

THE VIRTUAL RECONSTRUCTION OF PAHARPUR VIHARA

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Abstract: The monastic development of the Buddhist Architecture had attained an unparalleled height in the 8th century AD through the manifestation of the *Sompur Mahavihara*, presently known as *Paharpur Buddha Vihara*. The elaborate creative complex shaped by the local craftsmen from the very earth of Bangladesh remained little understood in terms of its form and morphology. The existing part of the dilapidated structure is deteriorating day by day being subjected to the causes both natural and man made. The structure, in its present form, poses with certain unexplained phenomena, which are worthy to investigate. The study, therefore, attempts to resolve those phenomena into a logical solution and create a basic understanding of the Form and Morphology of this particular organization. In this regard, a technical as well as an architectural perception will be given the utmost priority. An attempt of a conjectural restoration of the whole complex is the final outcome, based on the findings and on certain logical assumptions derived from the study.

Keywords: Vihara Archetype; Sompur Vihara; Paharpur; Bengal Heritage

Introduction

Paharpur *Vihara*, presently located in the Rajshahi District, was erected during the 8th century A.D. by the *Pala* Kings. The *Vihara* apart from that of *Nalanda*, is the largest in the region which, as archaeological excavations revealed, contains monasteries with ample rooms, courtyards, platforms, temples and bathing *Ghats* richly decorated in terracotta plaques of the most exquisite workmanship. The diggings have established clearly that there was a *Stupa* mound built here, with the biggest single *Vihara* monastery so far discovered (Anand, 1974) in the sub-continent. The *Vihara* represents an era of enlightenment in the history of Bengal when Buddhism had reached in its peak especially under the patronage of the *Pala* Dynasty. The structure, though in a dilapidated condition, still bears the reminiscent of its past glory.

The nature of investigation of this study, therefore, comprises of a framework that needs to be verified both in terms of space and time. The study focuses mainly on architectural interpretation, that is, the formal and spatial analysis of the archaeological findings incorporating the physical and functional findings with the aesthetic values of that time. Identification of the contextual factors and their role in the development of the archetype *Viharas* will also be a major focus. As the final outcome of the study, a conjectural restoration will be created in an attempt to unleash its past legacy to the modern eye.

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In this purpose, a literature survey was done on the Buddhist Philosophy and their developments in architecture, development of the architectural vocabulary of that period and specially, the socio-political and architectural expression of the Bengal region. A physical survey¹ was also made on the site conditions and the built forms of the *Vihara* complex.

The context

Geographic Context of Bengal

The term *Bengal* refers to a territory that stretches from the Himalayas to the north to the Bay of Bengal in the south and from the *Brahmaputra*, the *Kangsa*, the *Surma* and the *Sajjuk* rivers in the east to the *Nagar*, the *Barakar* and the lower reaches of the *Suvarnarekha* in the west. The territory thus defined is actually a product of a long process of geographic formation. Wide spread marine transgression followed by regression with consequent uplifts featured its geologic history.

The large alluvial basin of Bengal is flooded with quaternary sediments deposited by the Ganges and *Brahmaputra* rivers and their numerous associated streams and distributors. Climatically the excessive monsoon rain, varying between 70 to 100 inches in a year, facilitates the rapid growth of the wild vegetation. This phenomenon along with the high humidity and dampness poses serious threat to any structure abandoned to the mercy of nature. Moreover the devastating earthquake in 1897 was responsible for the obliteration of most of the historical monuments of Bengal. This is why, a little remains of any ancient Architecture is to be found anywhere in this region (Chakrabarti, 1992). This is specially the case where the buildings constructed with earthen brick failed to withstand the onslaughts of rainy weather and shifting nature of soil for long. The changing courses of rivers is almost a regular phenomenon the floods causes extensive damage and destruction to crumble away almost all the old buildings of this country.

Trade Routes and Settlements

The qualitative and quantitative development of Bengal's industries and the unrivalled facilities for movement afforded by the seacoast and river systems of this province has promoted the early growth of commerce. The principal centers of inland trade were obviously the towns. The archaeological excavations (Ahmed, 1984) and the historical accounts of different foreign travelers does reflect the fact that Paharpur had active interaction with its contemporary and later developments in India, Tibet, China as well as the Far East. Thus this center for learning played an active role, initially as a borrower' of the contemporary ideas, technologies and aesthetic values for the early or contemporary developments and later on as a disseminator, by influencing the contemporary and the later developments. A total understanding of the mobility of such influence is of utmost importance for the reconstruction work. The identification of routes through which such transactions took place can give us a linking pattern of technology transfer, idea developments and aesthetic interactions.

History refers that the *Pundravardhana*, had a great market place and streets lined with shops. The history of foreign trade with this part of the region may be traced back to at least 4th or 5th centuries BC. Bengal maintained an active overseas trade with South India and Ceylon. Bengal used to export spices to even Rome during the 1st century AD. In the middle age Bengal had relation with *Gujrata*. Historical accounts show that there were three radiating overseas routes from *Tamralipti* (Mojumder, 1964):

- a) Towards south east to Burma.
- b) To Malaya peninsula and the Far-East
- c) Towards southwest to *Kalinga*, *Eojrata* and Ceylon.

There were several land-routes for foreign trade:

- a) *Pundravardhana* to *Kamarupa*. (Textile, sandal etc.)
- b) *Pundravardhana* to *Pataliputra*. (Frequently used westward route).
- c) Towards china through the Himalayas (raw silk, silk yarn and silk cloth)

Philosophical Backdrop

Development of Ideas in Bengal: The Vedic *Samhitas* has completely ignored Bengal and single *Brahmana* text, probably also an *Aranyaka* that refer to its peoples do so in disparaging terms. Even the later work *Bodhayana Dharmasutra* regards the country as altogether outside the pale of Vedic culture. Due to the absence of positive evidence we can not admit that the Aryan culture made much headway in Bengal. The linguistic and ethnological evidence renders it highly probable that Bengal was till then mostly populated by Non-Aryan races. It is difficult to assign precise dates but Bengal must have come into intimate contact with the Aryan culture by the monks and warriors of the middle counties by the 4th century BC. After that, as always happens, the primitive culture of Bengal was profoundly affected by the impact of a superior civilization (Vedic, Buddhist and Jaina) and we possess very little knowledge of the old religious faiths and beliefs.

Buddhism: Founded in the 5th century BC by *Siddhartha Gautama*. He rejected the Hindu spiritual, ritual and social system. Buddhism restricts itself to a rationalistic analysis of *Samsaras*, in order to encourage meditation practices. Suffering (*Dokha*) being the basic characteristic of all desires, and pain can be overcome by meditation and *Nirvana* is realized. It denied soul and discarded metaphysical speculation as useless waste of time.

The Buddha bequeathed neither scripture nor successor to whom problems of interpreting the *Dharma* might be referred. Indeed, confident in the power of the *Dharma*, convinced in the need for unconstrained personal commitment and dedicated to the ideal of spiritual independence, he could hardly have entertained the idea of the institutionalized authority. After the *Mahaparinirvana* of Buddha, the *Sangha* expanded until a breaking point was reached after a second great council, reputedly held at *Vaishali* in 386 BC, to discuss disciplinary matters and schism produced two different camps. The conservative *Theravadians* held that *Nirvana* depended on complete renunciation of the ordinary concerns of this life and the Buddha, though of unique status, was human. The more liberal *Mahasanghikas* held that the *Arhant* ideal represented a self-centered denial of the universal compassion of the Buddha and that devotion or *Vakti* was as important a means as yoga for the attainment of salvation.

The development of these ideas remains obscure. From the broad division between *Theravadians* and *Mahasanghikas* some twenty Buddhist schools emerged in the last three or four centuries BC, each with its monasteries elaborating distinct doctrinal position in commentaries upon the *Sutras*.

The Viharas and the Buddhist schools of thought: There is no definite evidence as to the time when Buddhism first gained influence in Bengal. But during the period of Asoka Buddhism was established in this area. This was the time when different schools of thought were established in this region. Hundreds of educational centers known as *Viharas* were established under state patronization. In the 5th century, according to Fa-Hien, there were 22 *Viharas* in *Tamralipti*. There was a *Vihara* at Comilla in the 6th century called *Raj-Vihara*; there were 20 *Viharas* in *Pundravardhana* alone! 30 *Viharas* in *Samatata* and *Vanga*. During the reign of the *Palas* (8th century AD), Bengal experienced the golden period of Buddhism. But at that time the influence of Buddhism was almost wiped away from rest of the India. From 8th to 12th century AD Buddhism in Bengal went through many a changes and alteration. During the emergence of the *Senas* and the

renaissance of Hinduism the Buddhism soon disappeared for the absence of royal and philosophical support.

The Evolution of the Vihara Form

The *Viharas* and the *Sanghramas* were initially places of retreats for travelers especially during the rainy season where Buddha stayed with his disciples. Initially under temporary sheds gradually became established centers, which led to more permanent materials (Keay, 1967). According to *Vinaya Pitak* the first *Vihara* of Buddhist religion was established by *Bimbisar*, the king of *Magadha*, who offered the facilities to Buddha and his disciples at *Belubanaram* (Sunithananda, 1995). Afterwards Buddha directed about five forms of shelters for his followers – *Vihara*, *Adhya-jog*, *Prasad*, *Hormiyo* and *Guha* (Sunithinanda, 1995). These are known as *Pancha-lena*. The word *Lena* has its origin in the Sanskrit word *Layana*, which means – personal abode. Buddha also instructed the *Vikkhus* to travel and preach for nine months of a year and to rest for the rainy season (three months) in the *Viharas*. Probably this was the way the early *Viharas* were used for. The later *Viharas* show a considerable change even regarding the lifestyle of the monks, when they started to use it as a permanent abode. On the 2nd and 3rd century AD, the chief function was the pursuit of secular knowledge and pupils were allowed who would ultimately become something other than a monk. Thus a full-fledged Institution developed (Keay, 1967).

The Architectural vocabulary of the Viharas: The earliest rock-cut forms of range from isolated cells to the more or less formal grouping of cells about a hall preceded by a portico. The earliest datable reference can be traced in the one of the *Viharas* at *Bhaja*, which are the first decades of the 1st century BC. (Tadgell, 1990). The early *Viharas* of *Gandhara* were ad-hoc agglomeration of cells, perhaps ranged behind verandahs with communal halls, refectories, kitchen, bathrooms and cloisters in detached structures. Occasionally the central roof was covered to form a closed assembly hall and some of the cells were converted into *Stupas* or image-shrines dedicated to a saintly former occupant. This was obviously a practical arrangement in the exposed north which had a ready parallel among the most sophisticated excavated *Viharas* of the Western *Ghats* (1st century AD – 2nd century AD). In the mature form of *Gandhara* Monastery, a single *Stupa* dominated the site from a court of its own with one or more quadrangular *Viharas* related to it, often along strong axial lines (Tadgell, 1990).

The later developments of *Viharas* seems to have generated in two different locations almost simultaneously (4th – 5th century AD) –

- a. The rock-cut *Viharas* of *Ajanta*, *Elora*, *Bagh* and *Nasik* group were developed under the patronage of the *Chalukyan* kings during 5th – 7th century AD (470-642). But this trend seems to have terminated with the defeat of *Pulakeshin – II* by the *Pallava* king *Narasimha Varman* in 642 AD.
- b. The development of the brick *Viharas* in Bengal (4th – 5th century AD.) eg. *Nalanda Mahavihara* which later on became the mainstream development of this cult. The later developments of this trend are *Vashu Vihara* (7th century AD), *Sitakot Vihara*, the *Mainamati* group, including that of the *Paharpur*, *Vikramashila Viharas* (8th century AD) and many other *Viharas* in this part of Bengal. The historic accounts of different foreign travelers can be referred to on this regard-At different parts of Bengal (Roy, 1988)²

Table 1. Number of Viharas in different regions of Bengal as described by the ancient foreign travelers.

Name of the Travelers	Places				
	Pundrabardhana	Samatata	Tamralipti	Kojangala	Karnasubarna
Fa-hien			22		
Yuan-Choan	20	30	10		10

According to the inscription called the *Banya gupta's gunaighar -pattra* : there are three Major *Viharas* in the Bengal region. They were- *Asrama Vihara* of Rudra dattya, *Raj Vihara*, *Zensen Vihara*³. The trend, though declining, continued till the invasion of the Muslims in Bengal, which then faced a sharp fall and became almost extinct in the later eras.

Paharpur Vihara

Analysis of Form and Morphology

The monotony of the plain surface of the wall was relieved by insertion of stone Bas-reliefs on the angles of the projections and in built-in recesses throughout the wall. The construction of the lower terraces suggests that the central *Stupa* was crowned by a super-structure with elaborate roof. But nothing remains to show exactly what was the construction on top. The central temple, the exact height of which is yet to be determined, dominated the landscape. It was in cruciform shape, with projecting angles between the arms. Three raised terraces, with complex decorative walls, with carved brick cornices and terracotta friezes built up from individual plaques and even stone reliefs, covered the lower walls. The examination of the layers, from the top of the Paharpur central temple downward, reveals a simple structural plan. A hollow square on top of the terraces provided the center for the entire spectacular movement (Fig. 1).

It has been suggested that there was probably a four-faced *Chaturmukha Jain temple*. And to utilize this original structure, the Buddhists made a projection in the first and second terrace with an antechamber and a *Mandapa* on each side, thus leaving out portions of the whole length of the square on the four corners. A circum-ambulatory passage was made to run parallel with the parapet wall. And this resulted in the cruciform shape, with one projecting angle between the arms. There is an enclosing wall round the monument, conforming to the basement plan (Anand, 1974).

The spatial patterns: The whole complex seems to have been built in a single period. The repairs and additions seem not to have altered the original plan in any significant way. The *Somapuri Vihara*, as the Paharpur mound was called, seems to have influenced its contemporary and later developments in India, as also the other Buddhist architectural efforts in Burma and Indonesia.

The discovery at *Laurya Nandgarh* of an early prototype of the Paharpur shrine shows that the tradition of building the *Stupa* and *Vihara* at Paharpur, came from northern *Bihar*. Though it is likely that earlier *Stupas* and *Viharas* must have been put up in the Ganges planes as at *Kosambi* and *Barhut*. The emphasis on burnt brick and baked terracotta plaques, however, was common to the traditions of the whole area, where the Buddha had wandered. The soft alluvial earth lent itself to the molding and baking. The modeling of rectangular brick, and the modeling of forms, were both easily possible in the soft fine earth. The remains of a seventy-foot high wall of burnt brick shows the ambitious monumentality of the construction. The bareness of these walls was relieved on the outer facade by projecting cornices of ornamental bricks twisted rope design moldings and pyramidal and lotus patterns.

Basic Inquiries about Paharpur Vihara: In general the layout follows strong geometric lines and the cardinal axes. But since the whole complex has been subjected to major decay and later additions, a large number of controversies arise regarding certain irregularities. The following basic inquiries, in the whole of the *Vihara* and the central *Stupa*, are the key questions this study attempts to solve.

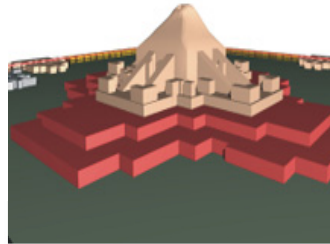
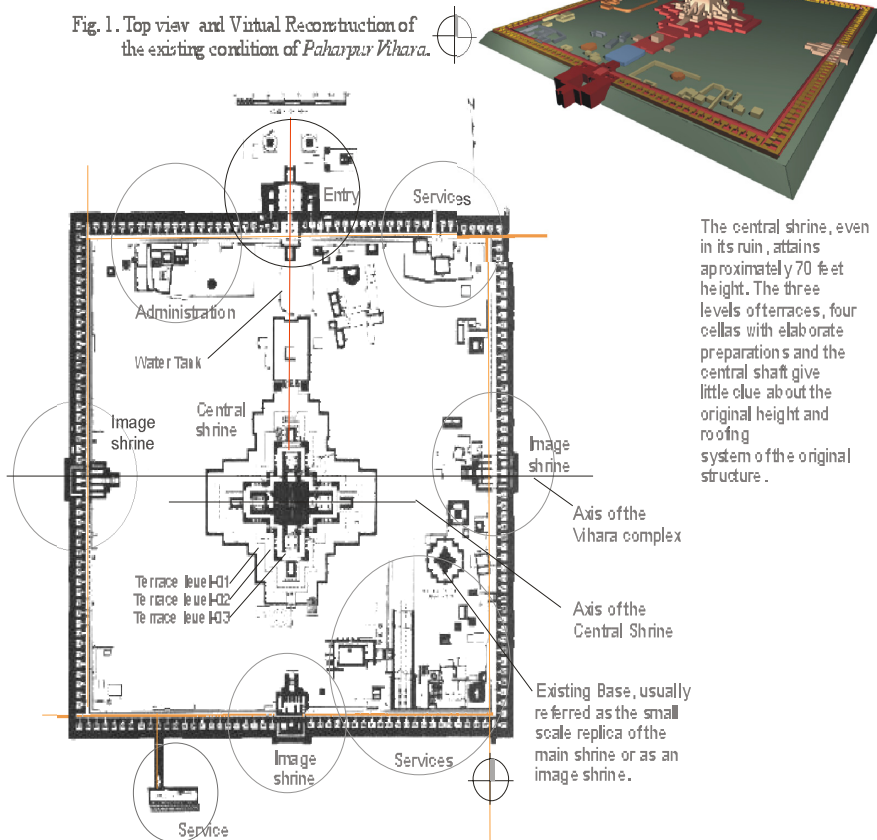


Fig. 1. Top view and Virtual Reconstruction of the existing condition of *Paharpur Vihara*.



The central shrine, even in its ruin, attains approximately 70 feet height. The three levels of terraces, four cellas with elaborate preparations and the central shaft give little clue about the original height and roofing system of the original structure.

Fig. 2. Paharpur Vihara: Plan showing different parts of the complex (source: Department of Archaeology, Bangladesh).

1. The overall size of the complex is 919'× 922' which is not a true square but very nearly so. This slight variation in the sizes of the adjacent sides whether is deliberate or merely an error is yet to be ascertained.
2. Another example of geometric irregularity is the positioning of the water tank. It is between the northern gateway and the temple, which is slightly off centered instead of retaining the expected symmetry. (Fig. 2)
3. Approaches from the eastern and western blocks were not aligned to the east west axis of the central *Stupa*. The central shrine is positioned off-centrally to the whole layout. The approach from the cellas towards the central shrine is not very defined. (Fig. 2)
4. The raised platform outside the main complex contains some irregular marks of extending walls or chambers. The use or logical justification of these features is not yet known.
5. Two minor entries/openings have been found regarding access to the complex in addition to the prominent elaborated northern gateway. The purpose of these openings is difficult to ascertain as they could have been used for drainage or for some other unknown purpose.
6. The thickness of the outer wall of the *Vihara*, as recorded in the previous studies (Archaeology Department, Bangladesh) is to be 16 feet, poses another mystery regarding its purpose.
7. The locations of various minor structures within the complex do not conform to the overall geometry.
8. The function of the various minor structures within the court remains in dark. Except a couple of structures referred as refectory and kitchen (Archaeology Department, Bangladesh), the use of the other structure has no possible reference.
9. If the *Vihara* is more than one storey, as some experts claim, then it is an important point to notice the absence of any remains of probable steps, stairs or staircases.
10. The central shaft of the *Stupa* proper whether is indeed hollow or entirely solid is another question to be explored.
11. The purpose of the antae-chambers in the central *Stupa* is also unexplainable, they do not conform to any known Buddhist rites or rituals.
12. The various small recesses in the walls adjacent to the central shaft of the *Stupa* poses question regarding their purpose, significance and especially their being of different sizes and shapes.

Proposed Virtual Reconstruction of the Form

Basic Assumptions: The *Vihara* in its present ruined condition provides a little information about the superstructure it once had. The other parallel developments in the Bengal region are in no better condition. Therefore any conjectural restoration of this structure needs to be built on the basis of certain assumptions. In this case, we also have drawn certain basic assumptions based on our study of the development of the *Vihara*. These are-

- Assumption 01.* Paharpur being a product of the *Pala* Dynasty must have had the features used during the period.
- Assumption 02.* The other Viharas on the Bengal region, though also in ruined condition, may provide important clues regarding space organization, zoning, functional activities and space use.
- Assumption 03.* Paharpur, being situated in a strategic point between the Indian subcontinent and the Far East, must have maintained a connection with the both. It is a product of the period of reincarnation of Buddhism which is then spreading fast towards the north and the east. This is evident in the gradual spot movement of the development of the Buddhist monastic Architecture –

3 rd – 2 nd century BC	<i>Sanchi Stupa</i> (Central India)
4 th century AD	<i>Nalanda Mahavihara</i> (Magadha)
7 th – 8 th century AD	<i>Shitakot, Paharpur, Vasu, Shalban Vihara</i> (Bengal)
11 th century AD	<i>Pagan, Ananda Temple</i> (Burma)
12 th century AD	<i>Angkor Vat</i> (Cambodia)

Thus the *Viharas* of Bengal stands in a point between the influence of the *Stupa* from the Central India as well as the Pagodas of the Far East. Paharpur being a major building of this particular development must have had considerable influence both in formal and spatial organization of the later developments. The study of these gradual developments further leads us to two more assumptions –

- a. Paharpur owed its very structure to that of the parallel developments of the Indian Subcontinent (both Hindu and Buddhist).
- b. It had had much of its formal characters and proportions similar to that of the Far Eastern developments.

Reconstruction of the *Vihara*: The following points were considered during the reconstruction process of the *Vihara*.

- a.
 - I) The different thickness of the surrounding wall of a cella indicates differences in load distribution in the overhead plane.
 - II) The outermost wall, now in a height lower than the cella walls, gives suggestion of a podium like development on which the whole of the superstructure stood on. This is also evident in the different monastic developments in the southern India (Stierlin, 1997) as well as in the Far East (Brown, 1975) (Fig. 3).
 - III) The presence of some outward facing cella like structures in the two wings (North and East) does not seem to be the part of the original scheme, rather they might be a later addition when some kind of orthogonal supports (buttresses) were needed to retain the walls in their original position. Therefore the supports were given only where it was necessary, while the rest remain in its original form.
- b. The thick wall between the corridor and the cella does suggest that the wall carried more loads down than the other three walls around. This can be a product of a situation where the wall needed to support the load of both the cella and the corridor at the same time. More over the thickness might result into counteract the horizontal thrust exerted by the roof on the wall. All these clues lead to a two-fold suggestion- I) both the cella and the corridor were covered spaces and II) such horizontal thrust on a vertical wall can only be exerted by a vaulted roof. Therefore both the spaces have had vaulted roof running parallel to the corridor's alignment. Similar kind of arrangements can be found in the great *Temple of Angkor Vat*, Cambodia (Brown, 1975) of 12th century AD. (Fig. 4)
- c. The masonry at the north-western corner of the corridor does also conform to the idea of a covered corridor throughout the whole complex.
- d. All other structures, except those discussed above and the central shrine, do not seem to have any kind of planning integration with the overall layout. Many of them are placed arbitrarily in different angles without showing any regard to the Temple axis or the rest of the complex. Some even overlaps the very basic layout of the cellas and the corridor. Even the structures with the same orientation as the temple proper, seems to be placed so arbitrarily that they do not conform to the huge axial preparation and the symmetric arrangement of the basic geometric layout. The builders, so sensitive about the geometry of such an organization, could not possibly make such arbitrary placements. Our deduction therefore is that, all the other structures are products of later ages and many a time the materials of the original structure (probably abandoned by then) came into a new use. The secondary gateway in the North might also be a product of later alteration where

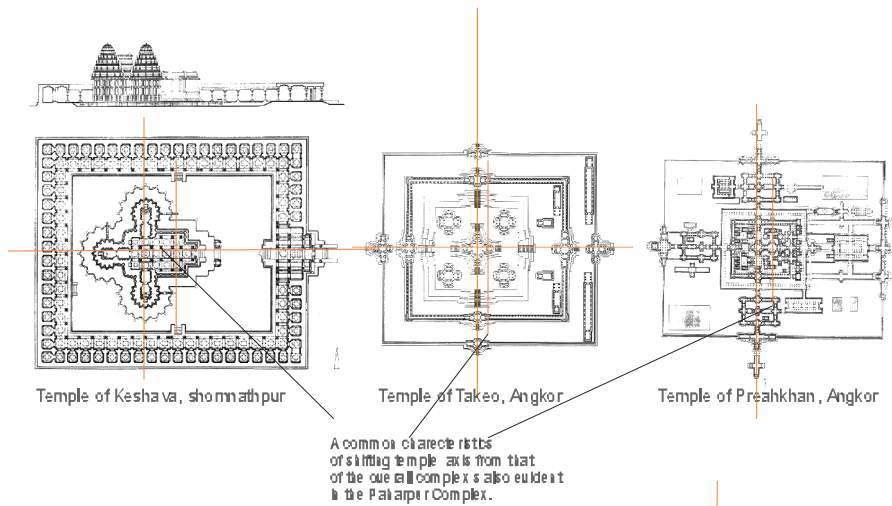
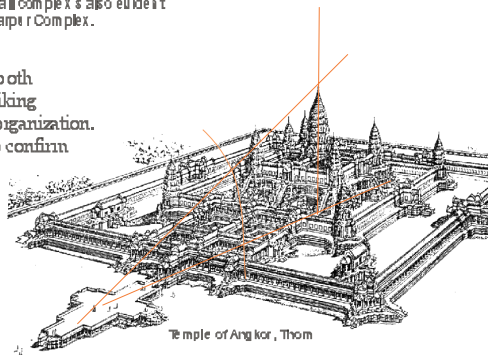


Fig. 3. Plans of monastic developments from both Indian and Far-Eastern origin show striking similarities in their layout and overall organization. The organization of Paharpur does also confirm to this pattern.



Reconstructed view of Paharpur Vihara

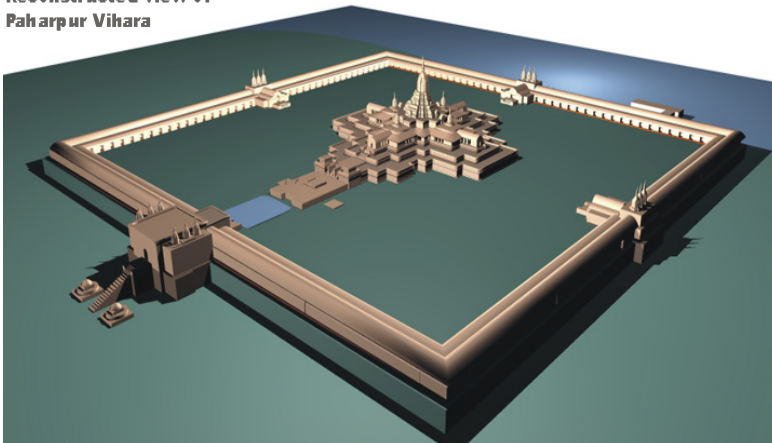


Fig. 4. The existing temple structures of the Angkor group, having strong similarities with Paharpur in layout and organization, provides important clue in the virtual reconstruction of the roof of the cellas.

a cella was demolished to make the change (between cella no. 15 and 16).⁴ The shift of the east-west axis of the central shrine from the central alignment of the *Vihara* had, of course, had some other purpose (probably the need for proper setback for the huge central shrine) which is a regular planning feature in the later developments (Fig. 3).

- e. The purpose of the three cardinal structures (except the Northern Gateway) has no specific reference. But a closer look to the parallel and later developments of the *Viharas* in the region reveals that these are actually Image shrines (Fig. 5).
- f. The more or less intact image-shrines at the center of the western wing and the huge alteration of its eastern counterpart suggest that the eastern part had been in use for a longer span of time. For some reason unknown to us the western part of the complex was abandoned earlier and was probably inaccessible to the later users. That is why more original elements (intact temple layout, drainage detail, stone bases for relics within *cellas* etc.) were found here. The later developments therefore concentrated on all the three sides except the west. And this is also the reason behind the absence of any buttress like supports on the western wing.
- g. An offset at the southern end of the eastern corridor shows a relationship similar to that of the *Sitakot* Monastery of 7th–8th century AD (Fig. 5), where the corridor supposedly provided the connection to the toilet block on the south⁵. The plan there suggests an outlet at the end of the corridor to provide an access to the service function. In Paharpur, such an outlet at the same point (probably altered in the later ages) seems to have served the purpose of accessing the *ghat* located afar to that direction. An offset in that direction supports this hypothesis. Once the boundary was crossed the elaborate podium level provided the necessary access to the latrine block.

The *Vihara* does not confirm to the idea of being multistoried as claimed by some experts. The structure, the lack of presence of vertical access, lack of reference of being multistoried in the historical account- all supports that the *Vihara* was a single storied structure (Fig. 6)

Reconstruction of the central *Stupa*: The following points were considered during the reconstruction process of the entral *Stupa*.

- a. The huge masonry of the central mass gives hints to a *Sikhara* type roofing attaining a considerable height (can also be referred to Hamilton's observations about the height). In Buddhist Architecture a *Sikhara* is actually a *Stupa* which contain certain relic of the Lord Buddha inside it. The floor of the hollow shaft (almost at the cella level) supports this idea that the *Sikhara* here, acted both symbolically and functionally, as a *Stupa* (Brown, 1975).
- b. I) The abnormally thick walls of the small span inner cellas, apart from its duty of buttressing the central shaft, are indicative of a huge load of the overhead planes. This kind of load on such a small span can only be created by the overhead superstructure of a *Sikhara* type roofing. Therefore a deduction can be made that the roof level of these inner cellas attained to a height that provided the platform from which the *Sikhara* sprang on.
II) The platform thus generated gets a cruciform configuration that matches completely with the shape of another structure on the ground located near the eastern wing of the complex and is usually referred as the replica of the main temple. The similarities of the two structures leads us to an assumption that the structure on the ground, instead of being a replica of the whole temple, is a life scale study model (or a later copy) of the *Sikhara* itself that might also had served a symbolic purpose on later ages. The assumption provides us with the reference of the shape and configuration that the original *Sikhara* have had at its base. The platform for the *Sikhara*, thus conceived, has remarkable similarities with that of the *Anada Temple* (11th century AD) at Pagan, Burma. The

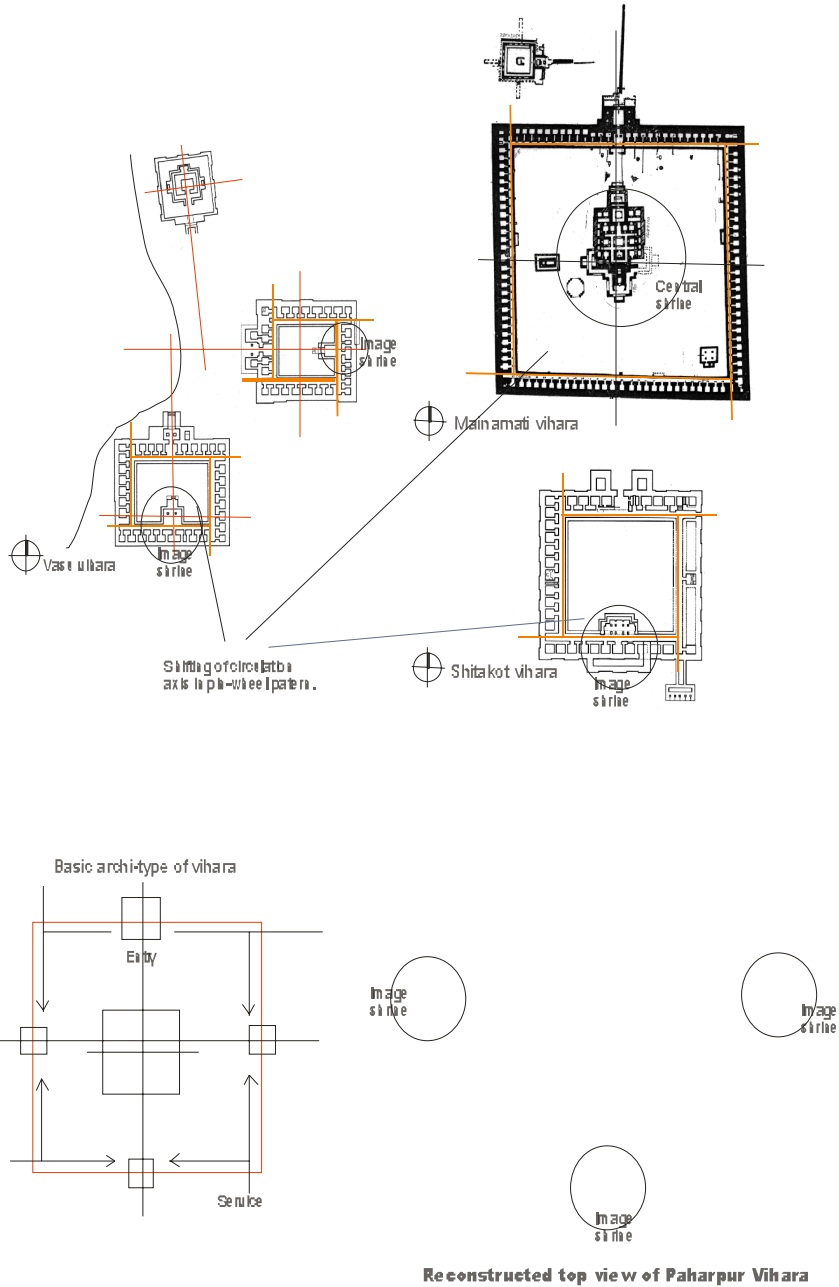
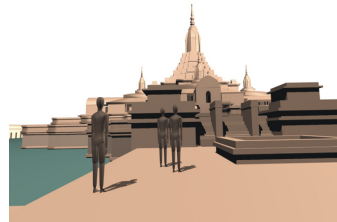
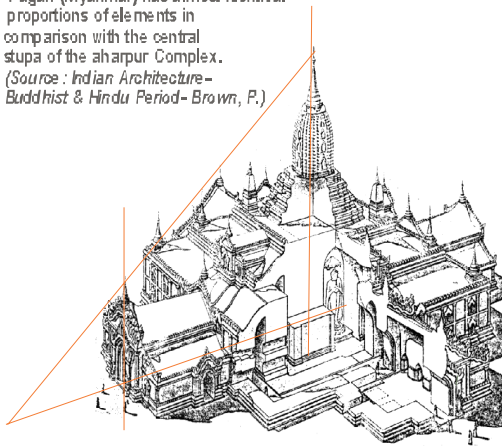


Fig. 5. Plans (Source: Department of Archaeology, Bangladesh) of early viharas show that developments of the Viharas in Bengal followed a similar pattern. This similarity reveals the basic archi-type of the Viharas Form in the region.

The existing super-structure of Pagan (Myanmar) has almost identical proportions of elements in comparison with the central stupa of the aharpur Complex. (Source: *Indian Architecture-Buddhist & Hindu Period- Brown, P.*)

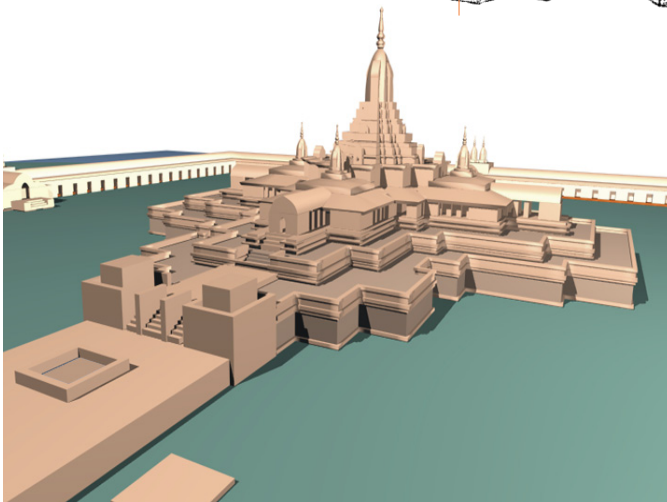
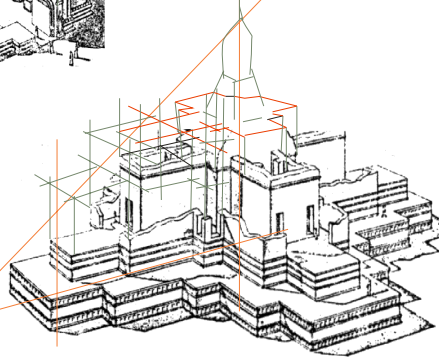


The Ananda Temple at Pagan, Myanmar.



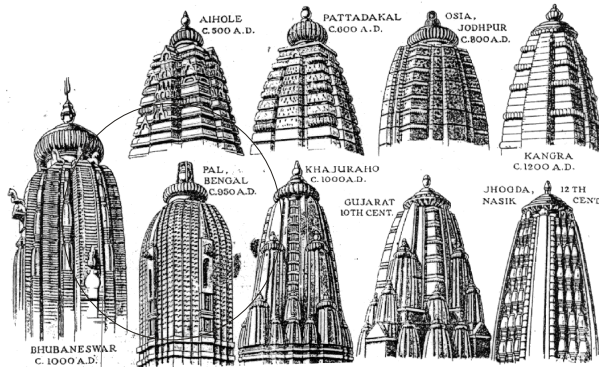
Paharpur : Central Stupa (Reconstructed View).

The early attempt of creating a conjectural view by Percy Brown provides the basis for the virtual reconstruction. Using the proportioning system of the Ananda Temple (Pagan), the conjectural model of Percy Brown is being extended. (Source: *Indian Architecture-Buddhist & Hindu Period- Brown, P.*)

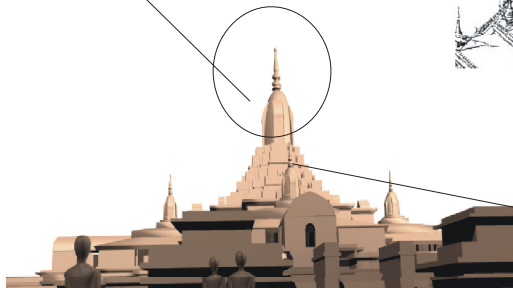
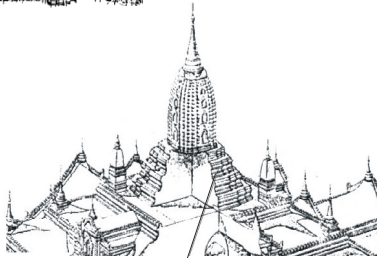


Reconstructed view of the Central Stupa

Fig. 6. The Virtual reconstruction of the Central Stupa.



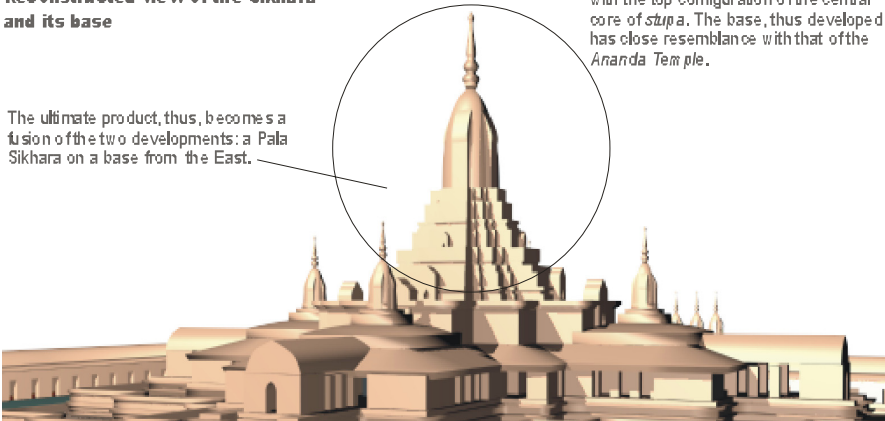
For the central shikhara of the temple in the paharpur vihara this form has been chosen, because this is the form used by the pala dynasty for their monuments in elsewhere (Source: *Indian Architecture-Buddhist & Hindu Period- Brown, P.*).



Reconstructed view of the Shikhara and its base

For the base of the *shikhara* of temple, the probable source of reference is the existing base-model near the eastern wing of the complex which, both in size and shape, has remarkable similarities with the top configuration of the central core of *stupa*. The base, thus developed, has close resemblance with that of the *Ananda Temple*.

The ultimate product, thus, becomes a fusion of the two developments: a Pala Shikhara on a base from the East.



Reconstructed view of the Shikhara of the central stupa of Paharpur Vihara

Fig. 7. The Shikhara of the temple

expression of the *Sikhara* must also have its root in its contemporary developments by the *Pala* kings (Fig. 7).

- c. The placement of four stone columns in a square layout, in each of the outer chambers, gives indication of another centralized roofing above. In such case the surrounding masonry acted independently devoid of any structural tie with the inner stone columns (Fig. 8 & 9). This kind of structural maneuvering was common in its contemporary practices especially on the southern parts of India (Brown, 1975). The roof therefore, rose on the stone beams, to form a *Sikhara* of smaller height and the whole was supported by the four columns. The presence of huge stone pieces on the existing floors of the cellas may actually be the fate the beams have had. The narrow gap between the columns and the masonry was covered with a vaulted roof as was evident in the Temple of the *Vital Deul*, at Bhubaneshwar (Brown, 1975).
- d. The roof of the ambulatory space was something of a more conventional type- a pitch supported on wooden rafters or a conventional vault – both equally feasible in this context. But the existing holes, high on the terrace walls, strengthen the hypothesis of the pitch roof on wooden rafters more.

The structures below the third level terrace of the central shrine shows no evidence of vertical extensions except only the two rectangular projections on each of the four arms. The projections, one smaller than the other, are suggestive of two different levels that connect the two consecutive terrace levels (Level two and three). But this simplified deduction contradicts with our findings since site survey and photographs reveal that both the rectangular projections had a plinth height as high as the third level terrace. This unique situation leads to the suggestion that the inner rectangle was actually the plinth of a higher structure probably accommodating the entry preparation for the main temple. The lack of existence of the structural supports at the third level terrace may pose another problem. But the possibility of the existence of the structural support seems almost evident from the dilapidated pilasters on the northern wing. The lower two terraces on the first and the second tier does not show any evidence of gaining vertical heights. They, therefore, acted simply as terraces facilitating probably the ambulatory facilities essential for such rituals. The grand axial preparation towards the central shrine from the northern wing is suggestive of a ceremonial approach path with varying levels and grand vistas. This being the only approach suggests a possibility that the temple was accessible from the north only.

Reconstruction of the Entry on the North: The following points were considered during the reconstruction process of the Entry on the North.

- a.
 - I) The approach stair, starting between two sacred mounds (*Stupas*), did reach the plinth in a single flight. The situation is similar to that of the approach stair of the temple of the Shalban *Vihara* at Mainamati.
 - II) The two different width of the inner and outer halls, and the deployment of a vestibule like connection in-between suggest a deliberate attempt to bring change of scale between the two spaces (Fig. 10). This does lead into two different volumes of spaces varying in heights, which would result in a two tier flat roof on the entry mass.
 - III) In the eastern and western flank, the brick portion of the structure, as a logical consequence have had a vaulted roof from inside. Externally this might had taken an expression of the repetitive *Sikharas* commonly deployed at that time (Brown, 1975).
- b. In both the entry halls, the pilastered stone column suggest that the overhead beam alignment is in one direction only, e.g. from east to west. This gives the suggestion of primarily two kinds of possibilities, existence of vaults or flat roof.

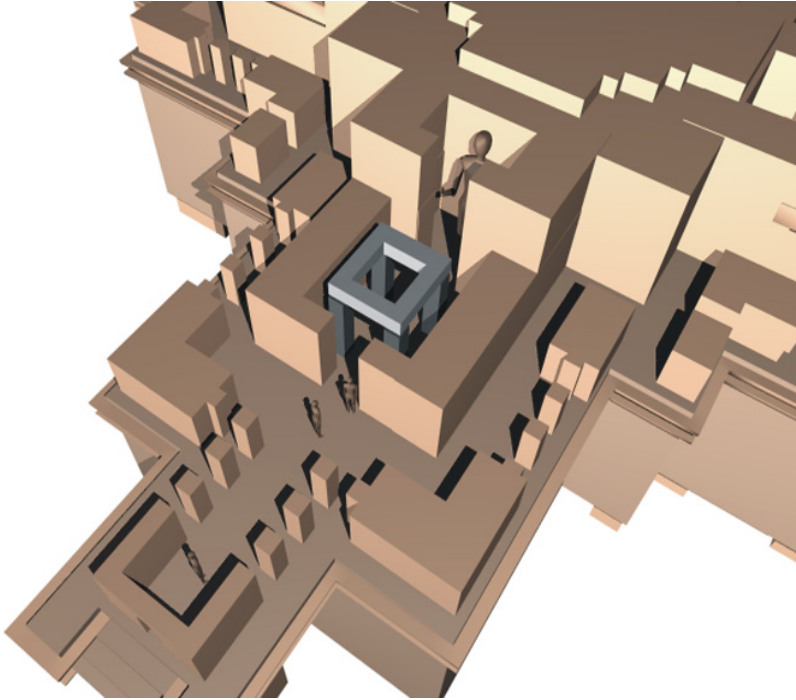
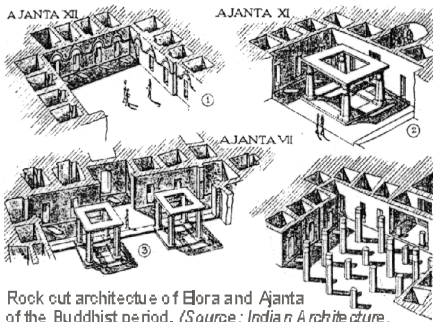


Fig. 8. Sectional perspective of the Stupa (Virtual Reconstruction) of Paharpur Vihara showing the structural system



Rock cut architecture of Ellora and Ajanta of the Buddhist period. (Source: *Indian Architecture, Hindu and Buddhist period- Brown, P.*)

The tradition of the structural system adopted here has its origin in the rock cut architecture of the Buddhist period. Basically the system of four stone columns supports a set of stone beams at the centre of a square space and thus creates a narrow circulation space around it. The central space is covered with either brick or stone corbelled vault and the circulation space is covered with stone slabs or brick vaulting system. In this system the central space becomes higher than the surroundings and thus expressed from the exterior.

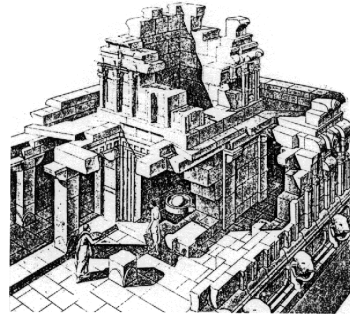
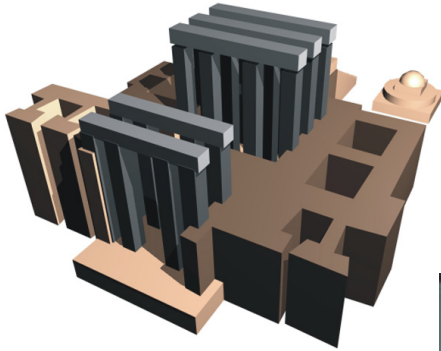
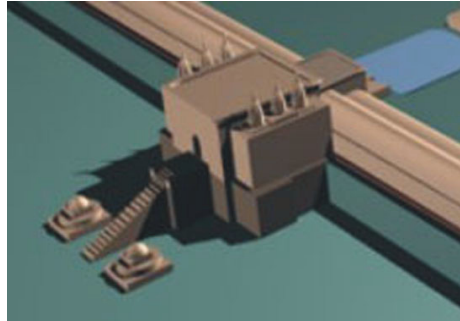


Fig. 9. The formal and structural relationship to the other contemporary and later developments of Hindu and Buddhist Architecture in the Indian Subcontinent.



The stone pillars of the entry structure and fragments of stone pieces on ground suggest a trabeated system of structural support. The rest of the entry structure, on contrast, have huge masonry support which indicates a heavy loading of the overhead plane.

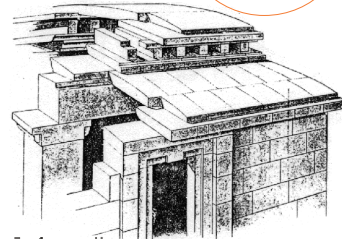
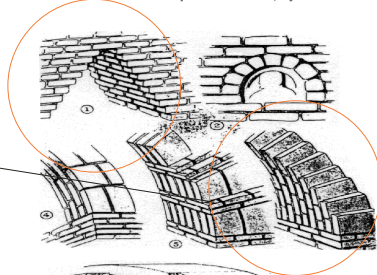
Fig. 10. The structural and spatial variety of the Entry on the north of Paharpur Vihara.



The vaulting system in the temples at the cardinal points of the, southern, eastern and the western arm.

The brick vaults and the corbeled arches of Benal (source: *Indian Architecture: Hindu and Buddhist period*-Brown, P.)

These are used in the viharas



Roofing on corridor: temple of parasuramesvara, orissa

Fig. 11. The structural and spatial variety of the Cardinal structures of Paharpur Vihara.

- I) vaults- spanning from one beam to another.
- II) flat roof. The first option has limitation since the width of each beam (assumed from the column size) is not good enough to accommodate a support from which two vaults can spring off. Moreover this option suggests a possible vault alignment resting orthogonally with the entry approach, which is highly improbable. Therefore, the other hypothesis that the roof was a flat one remains more valid (Fig. 10). This structural logic also gains support from the parallel development of the *Temple of Perumal* (Brown, 1975) (710-720 AD), where same situation has been handled with a flat roof solution.

Reconstruction of the Structures on the three Cardinal Directions: The following points were considered during the reconstruction process of the Structures on the three cardinal directions.

- a. When the western structure, keeping much of its original layout, is compared with the other two cardinal structures it becomes evident that the other two had a similar layout originally.
- b. I) The very distinct isolation of the three central chambers is indicative of an unconventional use of cellas instead of their conventional residential purpose. Study on some small scale *Viharas* (*Vashu Vihara*, *Sitakot Vihara* etc.) reveals an interesting fact that these structures are in fact temples usually serving a small monastery which does not have ample space or resource to erect a central one. In Paharpur, they served no different purpose but the role of a secondary temple or of a image shrine, along with the central one, which is evident in the early monastic developments in *Gandhara* too. The expression, therefore, will be very close to that of an image-shrine (Fig. 11). The roof treatment, therefore, will clearly express the identity of each image-shrine along with a greater homogeneity with the treatments of the roof of the central shrine. The end result may have an expression very nearer to that of the *Sikhara* as seen in the *Sari Vihara* (century 800 AD), Java (Brown, 1975).
II) The parallel brick walls from the cellas towards the court did, almost surely, gave rise to a multiple-vault structure (Fig. 11). The staggering of these elements suggests a possible hierarchy among them, which, when expressed in mass, would create multiple heights in the roof level. The expression again, will find a close affinity with the expression of that of the Pagan (Brown, 1975).
III) The roof of the U-shaped passage like element is supposedly something of a vaulted kind internally and is almost surely a low height passage than the cellas.

Conclusion

These *Viharas* were academic complexes and as well as architectural monuments. The meaning and the functions of these built forms must exist together to sustain our heritage and to create a proper environment required by the society. For any effort of conservation of these heritages a proper understanding of the form and morphology of these complexes are to be established. But even with our highest efforts some mysteries will remain as mysteries concerning these buildings, probably this is the very nature of this finest piece of architecture and the land on which it has grown.

Notes

¹ The survey was conducted by the authors in Masters program, BUET under the supervision of Dr. Shahidul Amin in April, 1999. Dr. Abu Sayeed M Ahmed provided the authors with many valuable resource information and suggestions in the analysis part.

² *Translations of the Royal Inscriptions on the descriptions of the different travelers of Bengal region has been used to form the table, as refereed by Roy, Ashim (1988) : Banga brittanta, Calcutta.*

³ *According to Fa-hien's (4th century AD) description: "These Schools were constructed by the aids/donations of the state rulers.... Agriculture was forbidden for the teachers. Expenses came from the share of the products of the land owned by the institution.... There were Libraries of different sizes attached to every Vihara".*

According to Yuan-Choan's (visited between 638-645 AD) description: Po-chi-po Vihara (three miles south of capital of Pundravardhana, Vasu-Vihara at Mahastangar) had "Wide and well lighted court, high pinnacle...700 students and teachers". Lo-to-mo-chi Vihara (Rangamati Vihara) as "Best in Karnasubarna...Rooms were wide.... High and multi-storey construction".

According to Huen-sung's (7th century AD) description: Nalanda Vihara was "largest in Asia - Maha-Vihara at the north-east of Buddha-goya....Ten Large Hall rooms, space in between the Hall rooms .. so that they have their own private zones...Walled in the four sides...Admission in this institution was very tough (rate : 2/3 out of 10 student.).There were 10,000 students..."

⁴ *Plan of Paharpur vihara prepared by Department of Archaeology, Bangladesh has been used here. Although lot of discrepancies has been found in that document which has been corrected by the site survey work of the authors.*

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