

Harnessing Sustainability through Traditional Modernization in the Context of Vernacular “A case of INDIA PEACE CENTRE, NAGPUR”

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Abstract—In view of the quantity and diversity of vernacular architecture in the world, it plays a surprisingly small part into sustainable development. This paper addresses the relationship between significance of vernacular architecture in sustainable building design with an example of India Peace Centre at Nagpur. The main objective of this paper is to understand the principles and strategies for sustainability from vernacular heritage and integrate those in present society. With the ever growing global concern for the use of energy and resources and associated climate change, architects have a greater responsibility to design buildings that are environmentally sustainable.

Keywords: Sustainability, vernacular architecture, sustainable building design.

INTRODUCTION

Architects are embracing regionalism and cultural building traditions, given that these structures have proven to be energy efficient and altogether sustainable. In this time of rapid technological advancement and urbanization, there is still much to be learned from the traditional knowledge of vernacular construction.

Vernacular architecture, the simplest form of addressing human needs, is seemingly forgotten in modern architecture. However one of the best illustration by putting case study of IPC is the supreme beautiful example of traditional, vernacular, architecture in modern era. India peace center is located in central India in the mist of Nagpur city.

In IPC confluence of traditional, vernacular and modern architecture where, not only the climatic problems were resolved, but also the aesthetics, physical and social functions of the dwelling is considered that contributed the design which is diverse and beautiful. The potential of traditional vernacular materials and techniques were applied to become the sustainable building design. The design of IPC edifies a lot in array to progress in the future of architecture and sustainable building. It's important to gain knowledge of the past and employ these strategies as a well-balanced, methodical whole to achieve optimum perfect sustainable building design. In IPC by applying vernacular strategies to modern design, a structure can ideally said to be entirely self-sufficient building in terms of climate responsive design.

PLAN FORM OF IPC

Contemporary courtyard

Courtyard is the focus of planning. It has been surrounded by colonnade veranda with various rooms behind them. This Wada follows the grid planning design. This spatial configuration decreases the intensity of light during the transition from outside to inside and useful for spill out activities in semi-open space from open space and built form. Thus, this plan form offers flexibility which was always present in the traditional architecture. The basic planning was introvert. Exterior façade of IPC expresses the traditional style, not the modern style as stone and brick elements are used. Structural grid is clearly visible in elevation of exterior façade. Features such as symmetry; square or rectangular



Fig. 1: Location Map of IPC

geometry planning have been continued in IPC. All the windows are ornamented into wooden facing the courtyard.



Fig. 2: Stone Entrance Foyer

The characteristics of a courtyard as an element in traditional architecture are that it connects inside and outside space. It is an environmental space that offers light and ventilation, landscaping, cooling, wind gathering etc. These characteristics of courtyard as spatial elements with style are enduring in IPC.



Fig. 3: Entrance highlighted with stone

The entrance of IPC has stone wall which is a traditional material and inculcated by ashok chakra which signifies the strength of the place. As stone is hardly affected by the normal day to day actions that leave wear and tear on other construction materials it has been used to represent in the front. And wind, rain, hail, sleet, and snow do not bother stone in the slightest. Because of its strength, durability, and ability to weather stone lasts for a long time. The whole structure is uplifted through plinth but on the other hand it is also binded through the exposed brick plinth which acts as one of the strongest connector.



Fig. 4: Semi open corridors highlighted through brick piers

The long corridors of IPC help in improving natural light, ventilation allowing for cooler air from outside penetrating into the built areas. These are fragmented with exposed concrete roof showing volume as it has normal human height and natural areas being created through vertical landscape upon the concrete pillars. "The aesthetic of the materiality of the existing space is usually one of hard surfaces made rough, bare brick walls and mottled grey concrete. "Features like exposed brickwork, raw concrete and beams present a creative challenge and the opportunity to source original decor to complement and contrast with these heritage elements."The decorative pillar becomes an accent feature for the décor in the corridor.

ARCHITECTURAL FEATURES

BRICK JALLI: PERFORATED BRICK SCREEN

Brick jali walls, a perforated brick screen which is utilized for natural air movement to cool the interior and create intricate patterns of light and shadow in IPC. Decorative exposed brick patterns have been used to enhance the facade treatment. The patterns of jalis cast magical shadows and reflections that grace the adjacent floors and walls, entrancing and mystifying. It has acted as an elegant visual barrier in IPC. The creepers above the brick jaali allow wind to pass through it but also obstruct the sunlight.

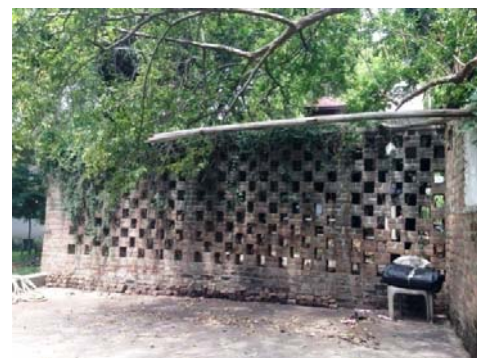


Fig. 5: Brick Jalli's creating as a screen wall



Fig. 6: Decorative brick wall with corner brick piers

TRADITIONAL LOUVER WINDOWS

The wooden louvers between the brick piers at IPC create great intricate niches of contemporary expression with different elements. The wooden shutters protect against sun and heat in summer and wind and cold in winter. It can be adjusted to allow varying amounts of air to enter. When it is opened, each slat opens at an angle that allows east sunlight and fresh air to come into the interior spaces of IPC. Here the louvered windows have provided free passage of air and sufficient light even when closed. These windows provide protection against excessive daylight and glare inside buildings without in any way affecting ventilation. No glass windows are used anywhere in the building; light and ventilation being provided by operable wooden louvers. The building merges very well with the plinth .The Architect conceptualizes the form of space through material and construction techniques. The Designer chooses these means in consonance with the purpose and it is the nature of purpose which provides the sense of space for which the form stands formaking an ambience of tranquility.



Fig. 7: Tradional Timber Louver window

STACK EFECT

Apart from the earlier mentioned strategies, there are several stack ventilation techniques inherited from vernacular architecture worldwide which are still in use today. This effect is used to naturally ventilate IPC. Among the most common techniques are the static type openings on top or upper part of the building like ridge, static and dormer vent, chimney flue, jack roof and roof monitor which most of them deal with the function to ventilate the trapped hot air underneath the roof, thus reduce the internal heat gain. An atrium is spaced with glazed roofs which are incorporated in the middle of a deep-plan building for both day lighting and ventilation purposes. The warm air exhaust through the top openings, resulting in cooler air being pulled into the building from the outside through the openings at the bottom keeping the interiors of the building cool. This architectural feature enhanced the stack ventilation performance by increasing high differential pressure through the use of the glazing elements at the upper part. This element at IPC absorb solar gain and increase the air temperature near the outlet area which in turn makes the stack flow more effective due to the increase in buoyancy-driven flow.



Fig. 7: Traditional Timber Louver window

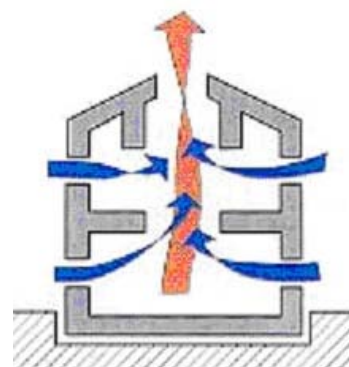


Fig. 8: Stack Effect used in roof

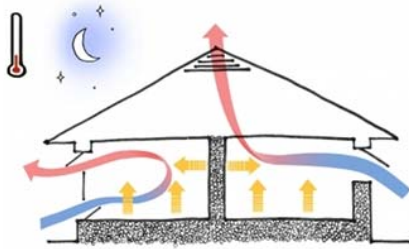


Fig. 9: Cross ventilation through Fenestrations

PERGOLA’S

During cooling seasons, external window shading is an excellent way to prevent unwanted solar heat gain from entering a conditioned space. Shading can be provided by natural landscaping or by building elements such as awnings, overhangs, and trellises. They are particularly useful for shading north and south-facing walls and north-facing outdoor entertainment areas. Pergolas are versatile in that they can be covered with hard materials such as corrugated iron or climbing plants which, if deciduous, have the added bonus of allowing the sun through in winter if desired. Moldings doubtlessly originated in prehistoric building, where they served specific structural functions, such as supporting, binding, or separating surfaces. Here in IPC the masonry column is a structural element which is one of the main load bearing element in a structure. These columns act as corner pillars, porch columns. It is economical and easy to construct brick pillars than RCC column.



Fig. 10: Creepers used over Brick jaali for better climatic control

STONE WALL AS THERMAL INSULATOR

Stone wall cladding for feature walls and retaining walls provides a rugged, organic and textural approach to surface treatments. Stone is a fantastic conductor; because of this, a poorly insulated stone will hold too much heat in the summer and lose too much in the winter. Because stone is such a good conductor, IPC which feature masonry have a higher thermal mass than other structures. The absorption of heat by

stone takes a long time, and once the heat is absorbed, it will be retained and radiated for up to days afterwards. This property of stone can work both for and against seeking to effectively heat or cool a stone house. The insulation is on the inside of the wall, none of the heat captured by the stone would be transferred into the building.



Fig. 11: Cross cross pattern of brick wall



Fig. 12: Stone wall acting as Thermal insulator

COURTYARD AS PASSIVE COOLING

Courtyard in IPC building design is attributed to the optimization of natural ventilation in order to minimize indoor overheating conditions. The courtyard has social, cultural, religious, and environmental benefits. The courtyard functioned as a convective thermostat and gave protection from extremes of weather.



Fig. 13: Image shows the pyramid of Sustainable Architecture

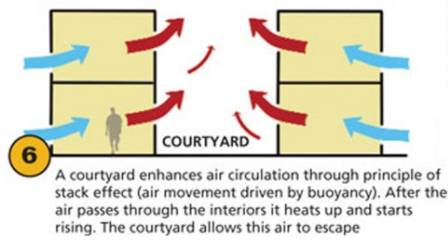


Fig. 14: Stack effect helps hot air to rise up

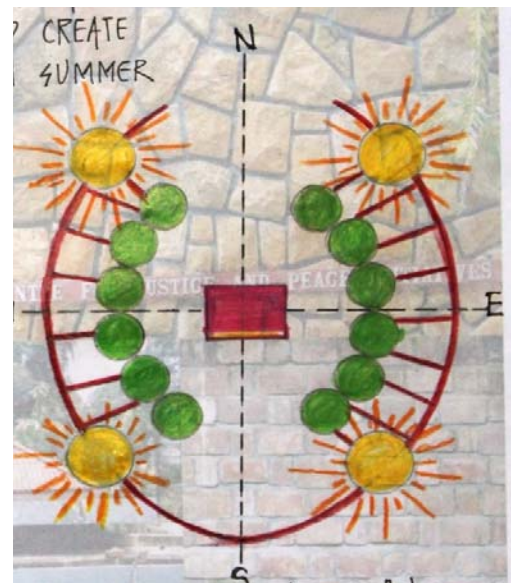
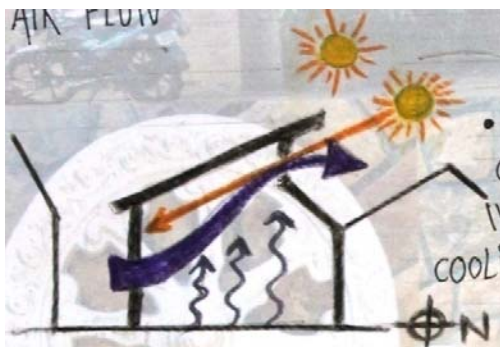
CLAY TILES AS VERNACULAR BUILDING ELEMENT

Clay roof tiles are solid and thus especially robust and dimensionally stable in IPC. They are insensitive to environmental influences such as heat, cold and frost. As a result, roofs covered with clay roof tiles in IPC require very little maintenance and guarantee a constant quality and beauty.



Fig. 15: Stack effect helps hot air to rise up

ORIENTATION



CONCLUSION

This study explores the strategic planning along with the climatic consideration as a major aspect. All the vernacular designing elements bring into play in the IPC building helped to become a paradigm of climatic responsive architecture. It is an integral part of any building design towards sustainability. Orientation of the building and its major openings can greatly influence the solar heat gain, thus it should be carefully considered with creativity by an Architect. The building has an open planning which contributes to greater extent. All the factors used in India Peace Centre is an amalgamation of traditional and contemporary architecture which blends to form the entire sustainable factor making it the best example in the composite climate of Nagpur.

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