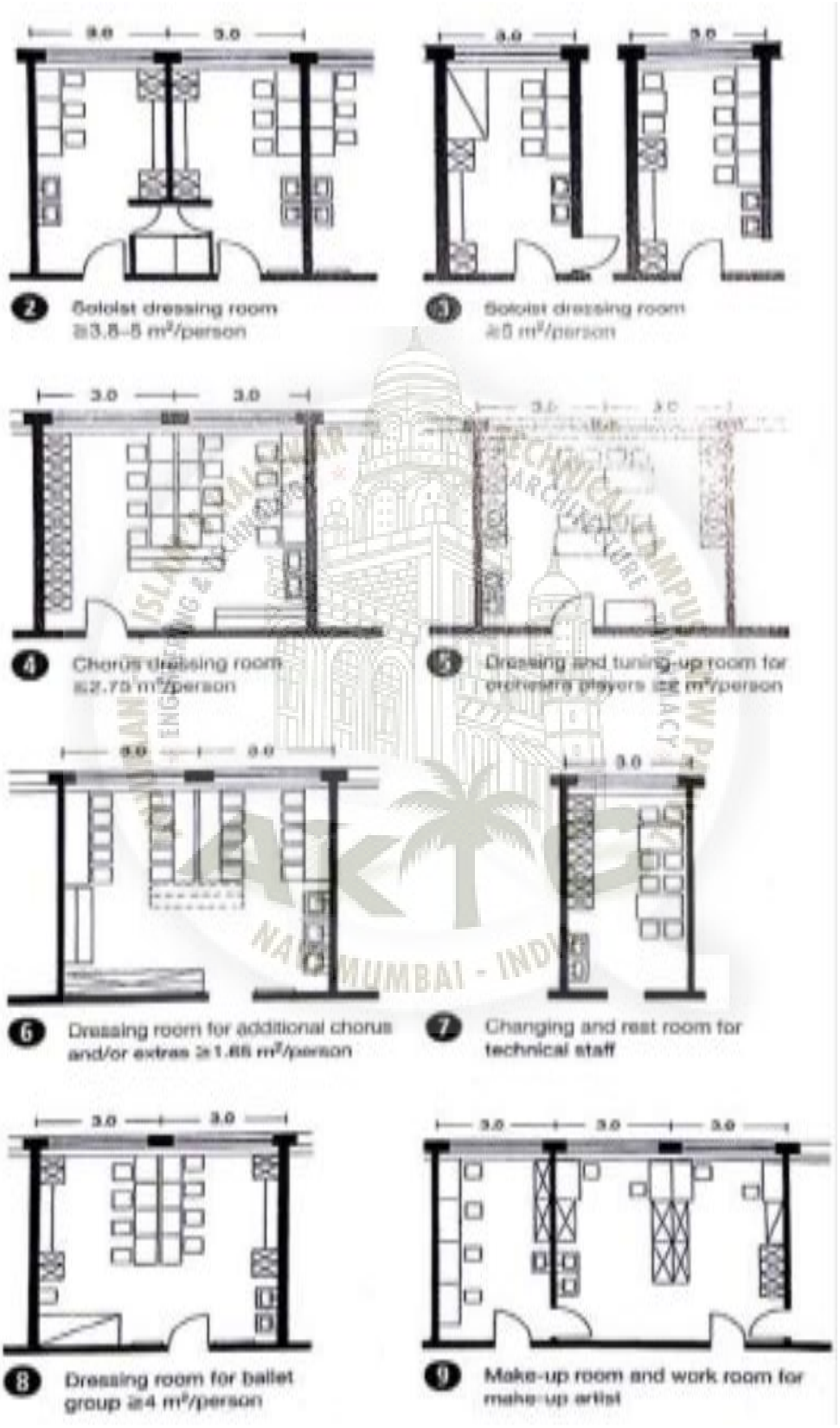
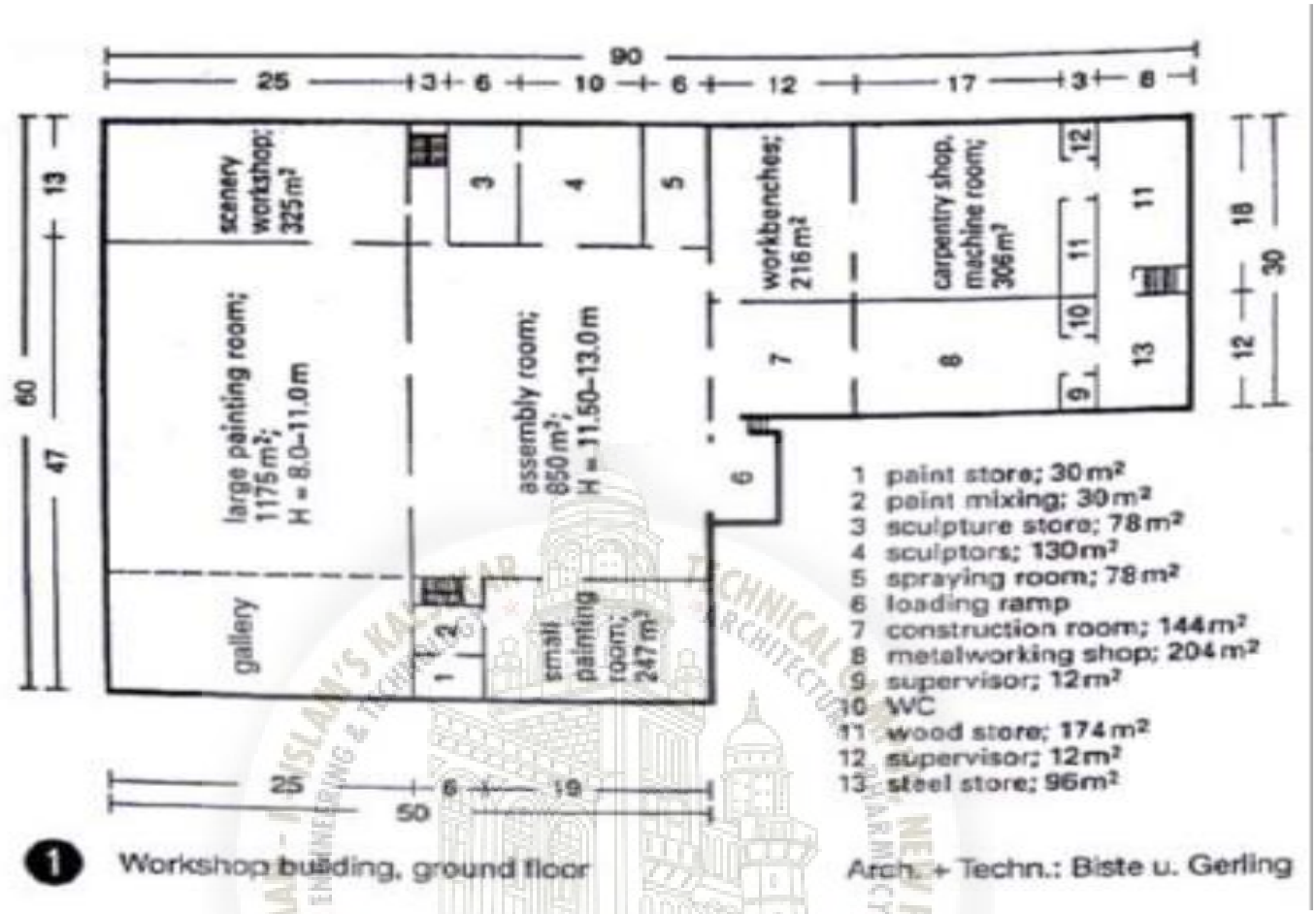


Figure: seating's layout

Workshops and staff rooms:

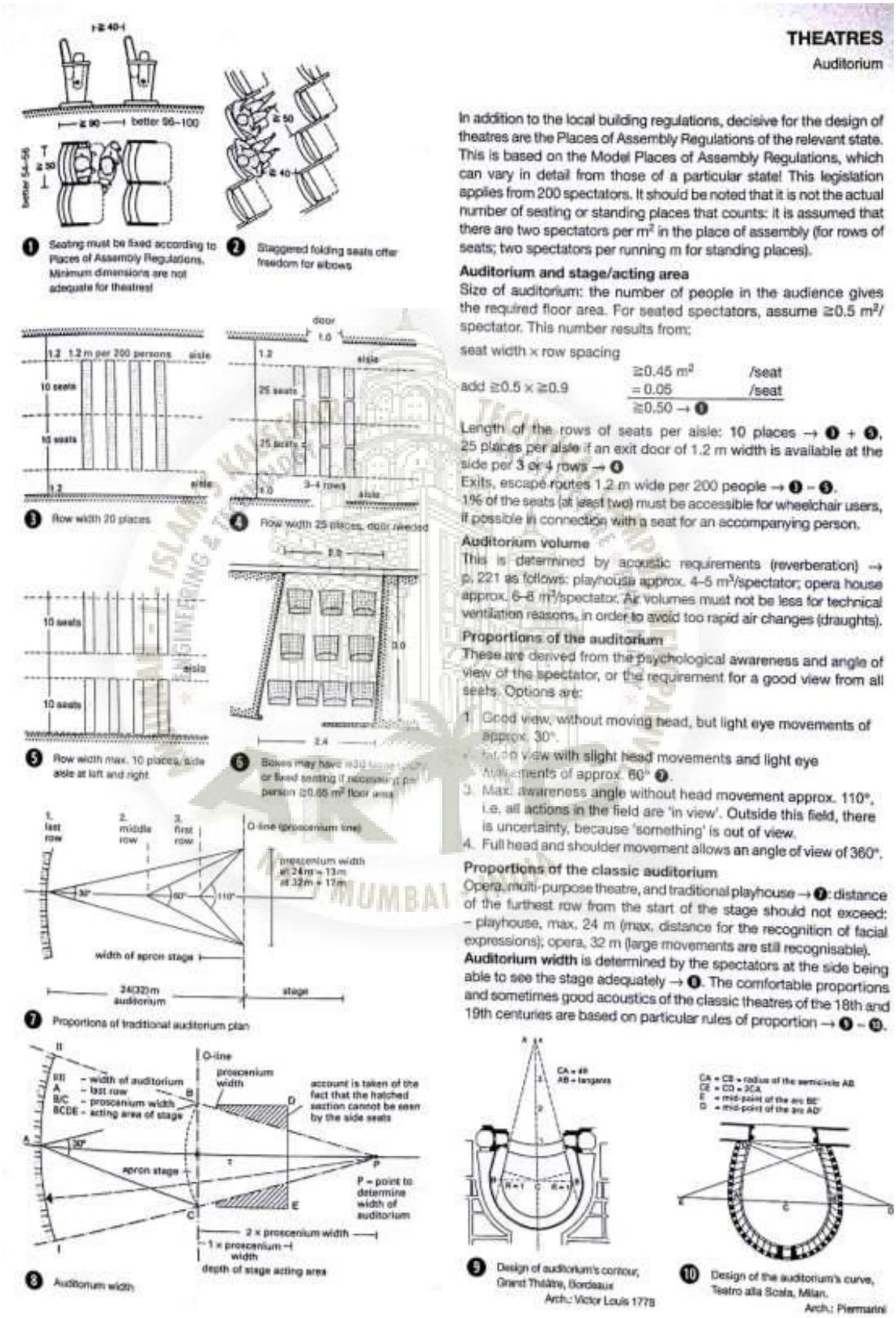




1 Workshop building, ground floor Arch. + Techn.: Biste u. Gerling

Figure: workshop area

Auditorium:



❶ Seating must be fixed according to Places of Assembly Regulations. Minimum dimensions are not adequate for theatres!

❷ Staggered folding seats offer freedom for elbows

❸ Row width 20 places

❹ Row width 25 places, door needed

❺ Row width max. 10 places, side aisle at left and right

❻ Boxes may have ≥0.50 loose width or fixed seating if necessary ≥1 m² per person ≥0.65 m² floor area

❼ Proportions of traditional auditorium plan

❽ Auditorium width

In addition to the local building regulations, decisive for the design of theatres are the Places of Assembly Regulations of the relevant state. This is based on the Model Places of Assembly Regulations, which can vary in detail from those of a particular state! This legislation applies from 200 spectators. It should be noted that it is not the actual number of seating or standing places that counts: it is assumed that there are two spectators per m² in the place of assembly (for rows of seats; two spectators per running m for standing places).

Auditorium and stage/acting area

Size of auditorium: the number of people in the audience gives the required floor area. For seated spectators, assume ≥0.5 m²/spectator. This number results from:

seat width × row spacing

	≥0.45 m²	/seat
add ≥0.5 × ≥0.9	= 0.05	/seat
	≥0.50 → ❶	

Length of the rows of seats per aisle: 10 places → ❶ + ❺, 25 places per aisle if an exit door of 1.2 m width is available at the side per 3 or 4 rows → ❹

Exits, escape routes 1.2 m wide per 200 people → ❸ – ❺.

1% of the seats (at least two) must be accessible for wheelchair users, if possible in connection with a seat for an accompanying person.

Auditorium volume

This is determined by acoustic requirements (reverberation) → p. 221 as follows: playhouse approx. 4–5 m³/spectator; opera house approx. 6–8 m³/spectator. Air volumes must not be less for technical ventilation reasons, in order to avoid too rapid air changes (draughts).

Proportions of the auditorium

These are derived from the psychological awareness and angle of view of the spectator, or the requirement for a good view from all seats. Options are:

1. Good view, without moving head, but light eye movements of approx. 30°.
2. Full view with slight head movements and light eye movements of approx. 60° ❼.
3. Max. awareness angle without head movement approx. 110°, i.e. all actions in the field are 'in view'. Outside this field, there is uncertainty, because 'something' is out of view.
4. Full head and shoulder movement allows an angle of view of 360°.

Proportions of the classic auditorium

Opera, multi-purpose theatre, and traditional playhouse → ❷: distance of the furthest row from the start of the stage should not exceed: – playhouse, max. 24 m (max. distance for the recognition of facial expressions); opera, 32 m (large movements are still recognisable).

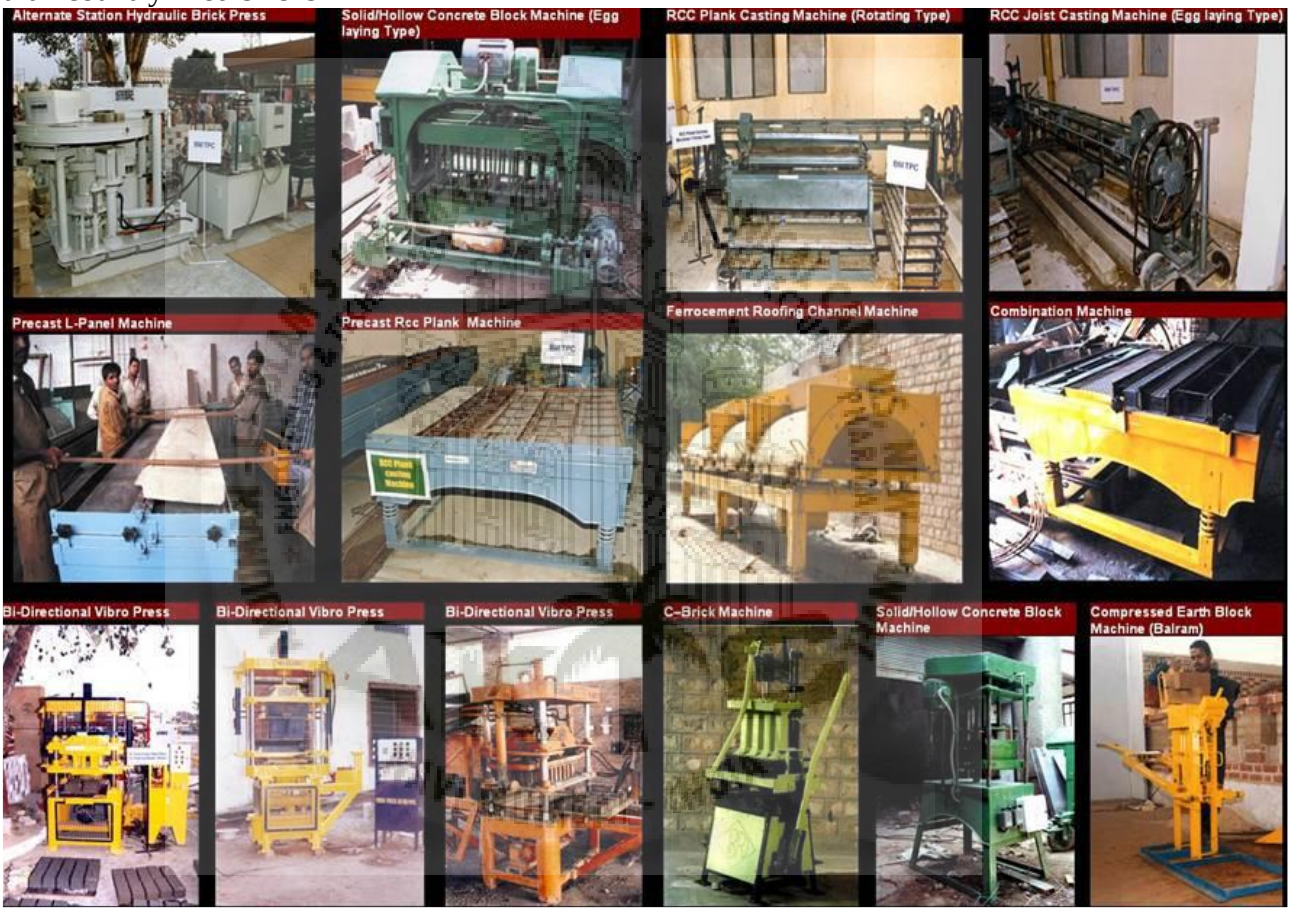
Auditorium width is determined by the spectators at the side being able to see the stage adequately → ❽. The comfortable proportions and sometimes good acoustics of the classic theatres of the 18th and 19th centuries are based on particular rules of proportion → ❾ – ❿.

❾ Design of auditorium's contour, Grand Théâtre, Bordeaux
Arch.: Victor Louis 1778

❿ Design of the auditorium's curve, Teatro alla Scala, Milan.
Arch.: Piermarini

Compressed Stabilised Earth Blocks

These are dense solid blocks manufactured by pouring slightly moistened soil into a steel press with stabiliser (lime/cement) and then compressed either with a manual or motorised press. The input of soil stabilisation allows people to build higher with thinner walls, which have a much better compressive strength and water resistance. With cement stabilisation, the blocks must be cured for four weeks after manufacturing. Af-ter this they can dry freely and be used like common bricks with a soil cement stabilised mortar. Many stabilizers can be used. Cement and lime are the most common ones, others, like chemicals, resins or natural products can be used as well. The selection of stabilizers will depend upon the soil quality and the project requirements.
A finished m3 of CSEB wall is generally 48.4% cheaper than wire cut bricks and 23.6% cheaper than country fired bricks



Filler Slab Roofs

Filler slab roofs are basically solid reinforced concrete slabs with partial replacement of the concrete in tension zone by a filler material. A number of alternative materials can be thought of (a) brick or brick panel (b) stabilized mud blocks (c) hollow clay tile/block e.t.c fig 6 shows ceiling of a typical filler slab roof using SMB filler. Quantity of concrete in the tension zone of the slab that can be replaced by a filler material de-pends on the shape of the filler material and the thickness of the slab. For example in a solid concrete slab of 125mm thick-ness, a filler block, 25% of the concrete can be replaced by a material , which costs one third the cost of concrete. This means that 15-20% of the cost of concrete can be saved by this operation.

Others Include;

- Stabilized rammed earth foundations
- Stabilized rammed earth walls
- Composite columns (round and hollow CSEB with reinforced concrete)
- Composite beams (U shape CSEB with reinforced concrete)
- Stabilized earth mortars and plasters
- Alternative stabilizers to cement ("homeopathic" milk of lime and alum)
- Alternative waterproofing with stabilized earth (mixes of soil, sand, cement, lime, alum and juice of a local seed)

SITE SELECTION AND JUSTIFICATION:

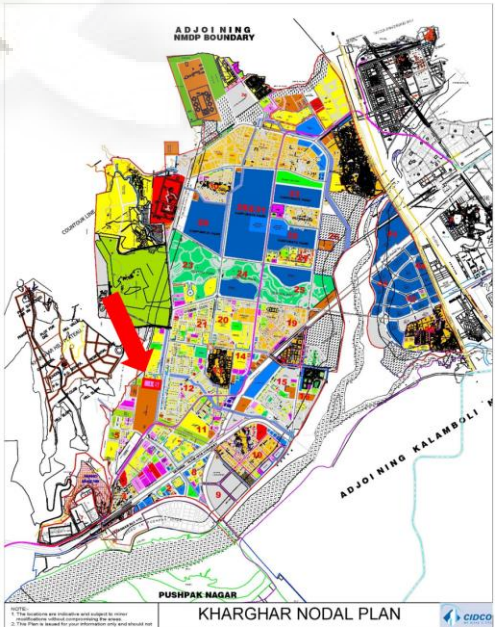
Kharghar is smart city one of the nodes of Mumbai metropolis situated at the Northern most tip of Raigad district where the most numbers of workers are available. It was developed by the City and Industrial Development Corporation i.e. CIDCO. Kharghar is located on the Sion Panvel Highway at one and half hour (approx.) drive during peak traffic hours from the heart of Mumbai city.

The area started developing in 1995 and now has a number of ready and under-construction projects both in the commercial and residential segments. Kharghar which is said to be the most developed node of Navi Mumbai, will be administered by recently established Panvel Municipal Corporation.

Naka	Size of the *Naka*	Share of inter-state migrants*	Average years in the *naka*	Percentage of those experienc-ing wage reneging	State Wise Fractionali-zation	Linguistic Fractionali-zation	Caste Fractionali-zation
Vashi	23	39	9	39	0.586	0.465	0.699
Sanpada	50	54	9	38	0.726	0.62	0.767
Nerul	67	46	9	31	0.664	0.435	0.712
Belapur	32	53	12	34	0.684	0.655	0.697
Kharghar	123	66	6	55	0.791	0.727	0.761
Sukapur	65	58	9	20	0.741	0.505	0.731
Kohinoor	39	28	8	33	0.465	0.302	0.654

Source: Author's, 2013
Note: *The figures denote the *percentage* of migrants from each *naka* who share the respective characteristic.

Site would have been in Mumbai but it would be so much costly and not affordable to invest then outcome, also cannot placed the structure in Konkan village area as it would not be populated and employee rate and awareness would be less in village side. So site selection would be way better in connecting region like Navi Mumbai city where land is affordable and with more population and employee rate.



About site:

Location: kharghar, Navimumbai

Site area: 21000 sq m.

Land use: Educational and Institutional.

Coordinates: 19.042675, 73.062491

Climatic zone: Tropical, Warm and Humid.

Site demarcation (note, red mark denote site demarcation, yellow line denote road access).

Back side view of site.

Front view of site (picture snapped after raining)

Interiors and products retail shops exactly opposite of the site.

TENTATIVE SPACE PROGRAM:

PLOT AREA - 21000 SQ.M, F.S.I - 1.0
BUILT UP AREA =

SR.NO	SPACES	NO.OF SPACES	TOTAL CAPACITY (USER PEOPLE)	MIN AREA(SQ.M)	TYPE OF SPACE	QUALITY OF SPACE
	SECURITY					
1	SECURITY CABIN	2	2	15	CLOSED	NATURAL VENTILLATION
	ADMIN					
2	RECEPTION	1	2	10	SEMI OPEN	NATURAL VENTILLATION
3	WAITING AREA	1	15	25	SEMI OPEN	NATURAL VENTILLATION
4	ADMIN STAFF	1	4	20	CLOSED	AIR CONDITIONED
5	ACCOUNTANT'S CABIN	1	4	15	CLOSED	AIR CONDITIONED
6	CONFERENCE ROOM	1	10	25	CLOSED	AIR CONDITIONED
7	MANAGING DIRECTOR	1	3	15	CLOSED	AIR CONDITIONED
8	HOD OFFICE	1	5	25	CLOSED	AIR CONDITIONED
9	ARCHIVE	1	3	10	CLOSED	NATURAL VENTILLATION
10	PANTRY	1		5	CLOSED	NATURAL VENTILLATION
11	TOILET	2		20	CLOSED	NATURAL VENTILLATION
	EMPLOYMENT DEPARTMENT					
12	INFORMATION AREA	1	2	10	SEMI OPEN	NATURAL VENTILLATION
13	WAITING AREA	1	50	75	SEMI OPEN	NATURAL VENTILLATION
14	FORM DISTRIBUTION AREA	1	50	75	CLOSED	NATURAL VENTILLATION
15	REGISTRATION AREA	1	50	75	CLOSED	AIR CONDITIONED
16	ACCOUNTANT'S CABIN	1	4	15	CLOSED	AIR CONDITIONED
17	PROJECT MANAGER	1	4	15	CLOSED	AIR CONDITIONED
18	ARCHIVE	1	3	10	CLOSED	NATURAL VENTILLATION
19	PANTRY	1		5	CLOSED	NATURAL VENTILLATION
20	TOILET	2		20	CLOSED	NATURAL VENTILLATION
	STAFF ROOM					
21	STAFF SITTING	1	14	40	CLOSED	AIR CONDITIONED
22	ARCHIVE	1	3	10	CLOSED	NATURAL VENTILLATION
23	PANTRY	1		5	CLOSED	NATURAL VENTILLATION
24	TOILET	2		20	CLOSED	NATURAL VENTILLATION
	WORKSHOPS					
25	STONE(BASALT/MALAD/LATERITE)	1	30	200	SEMI OPEN	NATURAL VENTILLATION
26	TERRACOTTA	1	30	200	SEMI OPEN	NATURAL VENTILLATION
27	RAMMED EARTH +STABILISED BLOCKS	1	30	200	SEMI OPEN	NATURAL VENTILLATION
28	CONCRETE/FERROCONCRETE	1	30	200	SEMI OPEN	NATURAL VENTILLATION
29	STEEL & ALUMINIUM	1	30	200	SEMI OPEN	NATURAL VENTILLATION
30	BAMBOO/CANE/WOOD CARPENTRY	1	30	200	SEMI OPEN	NATURAL VENTILLATION
31	FABRICS	1	30	200	SEMI OPEN	NATURAL VENTILLATION
32	GLASS & PLASTICS	1	30	200	SEMI OPEN	NATURAL VENTILLATION
33	KARIGARSHALA	1		200	CLOSED	NATURAL VENTILLATION
33	COLLAB OPEN GROUND WORKSHOP	1		400	OPEN	NATURAL VENTILLATION
	VOCATIONAL TRAINING					
32	CLASSROOM	6	250	300	CLOSED	NATURAL VENTILLATION
33	RESOURCE CENTRE	1		150	CLOSED	NATURAL VENTILLATION
	RESEARCH WING					
33	E-LIBRARY	1	20	30	CLOSED	NATURAL VENTILLATION
34	ENVIRONMENTAL LAB	1	15	50	CLOSED	NATURAL VENTILLATION
35	STRUCTURAL LAB	1	15	50	CLOSED	NATURAL VENTILLATION
36	STUDIO	3	70	450	SEMI OPEN	NATURAL VENTILLATION
	MULTI-PURPOSE SPACES					
	OPEN AIR AMPHITHEATRE					
	GREEN ROOMS	1	5	5	CLOSED	AIR CONDITIONED
	SEATING			400	OPEN	NATURAL VENTILLATION
	PROJECTOR ROOM			30	CLOSED	NATURAL VENTILLATION
	KIOSK	1	2	5	OPEN	NATURAL VENTILLATION
	TICKET BOOKING COUNTER	5	3	15	SEMI OPEN	NATURAL VENTILLATION
	SERVER ROOM	1		20	CLOSED	AIR CONDITIONED
	AUDITORIUM					
	CHANGING ROOMS	2	6	5	CLOSED	AIR CONDITIONED
	TOILETS	1	AS PER REQUIREMENT		CLOSED	AIR CONDITIONED
	PROJECTOR ROOM	1		10	CLOSED	AIR CONDITIONED
	SEATING ROOM	1	100	300	CLOSED	AIR CONDITIONED
	SERVER ROOM	1		5	CLOSED	AIR CONDITIONED
	GREEN ROOM	1		5	CLOSED	
	EXHIBITION AREA					
	OPEN EXHIBITION	1		400	OPEN	NATURAL VENTILLATION
	STORE ROOM	1		50	CLOSED	NATURAL VENTILLATION
	SEMI OPEN EXHIBITION	1		100	SEMI OPEN	NATURAL VENTILLATION
	CLOSED EXHIBITION	1		60	CLOSED	AIR CONDITIONED
	LOBBY	1		20	SEMI OPEN	NATURAL VENTILLATION
	TOILETS	1	AS PER REQUIREMENT		CLOSED	NATURAL VENTILLATION
	HELP DESK	1		10	SEMI OPEN	NATURAL VENTILLATION
	MANAGER CABIN	1	1	30	CLOSED	AIR CONDITIONED

	SOUVENIR(PRODUCT) SHOPS					
	STORE ROOM	1		20	CLOSED	NATURAL VENTILLATION
	DISPLAY AREA	1		50	SEMI OPEN	NATURAL VENTILLATION
	CASH COUNTER	1		15	SEMI OPEN	NATURAL VENTILLATION
	SHOPS	6		150	SEMI OPEN	NATURAL VENTILLATION
	OTHER FACILITIES					
40	LIBRARY	1	80	120	CLOSED	NATURAL VENTILLATION
41	CANTEEN+KITCHEN	1	50	150	SEMI OPEN	NATURAL VENTILLATION
42	STACKYARD	1		600	SEMI OPEN	NATURAL VENTILLATION
43	TOILET	2		120	CLOSED	NATURAL VENTILLATION
	ACCOMODATION					
44	LABOURS	1	120	400	CLOSED	NATURAL VENTILLATION
45	TOILET			100	CLOSED	NATURAL VENTILLATION
46	VISITORS	1	30	450	CLOSED	NATURAL VENTILLATION
	PARKING					
	TWO WHEELERS	AS PER DESIGN	AS PER REQUIREMENT		PUBLIC	SEMI OPEN
	FOUR WHEELERS	AS PER DESIGN	AS PER REQUIREMENT		PUBLIC	SEMI OPEN

TOTAL AREA	7435 SQ. M
CIRCULATION AREA 15% OF TOTAL AREA	1115.25 SQ. M
TOTAL BUILDUP AREA	**8550.25 SQ. M**