

An Overview of Architecture and Temple-Development under Kakatiyas

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Abstract

Kakatiya Kings who ruled the Eastern Deccan with Warangal as their capital from 1160 to 1323 A.D. as sovereign rulers built magnificent stone temples and monuments with beautiful sculpture and architecture. Majority of these monuments suffered structural damage over the years and if not restored now, they may completely collapse in course of time. The Telangana area experienced its golden age during the reign of the Kakatiya Dynasty, which ruled most parts of the present-day Andhra Pradesh and Telangana from 1083 to 1323 CE. Rudrama Devi and Prataparudra II were prominent rulers from the Kakatiya dynasty. The dynasty weakened with the attack of Malik Kafur in 1309 and was dissolved after the defeat of Prataparudra by the forces of Mohammed Bin Tughlaq in 1323. The Kakatiyas gave importance to three "T"s i.e. Tank Temple and Town policy. In this paper an attempt is made to discuss an overview of architecture under the Kakatiya dynasty.

Keywords: Kakatiya Dynasty, Architecture, Temple development, Orugallu etc.,

Introduction:

The Kakatiyas were powerful rulers of large parts of Deccan for almost 300 years (c.950– 1323 ce). Their capital was Orugallu, now known as Warangal. The Kakatiya dynasty was the famous dynasty of Telugu region or Andhra region. Earlier, the rulers like Betaraja I, Prolaraja I, Betaraja II and Durgaraja were the feudatories of the Western Chalukyas of Kalyana. It was Prola II, who established Kakatiya Dynasty as a sovereign dynasty. As per the "Prataparudra Yashobhushanam" written by Vidyanadha, Kakatiyas got their name because they worshipped the goddess called "Kakati". Therefore family was called Kakatiyas. The Kakatiyas also worshipped of Svayambhuva, i.e., Siva. The epigraphs further state that initially the Kakatiyas were of some Ratta or Rashtrakuta family and consequently Chaturdhakulajas or Sudras. It was eventually conquered by the Delhi Sultanate. First they were attacked and defeated by Alauddin Khalji for plunder, then again they were subdued by Ulugh Khan (son of Ghiyasuddin Tughlaq) and was renamed as Sultanpur. Before Orugallu, Hanamakonda was their capital. It was Kakatiya Dynasty which mined the famous Koh-i-Noor diamond. Italian traveller Marco Polo visited during the reign of Rudramadevi, the female ruler of Kakatiya dynasty famously known for her administrative capabilities and statesmanship. Rudreshwara Swamy Temple also known as Thousand Pillar Temple in Telengana is believed to be constructed during the period between 1175–1324 CE by order of the king, Rudra Deva. It stands out to be

a masterpiece and achieved major heights in terms of architectural skills by the ancient Kakatiya Vishwakarma Sthapathis (Architect). It is dedicated to Lord Shiva, Vishnu and Surya. Hyderabad's Golconda Fort was also built by Kakatiya ruler, and it became the early capital city of the Qutb Shahi dynasty (c.1512–1687).

Ramappa Temple also known as the Ramalingeswara temple, known for its beautiful intricate carvings, is the only temple in the country which has been named after its sculptor, Ramappa, who took 40 years to build the temple. Thousand Pillar Temple, along with Warangal Fort, Kakatiya Kala Thoranam and Ramappa Temple are added to the tentative list of World Heritage sites recognized by UNESCO.

The Kakatiyas derived their architecture from the Chalukyas but added indigenous character to it. The Chalukyan art was itself a blend of northern and southern India. The Kakatiyas simplified it by avoiding clustered decoration and made it look more vigorous and graceful. Locally available granite and sandstone was used for the main structure whereas Vimana was built with lime and bricks. A certain type of floating brick is still a curiosity of our museums. The dolerite (black basalt), a volcanic Deccan trap rock, was used for the pillars, jambs, lintels and its motifs. The polished specimens of this work are a treat to our eyes till now. It shows their religious devotion to this art. Kakatiyas stepped their vimanas instead of using curvilinear horizontal spires of Chalukyas and vertical structures of the north. The domed-ceiling of their Central hall was eight or sixteen sided instead of being circular. The star shaped structure was placed on a high plinth. The motifs are deeply cut and polished showing a high standard of workmanship and skill than the Karnataka work. No adequate basement was provided for the structure and its weight was transmitted directly to the ground instead of distributing it with arches. Hardly any cementing material was used. This brought an early decay to this construction.

Review of Literature

Nasimali S.K. (2014) in a research note observes that the Kakatiya rulers paid much attention to land management and development of agriculture. According to author the rulers of Kakatiya dynasty attempted to increase the extent of the cultivable land by clearing forests and bringing large tracts of fresh land under the plough. Land was surveyed and measured. Cultivable land was classified into two types namely wet and dry. The government took sufficient care for the proper upkeep of the tanks and canals. Annual repairs of the bunds, removal of silt deposits on the bed and repairs of the canals and sluices are the main items of maintenance they undertook. Thus, the Kakatiya age witnessed the development of agriculture and prosperity. The author concludes that Kakatiya age witnessed the reclamation of land, foundation of new villages, promotion of irrigational infrastructure and adoption of systematic land survey paved the way for the development of agriculture. It helped in turn to strengthen the state economy.

Sobhanbabu E. (2017) in his article opines that the ultimate basis in the belief structure for the legitimacy of the Kakatiya state stemmed from the monarch's descent from lunar (Chandra Vamsa) or solar (Suryavamsa Kshatriya ancestry). Thus one of the ways for legitimization of power was to incorporate a fabricate geneology, linking the ruler solar and lunar ancestry, in the gift deeds of the villages or lands presented to Brahmana and temples. The growth of understanding between the saivite sects and the feudal administration is suggested by the formed terminology of the land charters. According to authors the high

or low status power or slavery is not the consequence of current behavior and labour, these are consequences of previous action and there is nothing one can do to alter one's situation.

Milind R. Kothavade (2017) in his paper discusses the legacy of Kakatiya dynasty in South India. This dynasty set an example of people centric governance by establishing a water management system comprising of well-built reservoirs or tanks which were interconnected and used to quench the thirst of many people and were the sources of irrigation to many farms in medieval times. Water in these small tanks was completely controlled by local people. This paper also deals about, how Kakatiya rulers developed this system, how this small scale decentralized system of irrigation was ignored by subsequent rulers, and how the big dams replaced it as we moved to modern times. As control over water was lost, the region not only remained thirsty but also was relegated to backward area in the process of development. The author also discusses how people fought for their rights over their resources and were successful in doing so. A new state was formed and the tide is again turned back to small scale irrigation systems with Mission Kakatiya, a mission undertaken by the newest state of India, Telangana.

Objectives of the Study

1. To find out the significance of architecture under Kakatiya Period
2. To evaluate the contribution of historical Temples in Kakatiya dynasty
3. To analyze the importance of historical places in Kakatiya era.

Methodology

The present study is based on the secondary data published by various agencies and organizations. The study based on secondary data which is gathered from the published materials like annual reports, magazines, research articles and etc. The descriptive research designs is used to present the study.

Indian architecture is religious, aesthetic and symbolic. These three themes operate concurrently. Enshrining the themes, we have a large number of structures still standing for our observation and appreciation. Whatever the religious pantheon be the places of worship crystalized in the form of a temple, a stupa, etc., underwent many ramifications down the ages. It is also likely that some of the structural evolutions marked the genesis of regional styles. The temple architecture in particular is extant to us in three broad regional styles. They are more geographical rather than chronological groupings. They are known as the Dravida, the Nagara and the Vesara styles. It is likely that in the same vicinity, one is not surprised to see a variety of Sikhara forms.

Through the pages of history, we observe that certain forms of the temple were cherished and nourished by certain dynasties. With the result that we come across terms like the Pallava architecture, the Chola architecture, the Chalukyan architecture, the Hoyasala architecture, etc. Here, the word architecture is often used as a synonym for style. Against this background the Chalukyan architecture expresses itself in exotic forms of sikhara and arrangement of the ground plans. In particular, the Kakatiya religious architecture shows a variety of ground plan arrangements. One such is the Trikutachala.

In temple architecture, the architects adopted different structural forms like avarasra, chatrasra and gajaprista or apsidal form. Trikutachaa temple form is an extension of chaturasra form distributed on three sides of a centra man-dapa thus giving a structural unity OR plan as well as in elevation. Trikutachala or Triple shrine is a popular style of temple architecture which flourished in Telangana and other parts of the Deccan during the period from A.D. 10th century to early A.D. 14th century. The Western Chalukyas patronised this type of structural temples in their period. Later the Kakatiyas and the Hoyasalas followed, favoured and popularised this trikutachala form.

Trinity' is the most revered concept of Hindu worship. The three great gods Brahma, Vishnu and Maheswara are placed in the highest state of divinity in Hindu mythology. Though, trikutachala form was not developed along with the worship of the trinity, but certainly the evolutionary stage of this style coincided with the worship of the trinity. Most of the early triple shrines are dedicated to the trinity. Worshipping trinity was popularised by the Pallavas and the structural evolution of a temple also took a major turn under the reign of the Pallavas.

The Mandagapattu inscription of Mahendra Varma-I of the Greater Pallavas of Kanchi clearly states the creation of a temple for the Hindu Trinity. In that Mahendra Verma claims "This Trikuta was caused to be constructed by him for Brahma, Iswara and Vishnu worship without using bricks, timber, metals or mortar". From this inscription and the Mandagapattu cave, it can be deduced that the worship of the Hindu Trinity and the concept of Trikutachala was popularly known in the early historic period also. The Mandagapattu cave shrine which form a triple shrine consists of a rectangular hall 6.7 metres in length, 7.3 mts in width and 2.64 mts in height. In the back or south wall are three large niches 1.2 mts deep and a stone image was housed in each niche.

Apart from Mandagapattu, we can find the evolutionary stage of Trikutachala form in the early rock-cut caves of South India. The cave temples of Andra Pradesh at Mogalrajapuram, Vijayawada and Undavalli have the formative features of later Trikutachala temple forms. The first cave of Mogalrajapuram is a simple unit of three shrine cells. Akkanna-Madanna cave of Vijayawada and Undavalli cave unit also stood as early examples for excavation of triple cells in a row and are dedicated to the worship of the Trinity. After that, the Trikutachala style opened its wings in the Deccan caves. There are many triple shrines in the Ellora caves, Elephanta, Jogeswari, etc. and we can easily identify the process of adopting cruciform ground plan to Trikutachala in these places.

The first structural Trikuta was found at Badami. The Jambulingeswara temple at Badami was founded in A.D. 699 by the queen mother Vinayavati and this temple is called as "Traipurusha devalaya". It was built in cruciform having three shrines in the north, west and south which are dedicated to the worship of the Trinity. Kalyani Chalukya's admiration for this unique form is known to us from their Trikutas at Rattapalli, Harahalli in Karnataka and Malleswaram, Raikal, Valigonda, Chilvakoduru and Tandur in Andra Pradesh. As subordinates and successors of the Western Chalukyas of Kalyana, the Kakatiyas cultivated and adopted many of the architectural styles that were more prominent under the former. They

added some more structural features like large upapithas, high adinisthana recesses and projections in wall decorations, etc., all giving a perfect horizontal and vertical distribution of the architectural form. Kakatiya temples are well known for their interior decoration and especially for their latha turned pillars. The Kakatiyas and their subordinates left many Trikuta shrines which still remain in Telangana and other regions. These are found at Hanamkonda, Panagallu, Pillalamarri, Nagunuru, Kalabagur, Kondapaka, Nagulapadu, Garla, Kuchumanchi, Upperapalli, Katkur, Mutharam, Manthani, Vilasagar, Chittapur, Timmapur in Telangana region and one Trikuta at Pushpagiri in Cuddapah district are the best standing examples of this unique architectural form. Three shrines located on the three faces of a common mukha-mandapa is the most common feature in the temple layout of a Trikuta style of architecture. At some places three shrines are planned in a single line parallel to each other with a common mandapa in front. This form of layout is also described as Trikuta form of architecture. Among the Kakatiya Temples, all the Trikuta temples were built in cruciform ground plan. Except one, temples at Kuchumanchi have a rectangular mandapa with three shrines in a row on one side.

The Kakatiyas with their conquering zeal and spirit of nationalism and patriotism united the all the Telugu-speaking parts of the Deccan under their paramount power. It was for the first and the last time also (before the formation of Andhra Pradesh State) that the Telugu-speaking people were united under one government. Their spirit of nationalism and patriotism stood them in good stead in their offering gallant resistance to the Islamic invaders. This tradition and legacy of the Warangal kingdom was however continued by the Vijayanagara rulers.

The Kakatiyas had their ascendancy during the dominion of the Chalukyas of Kalyani. The earlier doubts expressed by certain scholars in tracing the descent of this dynasty from Kakartya Gundyana, a subordinate of the Eastern Chalukyan monarch, Amma II (945 AD.-970 A-D) were set at rest in view of the recently discovered Bayyaram Tank inscription. The names Kakartya, Kakatya and Kakaliya are etymologically connected. The dynasty derived its name either because of its association with a town known as Kakatipura (since the kings bore the title 'Kakatipuravallabha') or because of their worship of a goddess called Kakati. At Ekasilanagara (Warangal), the capital of the Kakatiyas a temple was dedicated to Kakitamma. Hence there is reason to believe that Kakatipura was another name for Warangal itself. The inscriptional evidence points out that the Kakatiyas were Sudras and that they were members of the Durjaya family whose remote ancestor Karkkalahola founded or first settled in Kakatipura.

In spite of inheriting the architecture style of Chalukyas, the architecture monuments of Kakatiyas have some distinguishing characteristics of local nature. Besides, the architects used the locally available granite and sandstone in the main structure of the Vimana and used bricks and lime in constructing superstructure. They used black granite for pillars, jambs, lintels, decorative motifs and icons.



Thousand Pillar Temple

Architectural Features of Thousand Pillar Temple

The Thousand Pillared temple or the Rudresvara temple consists of a triple shrine complex, Nandimandapa and a Kalyanamandapa built one after the other from north to south. The original prakara around this large temple complex is not extant. At present a compound wall built around the temple in recent times serves as the prakara leaving a rectangular courtyard. Apart from the modern entrance gate in the north, there are two dvaramandapas in the east and the west.

In the North-East of the courtyard, there is a tank built with finely dressed stone and provided with a flight of steps. This tank is in a rectangular form looking like a large well and maintains good water level due to the presence of natural springs within the tank. The three shrines of the Rudresvara temple and the central mukhamandapa are erected on a high upapitha. The upapitha or the jagati provides a common platform for the three shrines. The upapitha is built on a star shape. It also serves as an open pradakshina patha around the three shrines and has a width of 2.75 metres.

The upapitha raising to height of 1.43 metres has the typical Kakatiya mouldings. The following are its mouldings from bottom upwards - upana, jagati, kantha, patta, padma, galapada decorated with rat no. motifs, projecting pattapadma, kantha, tripatta kumuda, kantha padma and patta.

The Triple shrine block consisting of three shrines on the three sides of a central square mukhamandapa is built on a cruciform ground plan. The mukhamandapa has a projection towards the south and is provided with a mukha-chatusuki in front of it.

The three offsets on either side of the central bhadra projection of the wall are depicted like kudyastambas. The upper register of the wall or the The figure of Surya is represented with youthful body on the niche of the north wall of the antarala. He is adorned with diamond studded kirita-makura, a halo around his head and wears ardhoruka and ornaments. He is shown holding two lotus flowers in his two hands. Another interesting Surya image is sculptured on the south wall of the antarala of the Suryadeva shrine. Here

Surya's head is canopied by the hoods of a serpent. Though this image is also mutilated, Suryadeva is shown in standing posture. The sculpture of serpent hoods above the Sun is a unique feature and equalises Surya with Narayana.

Indra

Indra is represented on the lintel above the entrance of the antarala of the Suryadeva shrine. Here, Indra is represented in a dancing pose. He is shown dancing by keeping his left leg firmly on the ground and the right leg bent and lifted up. He is well ornamented with kiritamakuta, haras, ardhoruka and anklets. His mount Iravata is represented near the feet of Indra. On either side of Indra, there are two female figures holding chhamaras and two male and two female figures are shown playing musical instruments.

Nandi

The Nandi image that is shown seated in front of the mukhamandapa, facing the Vasudeva shrine of the temple is a good example of Kakatiya art. This image is carved out of a dolerite stone block. It is life sized and shown seated with its head slightly turned to its right. It is adorned with three rows of haras around its neck and the other parts of the body. Its ears are broken. Even in its erect posture, the bull appears elegant and represents masculine virility. There is another image with similar features within the court-yard of this temple. With the construction of the Thousand Pillared Temple at Hanamkonda, a unique architectural tradition reached its zenith. The feudatories of the king Rudradeva and his successors and many other temple builders of the later periods followed this Trikutachala formula.

Another Trikuta temple at Pillalamarri where three shrines are dedicated to gods Kacesvara, Kamesvara and Namesvara has a square hall in the centre with three shrines projecting to the north, west and south. The walls of this temple are plain. This Trikuta temple at Nagunur has an upapitha which has sufficient space all round the temple and serves as pradakshina pattha. The wall proper is divided into a number of broad pilasters and recesses. This temple faces the north and is dedicated to Siva. The internal parts of this temple are well decorated. The Trikuta temple at Pushpagiri in Cuddapah district stands as an example for Kakatiya Trikutas outside the Telangana region. It was built in A.D. 1255. The central shrine faces the east. The three shrines are dedicated to Kamaleswara, Hachalesvara and Pallavesvara respectively.

The Trikuta form of architecture was not much favoured after the fall of the Kakatiya dynasty. The Vijayanagara architects who made a remarkable contribution to temple architecture put their attention to building tall gopuras large mandapas, multiple prakaram, sub-shrines, etc. The Trikuta form of architecture did not receive proper attention of the Vijayanagara architects. And some disadvantages of this form also might have discouraged the architects from continuing this layout in temple building. The main disadvantage of this Trikuta form is the "light". Only the shrine facing the main entrance can get the light and the presiding deities of the other two shrines will remain in darkness. Kakatiya architects made some arrangements by connecting the shrines with 'vedika' instead of using walls to overcome the darkness and to give ventilation. Growing sectarian tendencies also might have affected the modes of the worship of different forms of the deities. It may be a cause behind the discontinuity of the Trikuta temple

form. Anyhow, the Trikutachala form stood as a favourite form of the Kakatiyas as shown by its structural remembrances which we are able to find at various places of Andhra Pradesh.

Ramappa Temple

The main units of the edifice were laid centrally over such weak foundations in an east-west axis. This resulted in sinkage of the structures, the fall centered inwardly: even the displacement of the heavy beams, slabs, pillar brackets clearly show the nature of this decline. The angular upsurge of the floor slabs under the pillars and walls is due to the unequal settlement of the sand pack at the foundation. But strangely enough the uttira (the beam) the bracket figures connecting it have not collapsed to the ground although present a precarious look. It is because the individual members of the pillar, and the roof slabs or ornate bracket figures are held by stone dowels-conical pieces sometimes even freely rotating, wherever the mortar or lead packing in the slot has gone due to heat. Therefore, a mixture of epoxy resin in quartz sand was filled in these voids. The massive beams were tied up similarly as also the chajja slabs and Kakshasanas (back seats) etc. The dowel patterns are interesting and range from simple ties to crosswise, right-angular, single armed swastika type etc. More interesting is the driving of the stone nails or wedges, not the metal ones. This clearly points to the awareness of the architects the undersirable effects of metal dowels particularly iron ones.



Ramappa Temple

Sikharas of Light Weight Bricks

A noteworthy feature, unique indeed, was the use of light weight bricks on the Sikhara of Ramappa Temple as also of the adjoining Devi shrine. The Sikhara over the main sanctum is typically of the southern order (squarish on plan stepped pyramidal Sikhara) and raised in four tiers (talas). Each tala invariably has the reinforcement of wooden cross-beams at the base on all beams got spoiled due to wood rot leaving the voids unfilled thereby the brick the four sides and in addition diagonally across the four corners. All these wooden masonry of each tier had no basal support and was overhanging. The portions of the western and northern faces. The stupa is lost and a hollow can be seen to the the Sikhara from griva (neck) upward was simply shaking. The brick masonry has crumbled at various places and cracks are extent, particularly on the exteriors at Sky which incidentally has become the abode of birds and bats.

The bricks used in raising this Sikhara are unique, they being of feather-weight well-burnt, virtually fused but reckoned as floating bricks of Ramappa Temple". The sikhara could stand in its shape, perhaps due to this extremely light super structure for a considerable period, even when the wooden joints got worn out. But with the expanding cracks in the brick masonry and weakening of the binding mortar, in course of time, the process of decay had quickened and caused alarm. Large chunks of the brick core-filling started falling inside the shrine through the void between the cross lintel and the over door shaft of the main entrance of the sanctum.

Originally this gap between the ceiling and the door lintel was covered by the bricks laid header-wise. The space in between the door and the connecting roof of the antarala was again filled by brick bats and loose stuff, set in lime mortar. Immediate steps were taken to remove the debris and arrest further collapse. The gap between the lintel and wall is closed with taki stone slabs. The hollow caused was packed with old bricks of light weight and alternately coal-ash mixed in lime and "cement mortar.

Since the old bricks of the site were extremely light and porous every care is taken to collect them for reuse. As a good quantity of light weight bricks was essential, advice of experts of Brick Research Institute, Pune was obtained. A Brick-Manufacturing Company called "SIPOREX INDIA LTD", responded and prepared lightweight foam blocks matching in fabric and porosity, hard enough to bear the load like the Kakatiyan ones of the site. The size of the Siporex blocks was, however, 59 x 24 x 15c.m. They were trimmed and reduced to the size of 30x22 x 8.5 c.m. before using them in the conservation works.

Thus the re-setting of the broken mouldings and finer architectural details has been achieved by chamfering of the old bricks, the external finish was given with milk of lime plaster added with Karakkai, Jaggery and egg mixture. Since there was no much figure work on the external face originally except geometrical and leonine heads marking the doucane mouldings of the talas and the Kudya sthambhika decor pattern, problems did not arise. The Sikhara talas a somewhat subdued har of kuta sala and panjara sikhara miniatures alternatively. This was brought out ably by the sthapatis who undertook the transplantation of the temples at the submersible areas of Sri Sailam.

The temple is pentagon in shape, raised on a platform about six feet from the ground with beautiful architecture which is one of its kinds. This platform connects the entrance hall, dance hall and the main sanctum. There are nearly thirty-two pillars with rich and intricate carvings and even the roof is covered with sculptors of the warrior Gods. To the left side of the main shrine, there is a pillar which generates music upon which you can play primary musical notes. On the top most part of this pillar, you find beautifully carved drummers in various dancing postures.

There are many beautifully carved sculptures, one is that of **Rati**, Goddesses of Spring, holding a bow made of sugarcane with the arrows of desire. There is also a pillar to the side of the courtyard, with one of the earliest Telugu inscriptions carved on it. There is a **temple of Lord Shiva** which is almost falling to pieces with finely carved Nandi (bull mount of Lord Shiva) housed in a separate hall. As you walk around the temple premises, you will get to experience the royalty as this is the land where the Kakatiyan kings once

toddled. The beautiful carving on the granite with fine cuttings is not the job of a day, rather, took months to built the temple what it stands as even today. Dedicated to the God Ramalingeswara, the temple was named as ramappa temple on behalf of its sculptor named ramappa.

It is the said to be the only temple in the country which is known by the name of its sculptor. Now under the administration of the Archaeological Survey of India, this temple an overview in the glorious past of this region and of Kakatiya rule. Currently, there are cottages by the side by the edge of the Lake with a restaurant, which were put in place by the Ministry of tourism. So you can explore this beautiful temple



Kakatiya Thoranam

The iconic Kakatiya Thoranam was built by Rudramadevi's father in the 12th Century. This ornate arch is said to have many similarities with the gateways at the Sanchi Stupa and is also the emblem of Telangana.

THE KEERTHI TORANAS

Investigations revealed that the Torana pillars stood over an anvil slab of 40 cm, thickness on a sand bed and the exterior mouldings were also resting on the packed sand cushion. The stone mouldings consisted of two layers of Upana of 55 and 75 cms. high. The upper Jagati has stones of 90 and 55 cms, with a decorative dala-padma or Rekha padma mouldings. The top flat stone is of 38 cm, thick. From the investigations of the foundation, we understand that the Torana pillars have an ornate adhishtana which was exposed to public view after the consolidation of the foundation. The base of the flat stone is strengthened by insertion of an "1" Eastern torana as well as the Northern torana were provided with this type of concrete apron and a curtain wall along the foundations to arrest any swing of the upper part of the torana. May it be noted that this type of apron still exists during the Nizams period also around the Ramappa temple which was retained %, and strengthened around.

Method of Temple Construction

The method of construction of Kakatiya temples was to excavate a wide foundation pit 2m to 3m deep below ground level and fill it with sand which acts as a "sand cushion" under the foundation, a technology which is still being practised in areas where expansive soils are found. Then a retaining (basement) wall of dry stone masonry without any cementing mortar was constructed over the sand cushion all-round the periphery of the temple to a height of m to 2m above ground level and then the space inside the walls was filled with sand. Thus the basement filling was done in sand which is a good engineering practice. Kakatiya temples followed a pattern of star type construction for accommodating Trikuta alavas. This system comprises of three temples and a pradakshana patha. The top of the first basement retaining wall affords a platform which acts as a pradakshina patha. The famous Nandi of Thousand Pillars Temple is located on such a platform. A second basement retaining wall is built over the first platform and the space in between it is filled by sand again. This affords the actual temple floor level to be raised well above the ground level to lend grandeur to the entire temple complex. At this level, floor slabs and also floor (foundation) beams are laid on sand. At the corners of the floor beams, the pillars rest vertically, transferring their load to the sand through the floor beams, while the space between the floor beams being covered with floor slabs. The roof consists of stone slab panels covered underneath with decor and rough finish at the top which rest on beams tongue-and groove joints with corbel stones to suit the pattern which ultimately rests on columns with The peripheral walls for temple are cavity walls with two stone blocks on either side to give required thickness of wall and the gap in-between is either left free or covered with sand or earth. The roof slab panels were covered with lime surki/earth.

Causes of Failure of Monuments

The sand used in basement filling, acting as foundation soil under columns was found to be not well compacted at the time of investigations. It was poorly graded with a relative density of only 40% - 60%. Effective confinement could have been lost by the drystone masonry retaining walls as the walls had only shallow embedded depth of 0.3m - 1.0m and sand could spill through the joints of (displaced) masonry. The study at Ramappa temple has further revealed that the lineaments and paleochannels, passing through the temple premises might have helped in the loss of confined sand over a period of time particularly due to the fluctuations of reservoir levels in the upstream side in Ramappa lake. A similar phenomena was also noticed at Thousand Pillars temple. The reactive upward pressures exerted by the foundation soil (sand) on the thin (0.3m thick) wide stone beams of inferior variety of rock caused tensile (bending) stresses in them exceeding their tensile strengths. Hence, almost all the floor beams cracked somewhere in the middle of their spans leading to floor upheaval. This is the most typical failure pattern to be observed not only in the monuments under investigation but also other temples in Warangal district built during the same period. This failure is conspicuously seen in Ramappa temple, where the floor upheaval is of the order of 30 cm. The detailed investigations conducted have revealed that the reasons of earthquake or failure due to expansive soils is remote. Human vandalism and poor maintenance (particularly of the roof drainage aspects) are the other causes of failure of these monuments.

The temple architecture of Kakatiyas replicates high superiority and the ‘Thousand-pillared temple’ is an attraction in the fruition of the Kakatiyan architectural style. The splendid temple Rudreswara, which was built by Recharla Rudra, the commander in chief of Ganapati Deva is a great sign of the culmination of the Kakatiyan style. The Gomateswara temple at Manthani, the Erakeswara and the Nameswara temples at Pillalamarri and the temple at Naguladu are the masterpieces of the Kakatiyan style of architecture.

There is a little evidence with regard to Kakatiyan sculpture. Among the sculpture of Kakatiyas the significant one is the *Kirtimukha* or *Krititorana*. The unique features of Kakatiya sculpture is the *Nandis*. The Nandi images at Palampet, Thousand-pillared temple, Sambhuni Gudi, Ghanapur, Kolanupalli are some of the unsurpassed examples with plentiful bell embellishment. The sculptural presence of *Hamsa* or swan motifs, on the gateways and friezes is to be noticed for their grace and beauty. Of the decorative sculptures, the motifs of dancers and Kolata are worth recording.

The dance styles patronaged by Kakatiyas resemble the dance styles of Jayaprasenani. The Narasimha temple at Parivela near Nalgonda consists of profusely carved lintels and jambs. The temples at Nandigonda contain splendidly furnished Mandapa pillars and ceilings.

The art of painting is also received the royal patronage. The traces of painting that are found on ceilings of the pillared halls of the temples at Ghanapur and Palampet bear witness to the painting expertise of that period. The defaced painting of the ‘Churning of the Milk Ocean’ found on the ceiling of the Sabha Mandapa of the Namevara temple at Pillalamarri is also a good example of their painting skill.

Suggested Remedial Measures

The immediate measures to prevent further damages are

- provision of an impervious cement concrete (1:3:6) apron 2m wide and 0.3m thick at ground level around the temple (this is already there for the main temple of Ramappa) which would avoid seepage of rain water into foundation soils
- provision of a 3m deep CC 1:4:8 curtain wall 0.3m thick adjoining the apron suggested above) to effectively confine the sand fill and prevent lateral movement of shallow retaining walls
- Sealing off of open masonry joints in the dry stone masonry walls above ground level by cement mortar 1:3 with fine aggregate obtained by grinding the rocks, to colour match the rocks used in actual construction to prevent rain water seepage through basement sand spilling over them
- prompt and proper civil engineering maintenance of the temples and their premises etc.

Conclusion:

Kakatiya Kings who ruled the Eastern Deccan with Warangal as their capital from 1160 to 1323 A.D. as sovereign rulers built magnificent stone temples and monuments with beautiful sculpture and architecture. The rule of Kakatiyas in Telangana is an era of transition and accompanied the starting of an epoch in the 13th century. The Kakatiyas by their support of art and their integrative polity improved agriculture, commerce and trade in the interior and construction of temples in Telangana, Rayalaseema and coastal Andhra. Majority of these monuments suffered structural damage over the years and if not restored now, they may completely collapse in course of time. The remedial measures suggested in the report comprise of (a) Structural forms like CC raft foundation (b) strengthening of sand by introducing root piles (c) Treatment of the sand by chemical grouting. These methods have to be adopted depending

upon the feasibility considering site conditions and type of conservation suggested by the Archaeological Survey of India.

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