

## **The South Indian Hindu temple building design system**

On the architecture of the Silpa Sastra and the Dravida style

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<sup>1</sup> Most figures have a footnote which refers to the source of it. When this is not the case the figure has been made or taken by the author.

## Introduction

The Hindus were in the position of numerous treatises on architecture and sculpture. These are collectively called the Silpa Sastra. Only few traces of them remain. How much there have been is not known. Some say, thirty-two, and others sixty-four<sup>2</sup>. However there are many works of acknowledged antiquity that talk about thirty-two principal ones<sup>3</sup>. The origins of the Silpa Sastra remain unknown. Some writers of these texts claim that the origins were to be found in the Vedic literature<sup>4</sup>.

What is now generally accepted is that “In ancient India, all compositions, whether religious, literary, or legal, were originally memorized and handed down orally from one generation to another. A particular composition would thus be the intellectual property of one group of followers of the composer and they preserved and guarded it to prevent its appropriation by others. This monopoly over a composition gave them a special status in society, in addition to bringing them rich clients. By composing in Sanskrit, the language of the Gods, the group gained an even higher, almost semi-divine status and were recognized as ‘Brahmans’.” ... “This spurred all other groups of composers and craftsmen who had hitherto been using popular dialects, to also convert to Sanskrit.”<sup>5</sup>

The intention of these texts was to show that they now had the status of learned Brahmins and they not only wrote technical, but also gave esoteric, magical, mystical, and astrological prescriptions to buildings. This included a whole set of rules of dimensions and proportions that were considered to make a structure theologically and ritually sound<sup>6</sup>.

There is something curious about the Silpa Sastra. None of the temples researched so far are built according to these Silpa inscriptions<sup>7</sup>. The reason given why the temples didn't fit with the text is because the texts themselves were not meant for other people than their own family. The number of Silpa texts has thus always been limited. The owner of a text would certainly follow the inscriptions when he constructed a building for clients, but those without these texts would copy these buildings but without the esoteric aspects whose very presence was often unknown and invisible to others. It is thus not surprising that texts generally do not match reality. In the real world of architectural construction, temples were built by imitation: one generation copying the predecessor or one rival architect, but always with some minor modifications to keep client interest alive. That is why temples in each region show so much a similarity to each other and yet do not match texts<sup>8</sup>.

There are only a few old works treating the Silpa Sastra. Of which the work *Mánasára* is the most perfect one<sup>9</sup>, but also *Mayamatam* has a great value. These texts were probably written around 450 till 550 AD<sup>10</sup>. Not a lot of study has been done on these manuscripts or

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<sup>2</sup> Rám Ráz p1

<sup>3</sup> Rám Ráz p2

<sup>4</sup> The Vedic literature is commonly known as the Vedas. These are texts which were written over a period of about 10 centuries, from about the 15<sup>th</sup> to the 5<sup>th</sup> century BC. (Encyclopaedia Britannica – Vedic religion)

<sup>5</sup> Pramara p5

<sup>6</sup> Pramara p5

<sup>7</sup> Pramara p3

<sup>8</sup> Pramara p6

<sup>9</sup> Rám Ráz p3

<sup>10</sup> Acharya, I.E.S. Prasanna Kumar. p lviii

Indian architecture in general. Till the 1990s only 17 works have been written on the subject (See table 1). The task of this essay will be to combine the knowledge about Indian architecture and make it more accessible.

S.No.	Circa	Work	Persons
1.	1780..	Architecture field work	William Jones, and Archaeological Survey of India
2.	1780..	Architecture field work through paintings	William Hodges
3.	1810..	Architectural theoretical work	Ram Raz
4.	1840..	History of Indian and Eastern Architecture	James Fergusson
5.	1890..	Architectural Documentation	Bannister Fletcher
6.	1905	Indian art, architecture, aesthetics	Ananda Comarswamy
7.	1920...	Indian art, temple architecture	Stella Kramrisch
8.	1910..	The Ancient and Medieval Architecture of India	E.B.Havell
9.	1930..	Sculpture analysis and theory	Alice Boner
10.	1930..	Architectural translation and graphics	P K Acharya
11.	1940..	Indian Architecture documentation	Percy Brown
12.	1960..	Hindu Architecture treatise translation and research	D N Shukla
13.	1960..	Architectural theory and analysis	Madhusudan A Dhaky
14.	1970..	Indian culture	Kapila Vatsyayan
15.	1980..	Architectural translation of Sanskrit Text	Bruno Dagens
16.	1990..	Architectural documentation with labeling and analysis	Adam Hardy
17.	1990..	Architectural documentation and analysis	Pierre Pichard

Table 1 - A Chronological List of Research in Indian Architecture and Allied areas<sup>11</sup>

## Vastupurusa

For the basis of Hindú architecture often reference is made to Vastupurusa or “the spirit of the site”. One legend explains this as follows. There was an evil demigod (bhuta) who was born during Siva’s fight with the Asur Andhaka. This bhuta possessed a terrifying countenance and an insatiable hunger. The legend goes that having done great penance, the bhuta won a boon from Siva that allowed him to swallow the three worlds that constitute the Hindu cosmos. As this being stretched himself and began to occupy the heavens, he fell flat on the earth. The various gods and demigods seized this opportunity and pinned various parts of his body to the ground, rendering him helpless. This being came to be called Vast (or Vastupurusa) because the gods and demigods managed to lodge themselves on his body. Legends hold that the deities, in pinning him down, occupied different parts of his body and continued to reside there (Figure1). In order to satisfy his hunger, Brahma ordained that he receive offerings from people on building sites before construction.

<sup>11</sup> Ar. Vinay Mohan Das p3

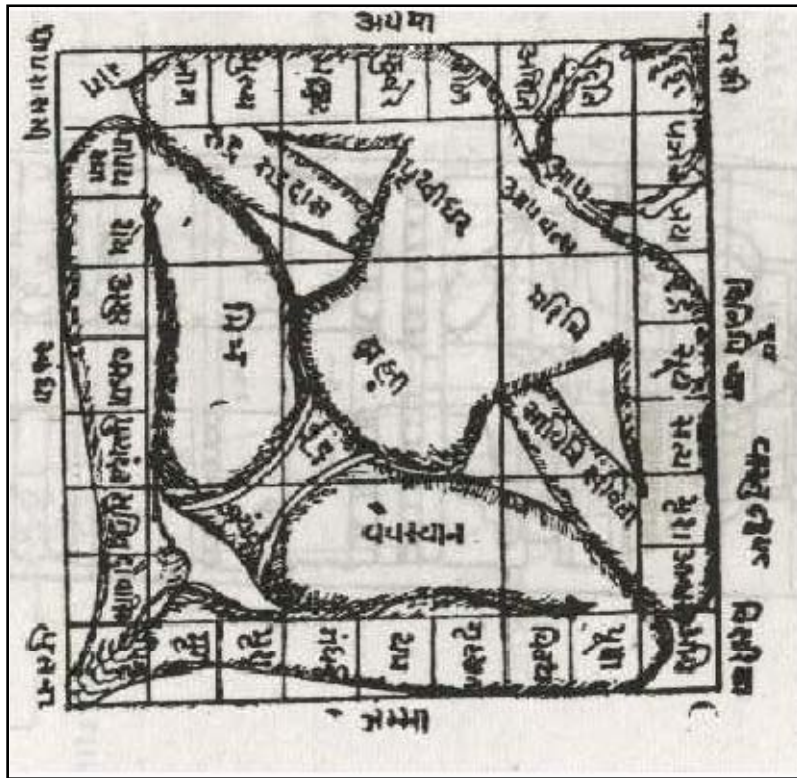


Figure 1 - The Vastupurusa pinned down on the ground by the gods<sup>12</sup>

The body of the Vastupurusa is supposed to be sensitive at a number of points called marmas. The well-being of the Vastupurusa assures the well-being of the building and, by implication, its owner. An important criterion for any building, therefore, is to avoid injury to the marmas located on the body of the Vastupurusa. To ensure that this is achieved, texts prohibit any direct construction upon the marmas themselves. The marmas are specifically said to lie at the intersection of major diagonals, seen as the veins (siras or nadis) of the purusa<sup>13</sup>.

<sup>12</sup> SanathanaDharma.com

<sup>13</sup> Sonit Bafna p29

## The system of measurement

In Indian architecture a different measurement system than in the west was used. The scheme is as follows<sup>14+15</sup>:

Name	Description of size
Paramánu	The particle perceptible only to the eyes of the sages, or something like atoms.
8 paramánus = 1 ratharénu	Like the grain or dust raised up by the wheels of carriages.
8 ratharénus = 1 valágra	Like the point of a hair
8 valágras = 1 louse	
8 lice = grain of yava	
3 or 3,5 or 4 yavas = 1 angula	Like the finger of the inferior, middle and superior sorts respectively
12 angulas = 1 vitasti or span	
2 vitastis = 1 hasta or cubit = 24 angulas	
26 angulas = 1 dhanurgraha	Like the handle of a bow
4 hastas = 1 dhanus or danda	Like a bow or rod
8 dandas = 1 rajju	Like a rope
There are also some very broad descriptions for the dimensions of buildings. All the buildings may be 24 angulas, but it is better to make them more specified.	
Conveyances (yána) and couches (sayana) have to be 24 angulas	
Temples (vimána) have to be 25 angulas	
Building's (vástu) in general have to be 26 angulas	
Villages have to be 27 angulas	

Table 2

<sup>14</sup> Rám Ráz p13

<sup>15</sup> Prasanna Kumar Acharya p3

## Orientation - The gnomon

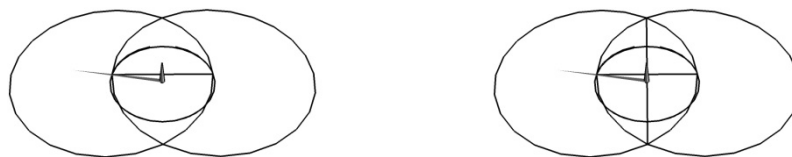
To define where these veins are, and where an architect should locate the outside walls of a Hindu temple, an architect got a tool called a gnomon<sup>16</sup>. A gnomon is something of 16 angulas in height erected from a smooth level piece of ground and of the same diameter at the bottom. There are six steps which are needed to construct a gnomon.<sup>17</sup>



Step 1: A gnomon is made by putting a specified object in the ground and by drawing a circle around it<sup>18</sup>.



Steps 2 and 3: The place where the shadow cuts the circle, in the morning and in the evening, is marked and a line is drawn between those two points. From these points two circles are made.



Step 4: On the place where these two new circles cut each other a new line is drawn. This line represents the North - South axes.

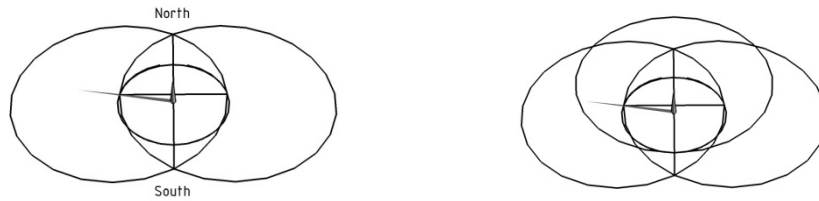
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<sup>16</sup> Michael W. Meister p302

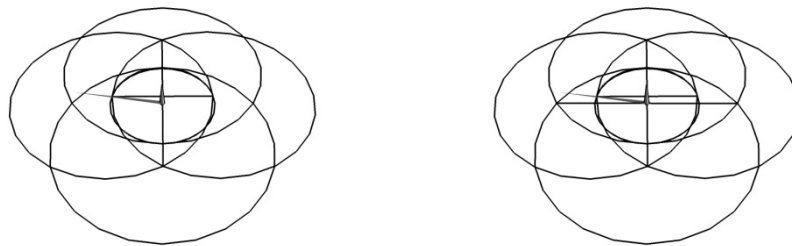
<sup>17</sup> Rám Ráz p19

<sup>18</sup> The exact dimensions of the different objects can be found in different books. For instance in the "Essay on the architecture of the Hindus" by Rám Ráz on p20.

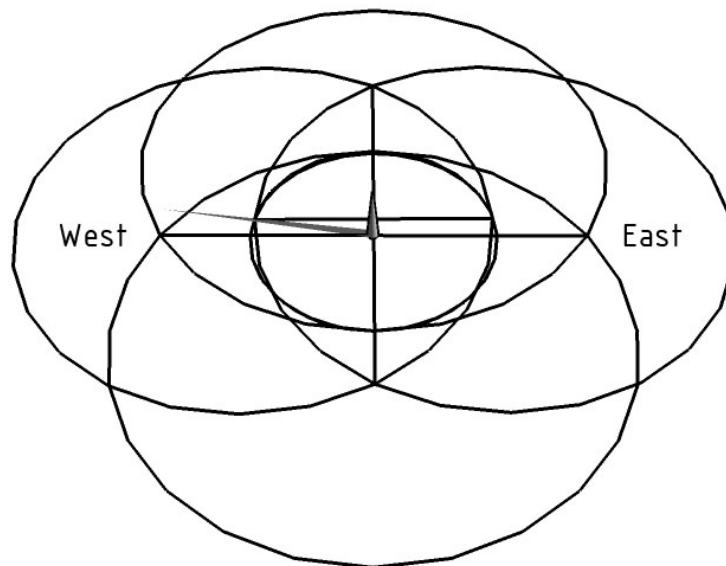




Step 5: From the places where the North - South axes cuts the first circle two new circles are drawn.



Step 6: A line, connecting the cutting points of the two new circles, is drawn. This line represents the West – East axes.



Because of the irregularity of the sun's motion in the ecliptic, various rules have been laid down for the purpose of rectifying its variations. Time plays an important role here. In one explanation for instance: "The place where the shadow of the gnomon projects, on two successive days at the same hour, being marked, the difference between those two days, is taken as the variation of the shadow for sixty ghaticas or twenty-four hours. The interval between the times at which the western and eastern points were marked on the preceding

day is multiplied by the difference of the shadow measured for one day, and the product being divided by sixty ghaticas, the result will give the difference of the shadow for the given time; it will then be only necessary to remove the eastern or western point so far towards the south or north, according as the difference of the shadow on the second day may be in either of those directions, or as the sun is in the southern or northern solstice.”<sup>19</sup>

The figure now found forms the basis of the Hindu architecture. What can be clearly seen is that the body of the Vastupurusa fits on the figure (Figure2).

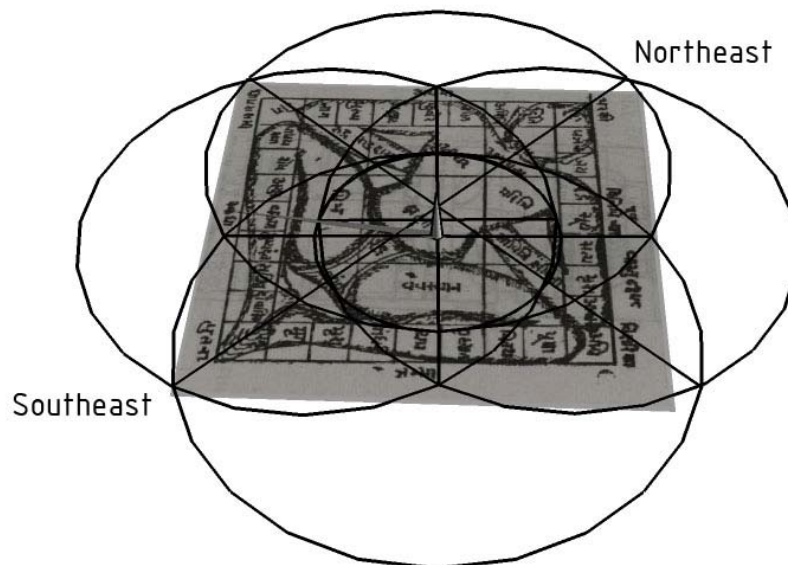


Figure 2 – The gnomon and the Vastupurusa combined

### Zoning in the temple – Using the grid

The visual representation of the Vastupurusa as a governing device for making a building is called a vastupurusamandala. It is drawn as a grid, but read as a concentric series of square shapes<sup>20</sup>. These representations had two purposes. First of all the grid provided a rigid “structure” which could be used for meditation and obligatory rituals. And secondly it “hid” the true basis of the building<sup>21</sup>. In other words, the grid provided a basis for the initiated for locating the correct deities, while on the other hand the body of the vastupurusa wasn’t shown to non-initiated. That is also the reason why the grid isn’t applied in the same way in the different temples in South India<sup>22</sup>. The grid only functioned as a means of zoning<sup>23</sup> the different deities in the temple. Because all the deities had a different quality or speciality the vastupurusamandala could also be used as a method for locating the different parts and functions of the building. For instance in the west the Lord

<sup>19</sup> Rám Ráz p21

<sup>20</sup> Sonit Bafna p33

<sup>21</sup> Sonit Bafna p46

<sup>22</sup> Sonit Bafna p39

<sup>23</sup> Sonit Bafna p43

of water, Varuna, ruled. For that reason it has been recommended to make the dining room, study room, or toilets in that part of the building<sup>24</sup>.

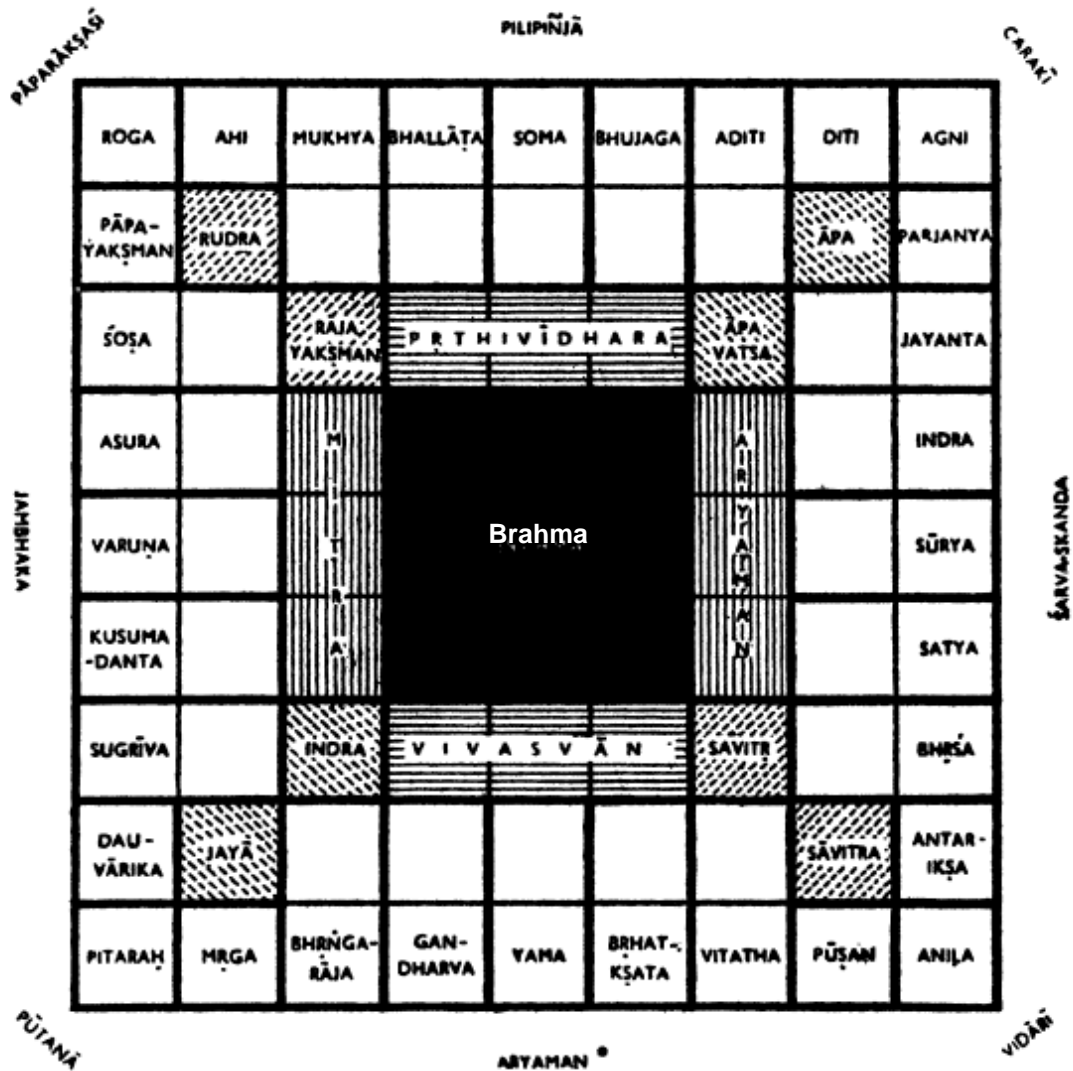


Figure 3 - The Vastupurusamandala<sup>25</sup>

Now the basics for the temple design have been explained. So it was possible for an architect to start designing. In South Indian temple design the architect most probably used several tools to design a building. Those will now be explained.

<sup>24</sup> Devshope – The scientific quality of this source is unknown, but here it is only used to explain the point. There are much more sources that explain where the Gods are located on the vastupurusamandala.

<sup>25</sup> Kramrisch p32

## Defining the groundplan

There are different ways how the gnomon has been applied to design a temple. Michael W. Meister analysed how this scheme was used in the Gargaj Mahadeva temple at Indor in the north of India<sup>26</sup> and that one will be used here to explain how that system could be applied to define the exterior walls of a temple.



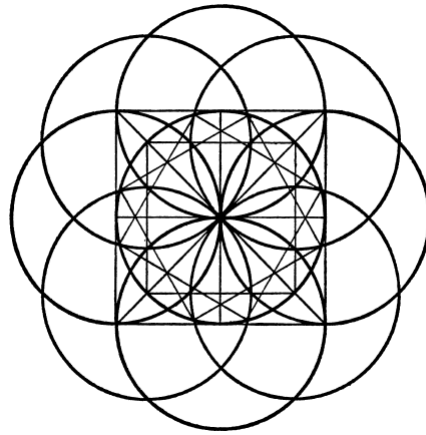
Figure 4 - Indor, Dist. Guna, Madhya Pradesh. Gargaj Mahadeva temple from the southeast, ca. mid-eighth century A.D.<sup>27</sup>

After the gnomon was drawn the architect knew how to orientate the building. He then started using circles to do three kinds of things.

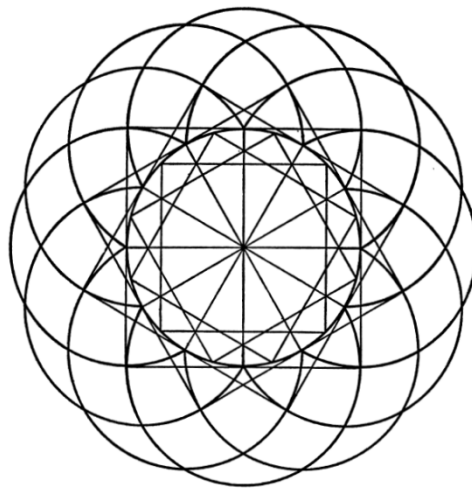
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<sup>26</sup> Michael W. Meister p303 – All the pictures that explain and show the temple of Indor are taken out of his analysis

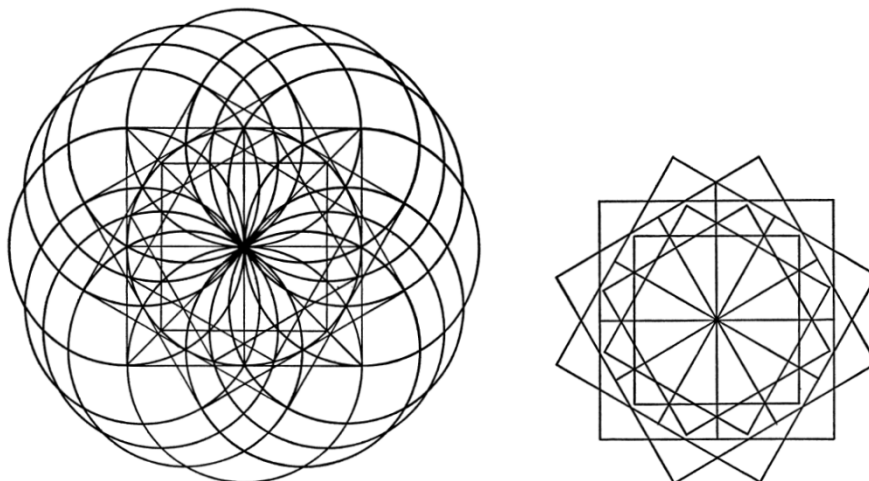
<sup>27</sup> Michael W. Meister p305



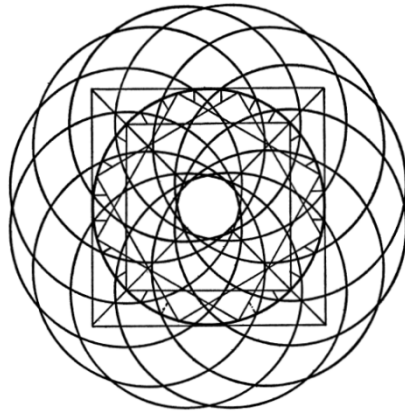
Step 1: The architect would use circles to construct the inner turned-squares.



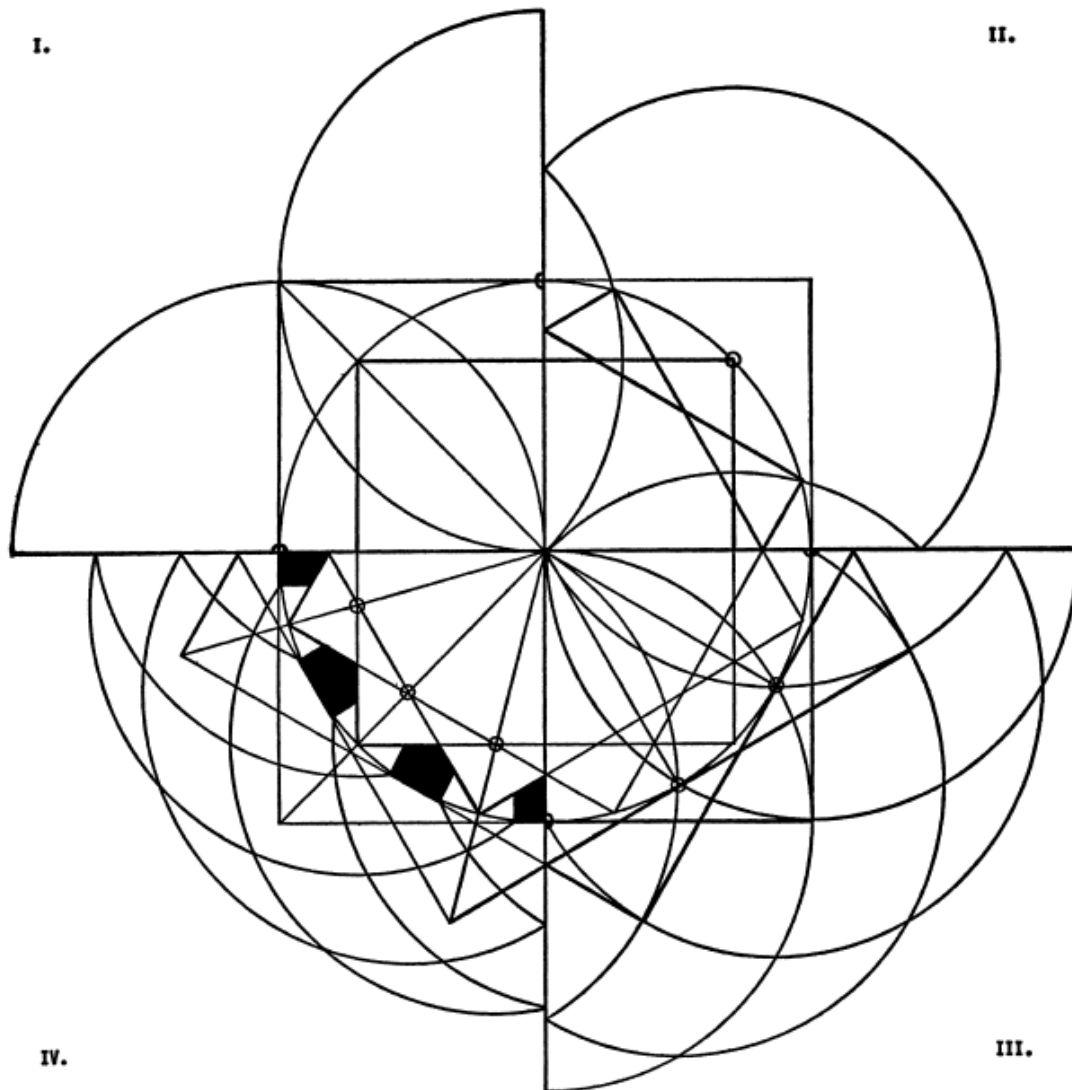
Step 2: The architect would use circles to construct the outer turned-squares.



The combination of the two resulted in the basic plan of the building.



Step 3: Then the architect would use circles to define the width of the walls.



All these steps resulted in the ground plan for the temple in Indor.

## Going vertical – The temple as a house for the Gods

The Vastupurusa forms the basis to locate the places of the Gods. Brahman is central in this picture and around him the other Gods are located. The temple itself was designed to house all these Gods and it was in another sense a manifestation of the universe<sup>28</sup>. The temple itself was made up of a collection of little houses, of various kinds and at various levels of order, from primary components to sculpture-sheltering niches<sup>29</sup>.

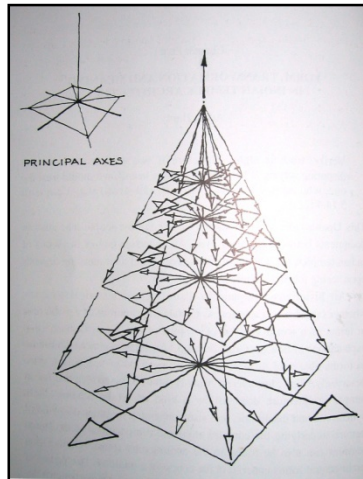


Figure 5 - The main axes and Movement of a temple<sup>30</sup>

In a graphical sense this meant that a temple had its origin somewhere at the finial, or at an infinitesimal point above its tip, continuing downwards, and outwards from the vertical axis of the shrine, radiating all around, but especially in the four cardinal directions<sup>31</sup>. In this way the building is broad at the bottom and small at the top (Figure5)<sup>32</sup>. Movement is explicitly and illustrative portrayed through a number of mutually reinforcing architectural means<sup>33</sup>:

- *Projection*: Projection (throwing forward) of an embedded form suggests emergence, particularly if there is a sense of direction – forwards, sideways or diagonal.
- *Staggering*: Multiple projections create staggering, with offsets or step-like serrations. The stepped bulging of a surface, growing out in stages, suggests expansion (as in the staggered or expanding square plan). Multiple projection in conjunction with multiple embeddedness or interpenetration can convey a multiple emanation, either unidirectional, like the unfolding of a telescope, or in four or more directions. Closely serrated edges may create the impression that a form is vibrating, as if with inner energy.
- *Splitting*: Where an element is represented as having split down the middle, the two halves having moved apart, there is a sense that the space contained by the element expands on both sides. Another form revealed between a split pair will appear to emerge from the void.

<sup>28</sup> Hardy p109

<sup>29</sup> Hardy p109

<sup>30</sup> Hardy p108

<sup>31</sup> Hardy p107

<sup>32</sup> This is also logical in the sense that the most important God (Brahma) had the highest part in the temple, while the least important Gods had the lowest part in the temple.

<sup>33</sup> Hardy, tradition and transformation, p182 and Hardy p110



- *Bursting of boundaries:* A sense of the emergence and expansion of an enshrined form will be all the stronger if projection is accompanied by a penetration or overlap of the surrounding frame.
- *Progressive multiplication:* A transformation from unity to multiplicity is expressed by an expanding, proliferating pattern. A single element begins a sequence of rows in which the number of elements progressively increases.
- *Expanding repetition:* In a rhythmic series, the elements are all similar, but get progressively bigger.
- *Pictorial representation:* While all these means of conveying movement are to some extent representational, some kinds of depiction in a direct, pictorial way, are unquestionably so.

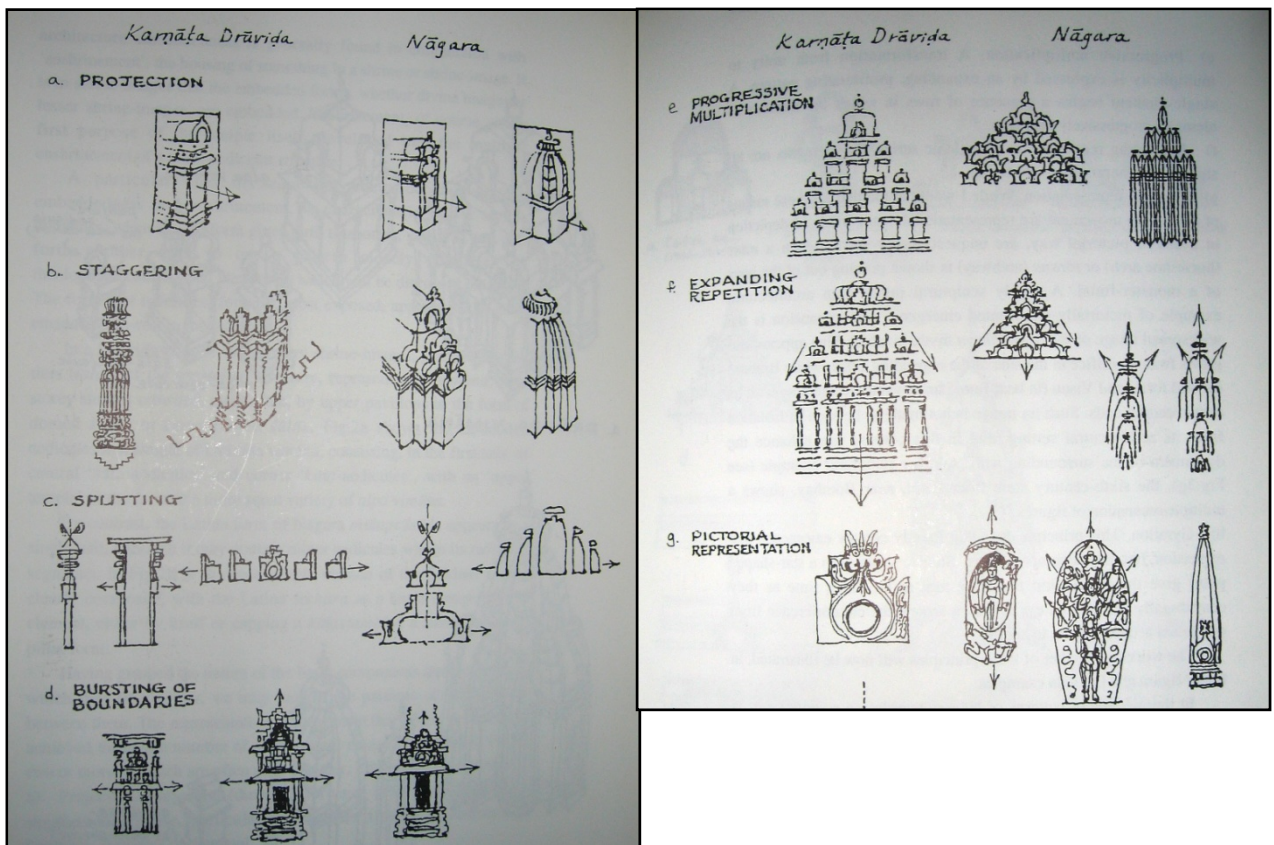


Figure 6 - Some of the architectural means of portraying movement (See Hardy p112 and p113)

This main form was then divided into a lot of small “houses” for the Gods (Figure7)<sup>34</sup>. These “houses” could give place to sculptures and these sculptures were no “decorative veneer”, but were an important part of the building. The enshrinement was the first purpose of the temple itself<sup>35</sup> and it was therefore essential to regard the sculptures as an embedded part of the building.

<sup>34</sup> After studying the literature it is tempting to believe that the whole temple was made up from one element. But because of the small scale of the research it is not possible to find enough proof for this statement.

<sup>35</sup> Hardy p110



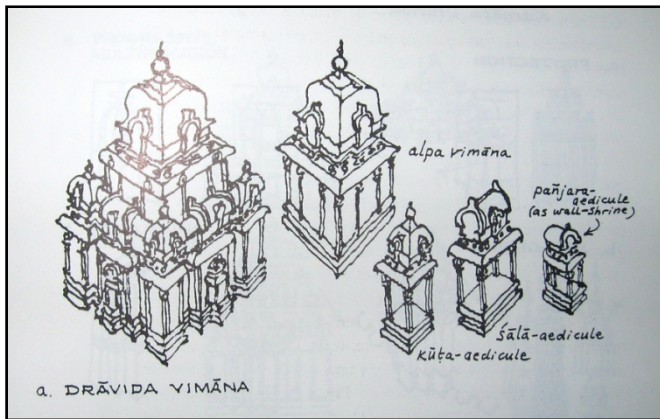


Figure 7 - The division of a South Indian Temple into small "houses"<sup>36</sup>

Since the Hindus believe that the universe features a cyclic nature of creations and destructions<sup>37</sup> and since the Hindu temple represents the universe, it had to embody the cyclical notion. For that reason a pattern of growth is added. This pattern grows from unity to multiplicity, simultaneously tending back to unity through a process of dissolution and fusion<sup>38</sup>. In this way it is cyclical. These cycles can occur at different times and at different rates in different parts of a temple. To achieve them several architectural tools are used<sup>39</sup>:

- Increasing aedicularity
- Aedicular density, meaning that shrine images get closer together with increasing interpenetration
- Proliferation and fragmentation
- Central emphasis along cardinal axes, in parts as well as a whole
- Using an increased sense of movement
- Staggering
- Continuity and alignment
- Abstraction
- Assimilation

The tools for achieving the pattern of growth and of movement would then be used by an architect to help him design a temple. But there were more things that could help the Indian architect. Like the Greeks, Romans and Egyptians, the Hindus also had an architectural order.



Figure 8 - Generalized pattern of evolution in South Indian temples (See Hardy p126)

<sup>36</sup> Hardy p111

<sup>37</sup> Madhavananda - The scientific quality of this source is unknown, but here it is on point. There are much more sources that explain the Hindu universe.

<sup>38</sup> Hardy, tradition and transformation, p182

<sup>39</sup> Hardy, tradition and transformation, p182 – these concepts had not yet been worked out very well and are for that reason not explained more clear here.

## The Hindu order

The Hindu order consists of four principal parts<sup>40</sup>:

- The upapítha or pedestal
- The athisthána or base
- The sthamba or pillar
- The prastára or entablature

These four will now be described.

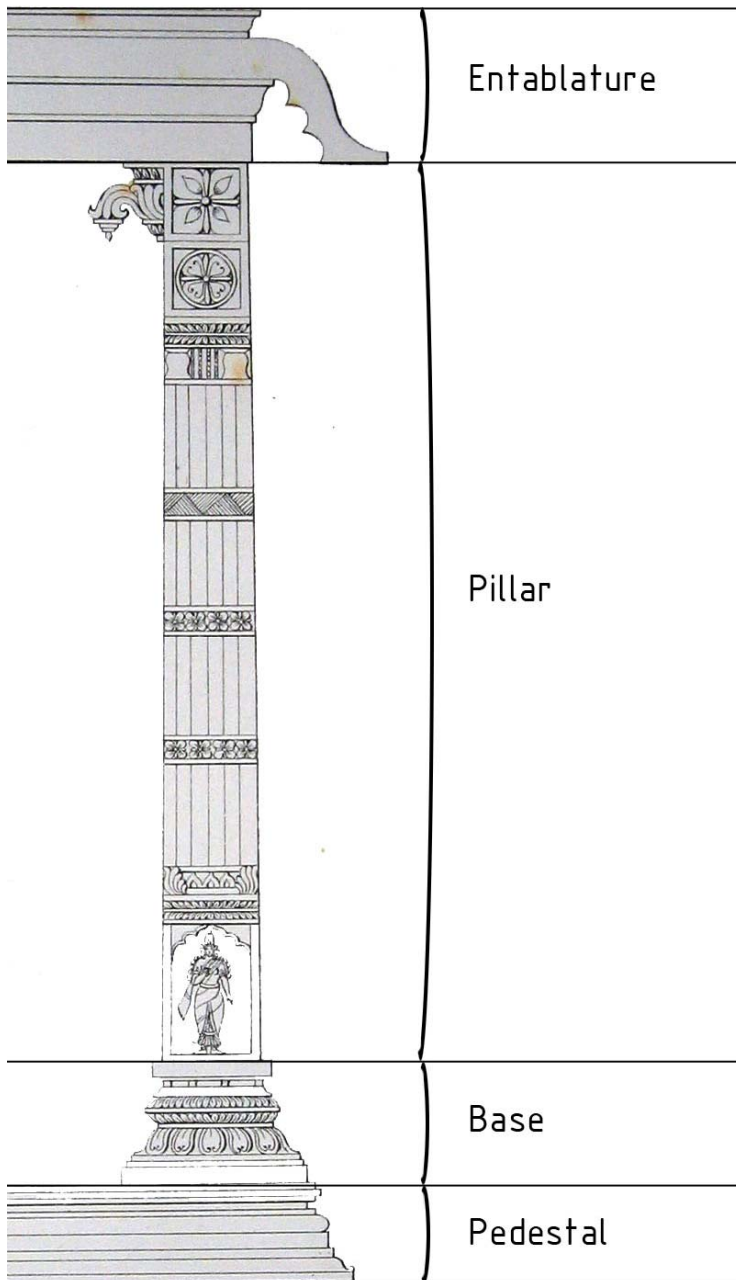


Figure 9 – The basic structure of the Hindu order<sup>41</sup>

<sup>40</sup> Rám Ráz p22

## Upapítha or pedestal<sup>42</sup>

Upapítha is derived from upa (under) and pítha (seat or bench). It is placed not only under the base of a column or pilaster, but it is frequently employed, both singly and together with the base, as a pavement for temples and porticoes, over cornices of edifices consisting of several stories in height, as a platform for thrones, and as seats for statues.

The pedestal is the lowest division in a column<sup>43</sup> consisting of three principal parts, namely, the die, the cornice, and the base. It is employed for support, heightening the column, and increasing the beauty<sup>44</sup>.

Pedestals can be divided into three sorts, according to the magnitude of the buildings in which they are to be employed. The first sort is called védibhadra, the second pratibhadra, and the third manchabhadra. Each of these are then again divided into four sorts<sup>45</sup> (Figure10)<sup>46</sup>.

The védibhadra is suited for all kinds of buildings<sup>47</sup>. The pratibhadra is suited for the edifices of gods, Brahmins, and Kings<sup>48</sup>. The location of the last sort isn't clear. Máнасára writes that the manchabhadra is described separately<sup>49</sup>, but it doesn't state where this is.

The height of the pedestal is determined by the base of the pillar. The height of this base is divided into four parts. Of these four parts the first part from the plinth to the fillet is divided in 8 parts. The height of the pedestal is then defined by a certain number of these parts. This number is defined by what kind of building it is used for<sup>50</sup>.

In Figure10 the different kinds of pedestals can be seen.

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<sup>41</sup> A picture of Rám Ráz plate 11, modified by the author of this essay.

<sup>42</sup> In the Mayamatam there is a distinction between the pedestal and the socle. It is not really clear whether there is a difference between the two because in the Mayamatam the three different categories for socles are the same as for the pedestals in de Máнасára. Dagens makes a remark though on page 151 of the Mayamatam that the socle is a supplementary base for the building. But this remark doesn't explain the difference between the socle and the pedestal.

<sup>43</sup> In the Máнасára also called stylobates and stereobates, but the Mayamatam calls the top part of the base the stereobate. This makes it unclear what the stylobate and stereobate are in the Indian orders.

<sup>44</sup> Acharya, I.E.S. Prasanna Kumar p123

<sup>45</sup> Rám Ráz p27

<sup>46</sup> The Mayamatam differs here from the Máнасára. There it is written that the third socle is called subhadra. Dagens p151. See also remark 39 in this document. In the Mayamatam chapter on pedestals, 8 different types are described.

<sup>47</sup> Acharya, I.E.S. Prasanna Kumar p125

<sup>48</sup> Acharya, I.E.S. Prasanna Kumar p127

<sup>49</sup> Acharya, I.E.S. Prasanna Kumar p129, also the Mayamatam doesn't explain in what kind of buildings the different sorts of socles can be applied.

<sup>50</sup> This can either be a small, intermediate or large building. Acharya, I.E.S. Prasanna Kumar p123

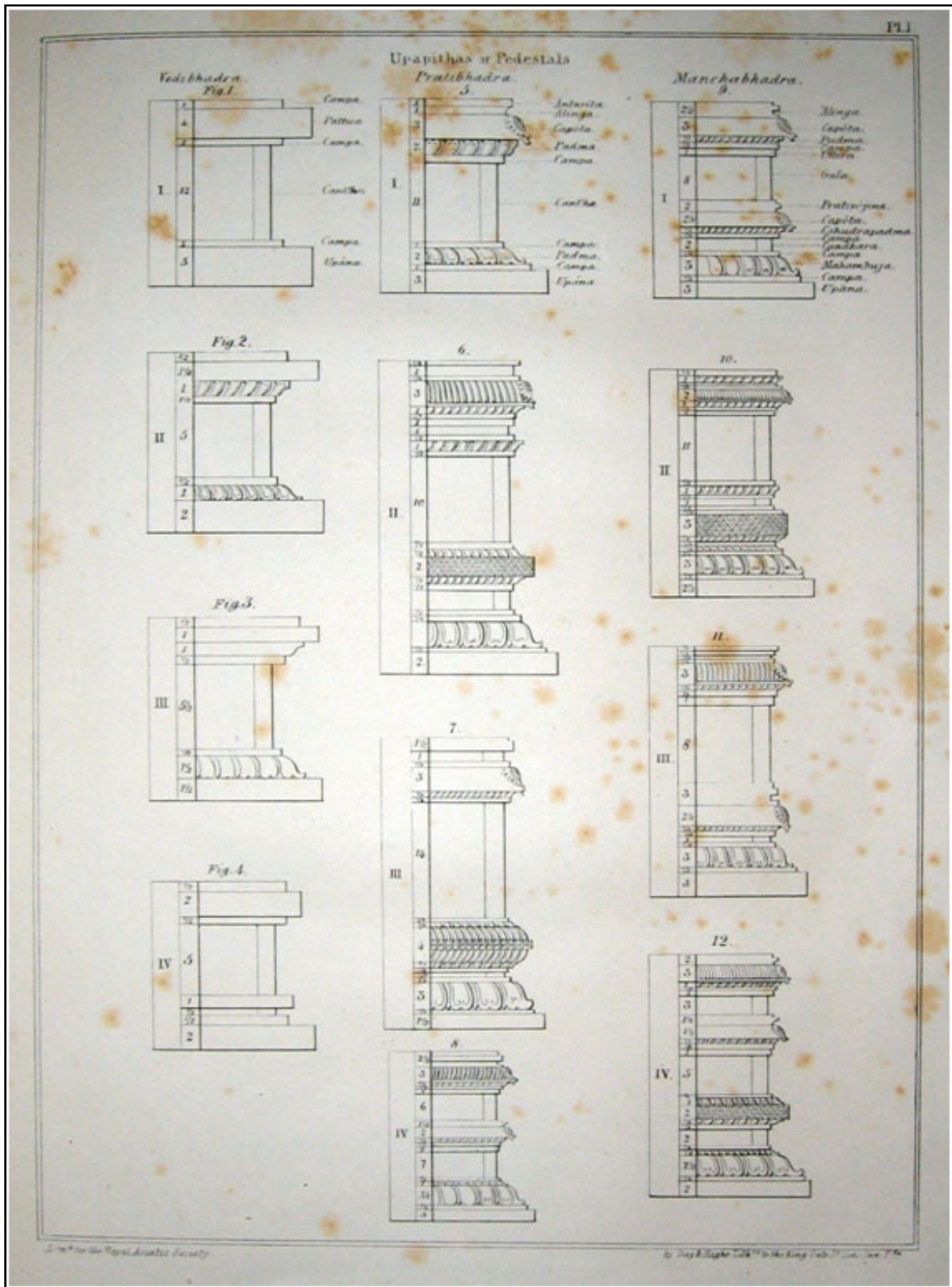


Figure 10 - The three kinds of pedestals of the Hindu order<sup>51</sup>

<sup>51</sup> Rám Ráz plate 1

## Athisthána or base

The Mayamatam describes that the base is that upon which the buildings rest<sup>52</sup>. In this way it makes clear that the pillar has a constructive character. It must be able to withstand the forces in the building.

There are two ways to determine the height of a base. It can be done according to the number of storeys of a building, or according to the cast. The Mayamatam and the Mánasára differ in how high the base may be, but since the Mánasára “forgets” to describe the height of the buildings for the Gods, the description from the Mayamatam will be taken.

For buildings for the Gods it is 4 cubits high, for Brahmins (intellectual and priests) 3½ cubits, for kings (the government) 3 cubits, for crown princes (the military and administrative classes) 2½ cubits, for the Vaisyas (the farmers and businessmen) 2 cubits and lastly for the Sudras (the workers) 1 cubits<sup>53</sup>.

About the forms of bases the literature is not clear. The Mánasára says there are 12 varieties of bases<sup>54</sup>, but later on it describes 18 varieties. Rám Ráz writes in his “Essay on the architecture of the Hindús” that there are six sorts and the Mayamatam describes 14 different ones<sup>55</sup>. In Figure11 and Figure12 the forms described by Rám Ráz can be seen. His description seems to be the most reasonable one, because the Hindu entablature and the Greek and Roman orders also consist of six different ones.

The base may be reinforced to make it more solid. The architect can add or subtract 1, ¾, ½, ¼ parts. He can also add or subtract 2, 1½, ½ or ¼ digit. The most important thing here is that the proportions of the base must be related to those of the building. In response to that the rest of the pillar relates to the base of the pillar.

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<sup>52</sup> Dagens p161

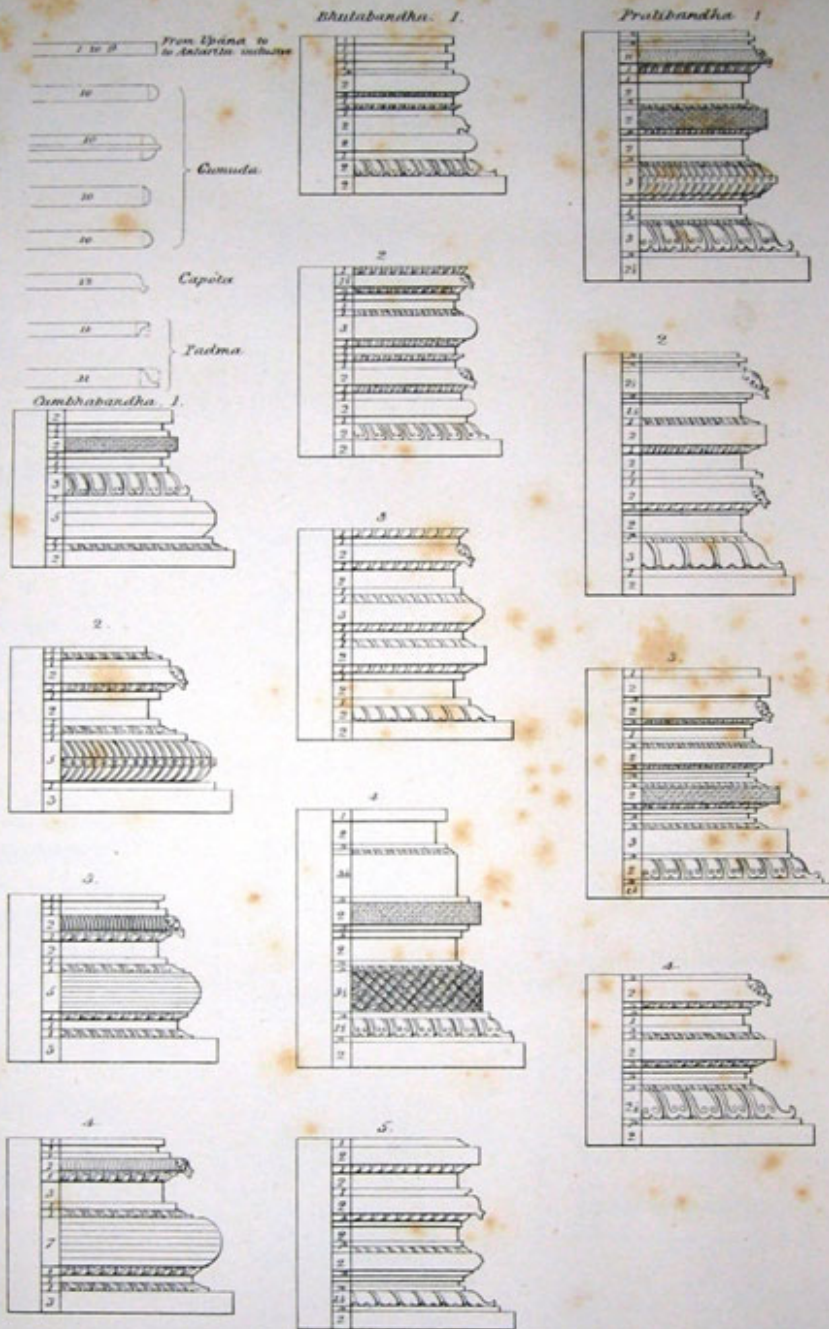
<sup>53</sup> Dagens p161

<sup>54</sup> Acharya p131

<sup>55</sup> Dagens p171



Achsthānas or Bases.



*Lith. by the Royal Asiatic Society.*

*By J. P. N. Gupta Lith. by the Society.*

Figure 11 – The first three kinds of bases of the Hindu order<sup>56</sup>

<sup>56</sup> Rām Ráz plate 2

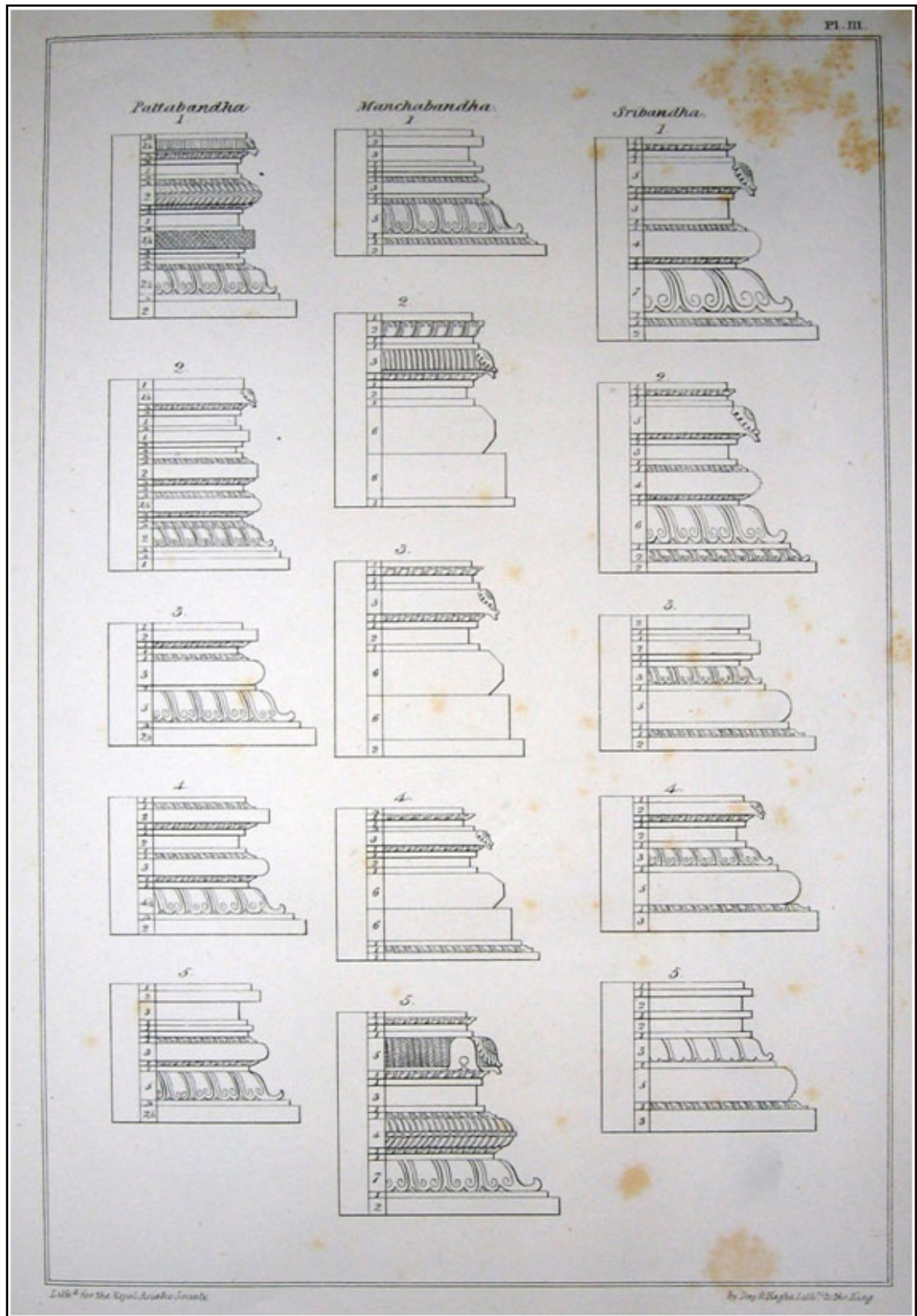


Figure 12 – Kinds four till six of the bases of the Hindu order<sup>57</sup>

<sup>57</sup> Rám Ráz plate 3

## Sthamba or pillar and the thickness of walls

In Indian architecture there are seven sorts of pillars<sup>58</sup> and these are related to the base or to the amount of floors in the building<sup>59</sup>.

When the base is taken as a reference point for the length of a pillar, than it may be  $1\frac{1}{4}$ ,  $1\frac{1}{2}$ ,  $1\frac{3}{4}$  or 2 times the height of the base. In total there are 12 varieties of the height of a pillar. For the pilaster (in other words a wall-pillar) it is either 3, 4, 5 or 6 angulas. The diameter of a pillar is 2, 3 or 4 times the width of the pilaster<sup>60</sup>.

When the amount of floors in a building is taken as a reference points for determining the height of the pillars, then the ground floor pillars of a twelve storey building are  $8\frac{1}{2}$  cubits in height. By subtracting one span for each storey a height of 3 cubits is obtained for the pillars of the top storey. The diameter of the ground floor pillars of a twelve storey building is 28 digits. By subtracting two digits for each storey 6 digits are obtained for the diameter of the pillars of the top-storey<sup>61</sup>.

There are 6 forms of pillar. Namely: square, pentagonal (5 sides), hexagonal (6 sides), octagonal (8 sides), 16 sided and circular. These shapes are uniform from bottom to top, but the base and top may be square. The top of a pillar consists of 7 elements<sup>62</sup>: The bracket capital, the dye (featuring a human figure), the abacus, the bell capital, the support, the lotus and the band ornamented with garlands.

Pillars are used for all kinds of buildings. Like palaces, pavilions, auxiliary temples, gate-houses and the dwellings of the lower castes. For erecting the pillars worship ceremonies are carried out.

For the design of the seven different pillars a lot of rules are given. These can for instance be found in the Mánasára. In Figure 13, Figure 14 and Figure 15 examples of the different sorts of pillars can be found.

About the walls of a building not a lot of information can be found in the documents, but in the Mayamatam a description for the width of the walls are given. A wall is 2, 3, 4, 5 or 6 times the diameter of a pilaster. A pilaster is  $\frac{1}{2}$ , two-thirds or  $\frac{3}{4}$  of the pillar<sup>63</sup>.

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<sup>58</sup> Rám Ráz p29 – In the book of Rám Ráz (p36) three more can be found, but the author writes himself that he is unable to find out what they are, and he concludes that they are most probably some sort of improvement.

<sup>59</sup> The Mánasára uses the base to define the pillars. The Mayamatam uses the amount of floors in a building to define the height of the pillars.

<sup>60</sup> Acharya p151

<sup>61</sup> Dagens p179

<sup>62</sup> Dagens p187 - Of all these elements there are clear descriptions regarding the size and decorations.

<sup>63</sup> Dagens p181



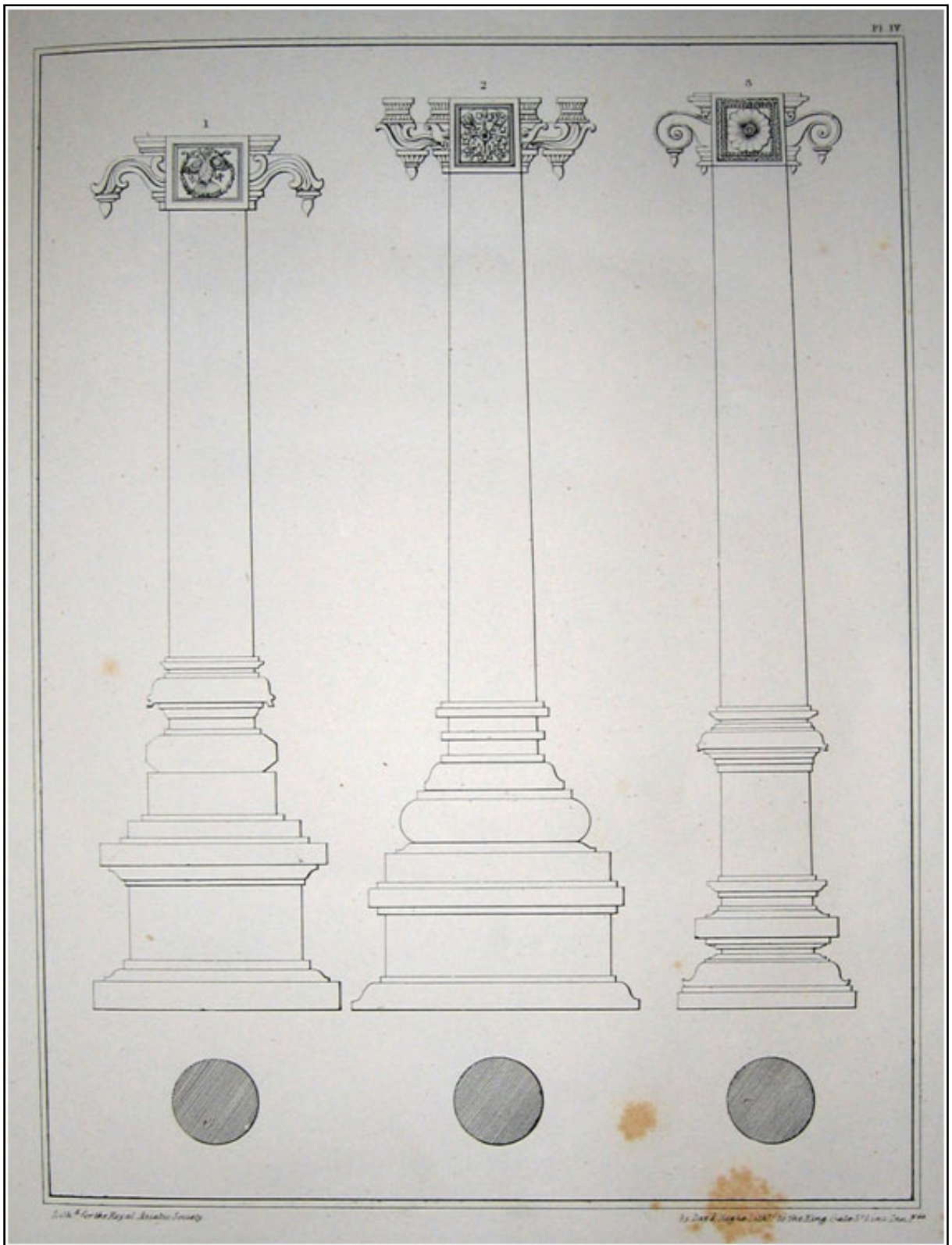


Figure 13 – First three pillars of the Hindu order<sup>64</sup>

<sup>64</sup> Rám Ráz plate 4

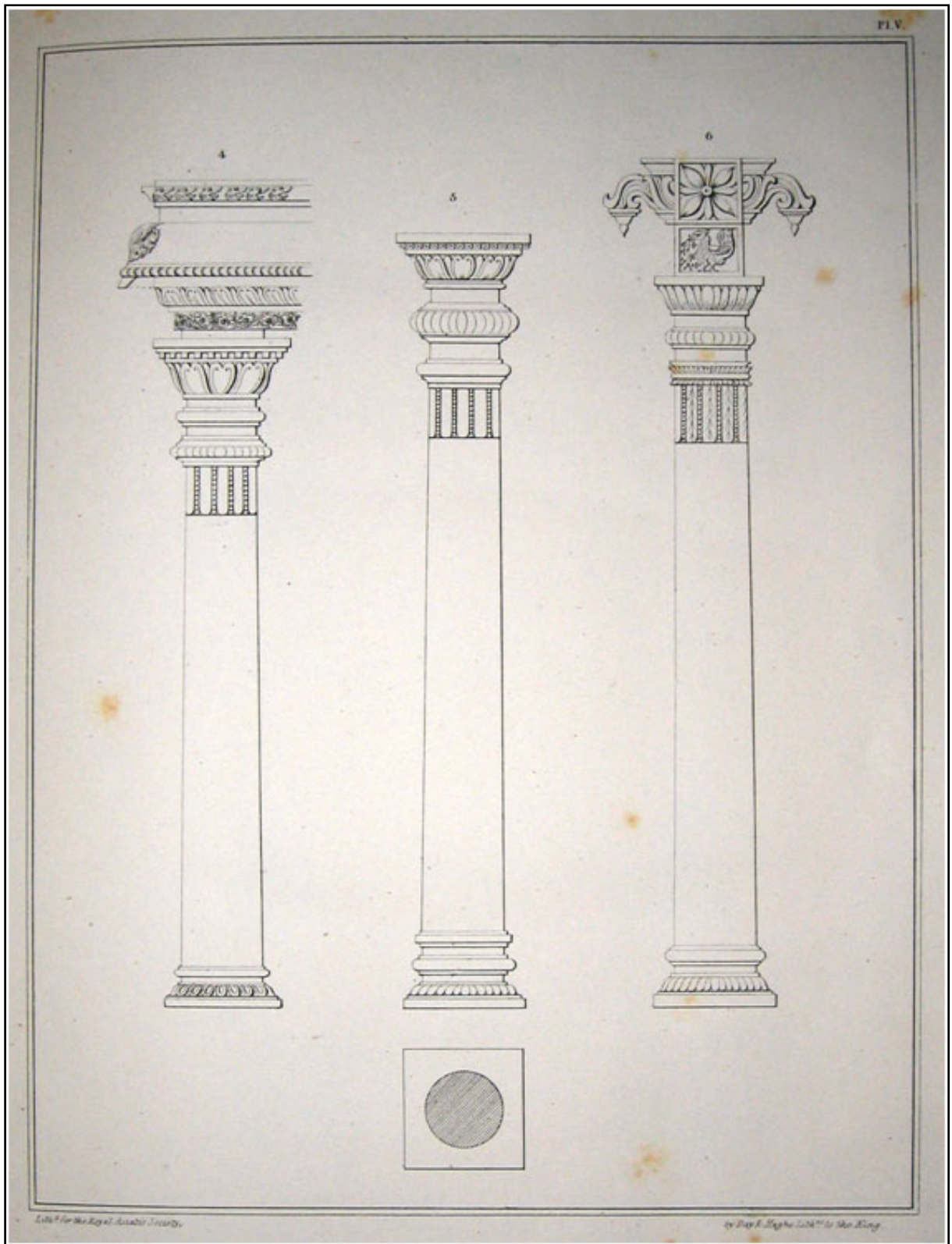


Figure 14 - Pillars four till six of the Hindu order<sup>65</sup>

<sup>65</sup> Rám Ráz plate 5



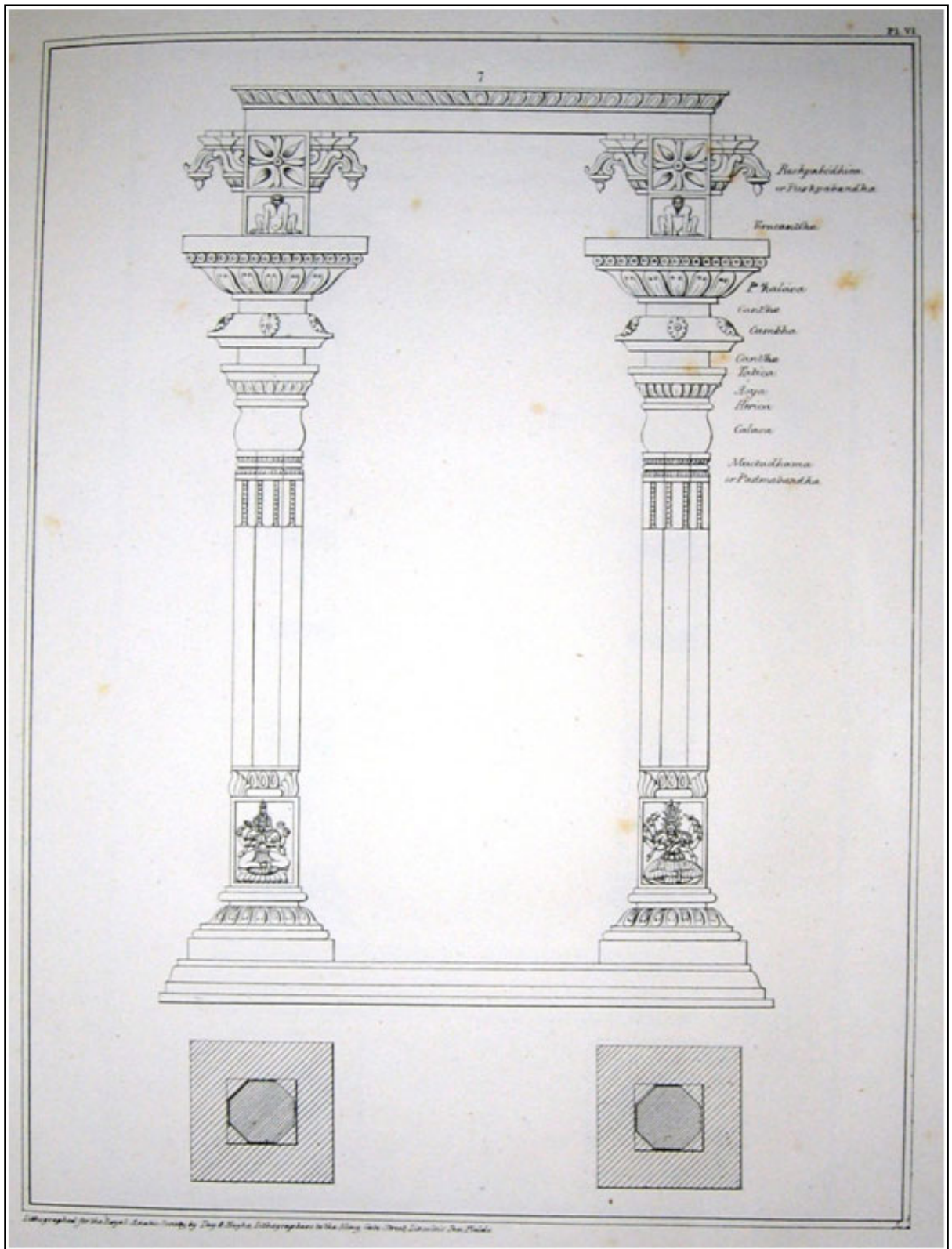


Figure 15 – Pillar 7 of the Hindu order<sup>66</sup>

<sup>66</sup> Rám Ráz plate 6

## Prastāra or entablature

The last part of the Hindu order is defined by the entablature. It is the element between the pillar and the roof of a building.

There are six varieties of entablature in the Hindu order<sup>67</sup> (Figure16 and Figure17)<sup>68</sup>. Each of them serves another class. These are the Gods, the Brahmans (intellectual and priests), the Kings or the government, the crown princes or the military and administrative classes, the vaisyas (the farmers and businessmen) and finally the sudras (the workers)<sup>69</sup>. Here a similarity can be found with the Greek and Roman orders. Also in those orders there are also six entablatures: Doric-, Ionic-, Corintic-, Tuscan-, Doric- roman and Composite order<sup>70</sup>.

There are three ways to define the height of the entablature. In the first one the height of the entablature are  $\frac{3}{4}$ , 1,  $1\frac{1}{4}$ ,  $1\frac{1}{2}$ ,  $1\frac{3}{4}$  or 2 times the base.

In the second method the six varieties of height of the entablature are  $\frac{1}{2}$ ,  $\frac{3}{4}$ , 1,  $1\frac{1}{2}$ ,  $1\frac{3}{4}$  or 2 times the pillar.

In the third method, which only the expert architect may use, the height of the pillar is divided into 8 equal parts. Of these 7, 6, 5, 4, 3, and 2 parts are the six kinds of height of the entablature. This last method has been derived from the Vedic literature.

For the design of the entablature a lot of rules are given. These can for instance be found in the Mānasāra.

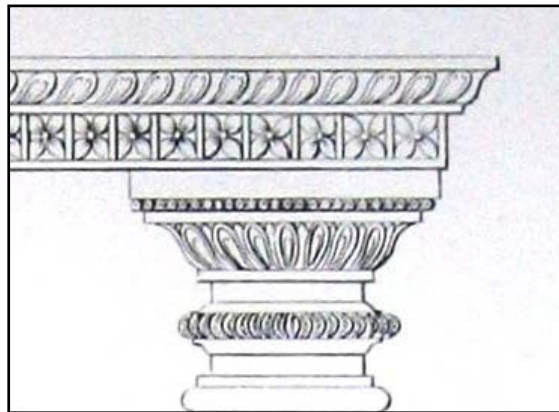


Figure 16 - Entablature<sup>71</sup>

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<sup>67</sup> Acharya p175

<sup>68</sup> Only five different entablatures could be found in the book of Rām Ráz.

<sup>69</sup> Acharya p175 and "The Varnasrama Social System"

<sup>70</sup> Encyclopédie Universelle Larousse, ordre

<sup>71</sup> Rām Ráz plate 13

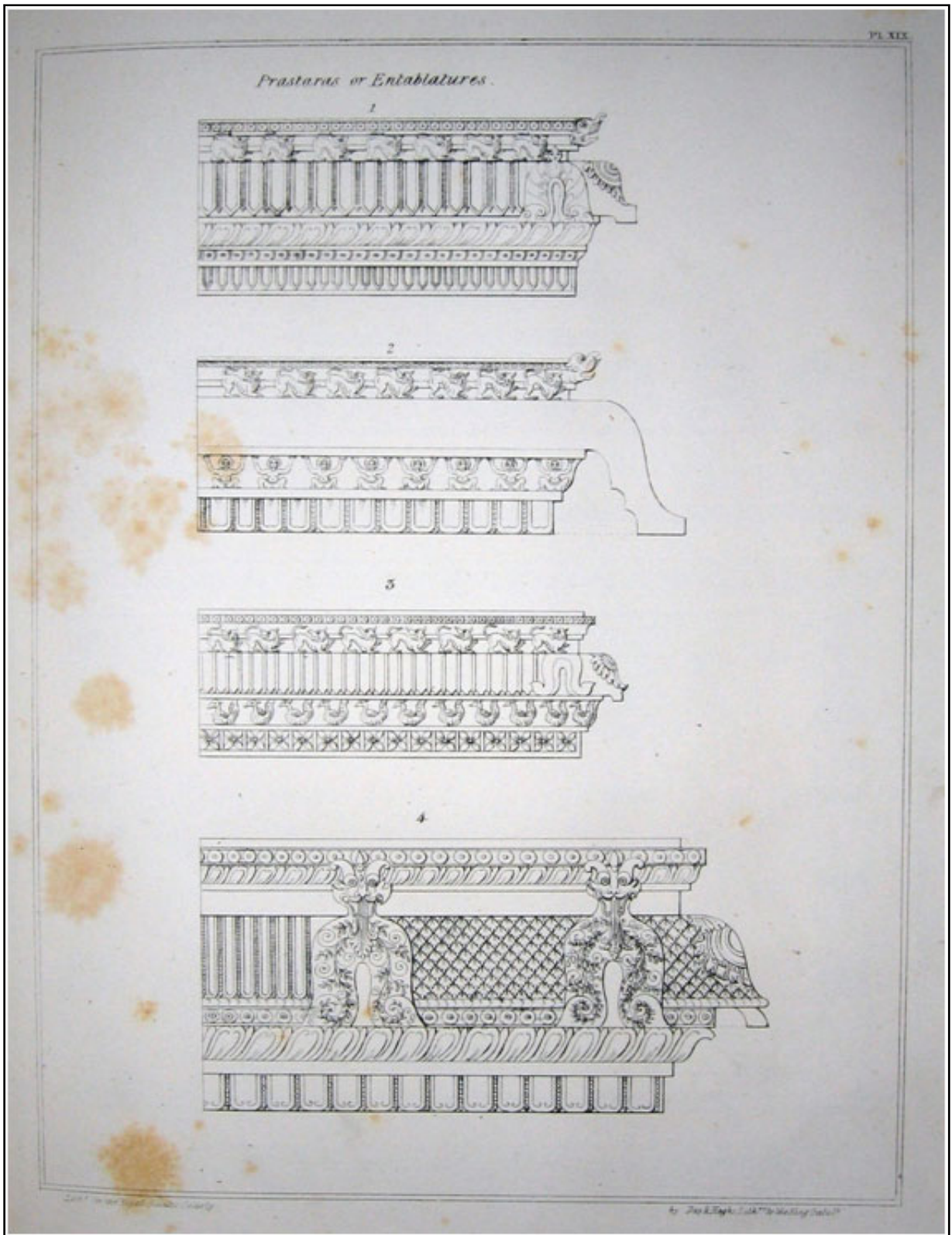


Figure 17- Entablatures<sup>72</sup>

<sup>72</sup> Rám Ráz plate 19

## Intercolumniation

For the intercolumniation two different approaches can be used<sup>73</sup>. The first one is relative to the rest of the building<sup>74</sup>: “The intercolumniation may be either two, three, four, or five diameters; it is measured in three ways, first from the inner extremity of the base of the pillar to that of another; secondly from the centre of the two pillars, and, thirdly from the outer extremities of the pillars including the two bases.”

The second approach to intercolumniation is not relative to the building. In this approach the intercolumniation consists of 9 different possibilities. These are defined by 2 or 4 cubits, where each time 6 digits can be added. The architect can chose all of the 9 possibilities. Here it doesn't matter what its type is, but the disposition of the pillars has to be regular, because otherwise it is believed to bring destruction upon the building and upon its site<sup>75</sup>.

## The building order

When the architect had made a design<sup>76</sup> the building could start. For instance the building order of a one level South Indian temple consisted of 9 steps<sup>77</sup>:

1. A base would be made
2. Placing of the pillars
3. Putting the walls up
4. Placing the handrail
5. Adding the entablature
6. Adding the roof
7. Adding of the attic
8. Adding of the summit
9. Adding the final elements

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<sup>73</sup> In the description of the intercolumniation the Mánasára and the Mayamatam differ. The Mánasara explains it as something relative to the rest of the building, while the Mayamatam uses a non relative approach. Which of the two has been used more, or which one the architect should chose, is not known.

<sup>74</sup> Rám Ráz p32

<sup>75</sup> Dagens p193

<sup>76</sup> For an example see for instance the drawings discovered by Pandit Sadashiv Rath Sharma of the Padmakesara Deula at Konark (Sonit Bafna p35)

<sup>77</sup> Ar. Vinay Mohan Das p8. Since this information is quite new and since not more information is available it is out of the reach of this essay to verify if this information is correct

## The role of the architect

In the *Mánasára* it is explained where the architect comes from and what his tasks are. First you have the architect of the universe. That is Visva-karman and he comes from Siva, Brahma and Indra<sup>78</sup>. Visva-karman has four faces. The eastern face is called Visva-bhu and he is the progenitor of the universe. The southern face is called Visva-vit and he is the knower of the universe. The northern face is called Visvastha and he is the resident of the universe. Finally, the western face is called Visva-srastar and he is the creator of the universe.

From these four faces four children were born. From the eastern face Visva-karma was born. From the southern face Maya was born, from the northern face Tvashtar was born. And from the western face Manu was born. All these children then married. Visva-karma to the daughter of Indra, Maya to the daughter of Surendra, Tvashtar married the daughter of Vaisravana and Manu married the daughter of Nala.

Each of these couples got one son who is important for the role of the architect. The son of Visva-karman is called sthapati or master-builder. The son of Maya is known as sutra-grahin or draftsman. The son of Tvashtar is known as vardhaci or designer. The son of Manu is called takshaka or carpenter.

Of these four architects the master builder (sthapati) is the most important one. He is the guide or guru of the other three, but he also needs to have the best knowledge. He needs to know all the branches of knowledge, knows the Vedas, is deeply learned in the science of architecture and knows how to direct.

The draftsman (sutra-grahin) also knows the different branches of knowledge, knows the Vedas and he is an expert in drawing.

The designer (vardhaki) knows the Vedas, has a capability of judging correctly in architectural matters, and is an expert in the work of painting.

The carpenter (takshaka) knows carpentry well, is sociable, helpful to colleagues, faithful to his friends and kind in nature. He should study the Vedas.

The *Mánasára* describes that building-work can nowhere in the world be done without the help of these four people<sup>79</sup>.

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<sup>78</sup> Siva is the destroyer or transformer, Brahma is the creator and Indra is the weather or war God.

<sup>79</sup> Ar. Vinay Mohan Das p5-7



## The Indian order versus the Western orders

In the literature not much information can be found concerning the differences between the Indian and the Greek, Roman and Egyptian orders. Rám Ráz is one of the few who has made a comparison between these<sup>80</sup>.

Rám Ráz writes that the difference in the Indian order chiefly consists in the proportion between thickness and height of pillars; while that of the Grecian and Roman orders depends, not only on the dimensions of columns, but also on the form of the other parts belonging to them.

About the proportions of columns, Rám Ráz writes that, the second sort of column in the Hindú architecture<sup>81</sup> may be compared with the Tuscan, the third with the Doric, the fourth with the Ionic, and the fifth with the Corinthian or Composite pillar. Rám Ráz thinks that this affinity between the different columns of India and of Rome and Greece is really striking. For that reason he believes there had to be a similar background for the origin of both. It stays unclear though where this origin can be found. There is some difference though. According to Rám Ráz, there are other columns in the Indian architecture, not only one diameter lower than the Tuscan, but from one to two diameters higher than the Composite.

According to Rám Ráz, the Egyptian columns appear to have no fixed proportion in regard to thickness and height. In some of the specimens of the ruins of Upper Egypt, the height of the columns consists of from four to six times the lower diameter. This is similar to the first sort of the Indian pillar. The orders of India, and of Greece and Rome, are, according to Rám Ráz, remarkable for the beautiful effect of their proportions, a circumstance to which little regard has been paid by the Egyptians.

Rám Ráz then writes that both the Indian and Grecian columns are diminished gradually in their diameter from the base to the summit of the shaft. This is different from the Egyptians where this practice has never been observed. They probably used an opposite rule, where the shafts are made narrower at the bottom than at the top.

According to Rám Ráz there was a general rule adopted by Hindu architects. In this rule the thickness at the bottom is divided into as many parts as there are diameters in the whole height of the column. So, the column gets smaller towards the top. This differed from the Grecian and Roman architecture, where the diameter of the upper part of the shaft is made one-sixth less than its thickness at the base. So the higher a column gets the thicker it stays towards the top.

The main point why Rám Ráz was using this explanation was to show that the Greeks weren't the only ones that used scientific skill to achieve the most beautiful result. The Indians also used science to achieve beauty.

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<sup>80</sup> Rám Ráz p38 - 40

<sup>81</sup> See figure 13, 14 and 15 in this essay for the different Hindu pillars and figure 18 for the Roman and Greek pillars



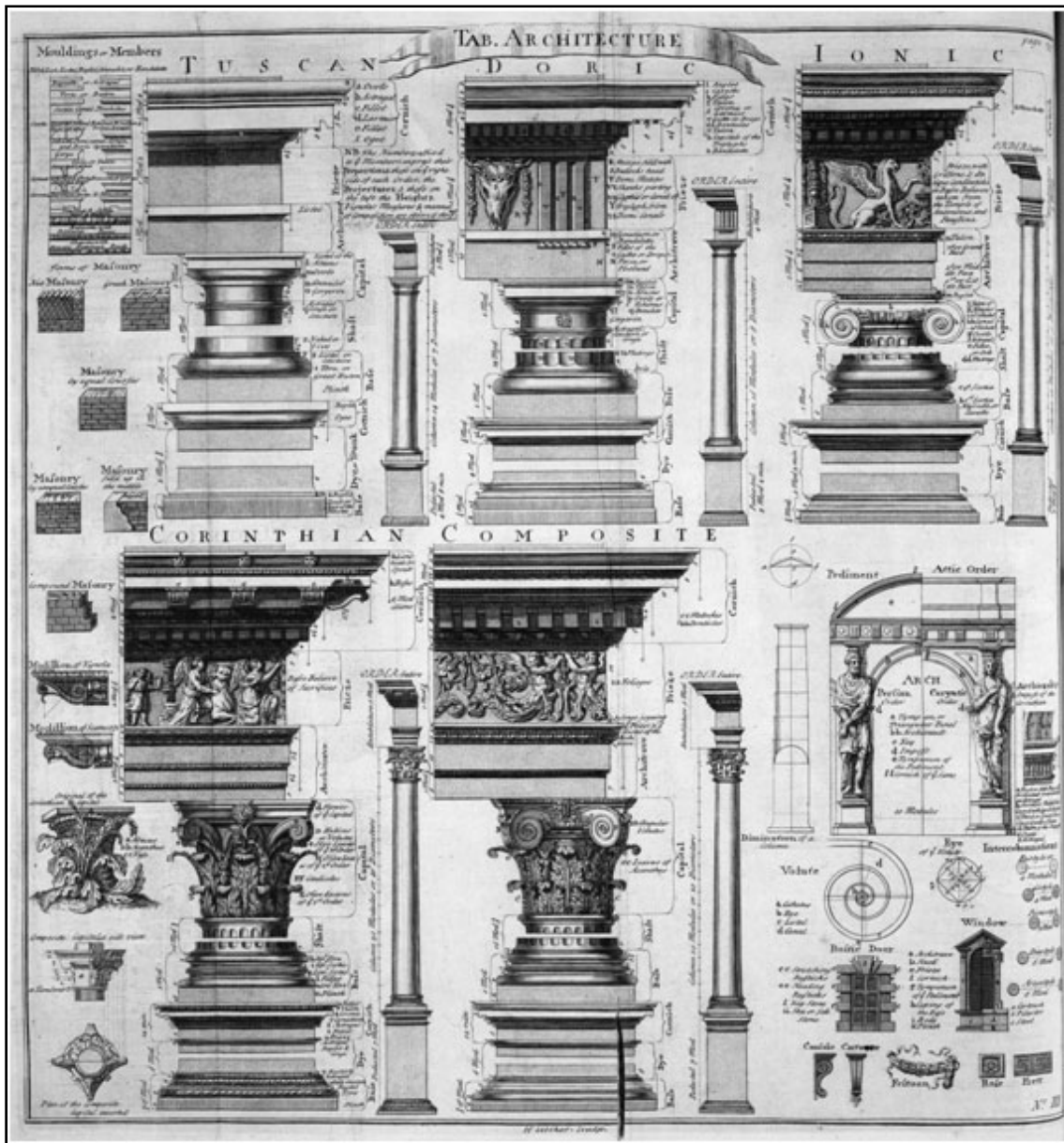


Figure 18 – The classical western orders from the Cyclopaedia by Ephraim Chambers of 1680-1740<sup>82</sup>

According to Rám Ráz the plan of the Grecian, Roman and Egyptian columns are always round. The Hindu columns can on the other hand be of every shape<sup>83</sup>. The decorations of the Egyptian columns often represent a bundle of reeds tied up with a cord on the top. On the top a square stone is placed. He writes that in some specimens also bindings or fillets in various parts of the shaft are found, and that in the interval between them, reeds and hieroglyphics are represented. The Indian orders differ in this respect. Not any of these ornaments can be found in this architecture.

The Hindu intercolumniation differs from the Grecian one. In the Grecian one there is a very clear description of the columns. In the Hindu architecture only the spaces allowed

<sup>82</sup> System

<sup>83</sup> As has been shown in this essay this is not entirely true (see chapter Sthamba or pillar and the thickness of walls). There were a limited amount of shapes permitted, but the point that Rám Ráz tries to make is still valid. The Hindus had much more shapes except for the circle.

between two different pillars is known. But, as Rám Ráz writes, these almost nearly coincide with the Grecian mode of intercolumniation, although a lot of times this can also not be true. According to Rám Ráz the same may perhaps be said about the Egyptian colonnades.

The Indian pedestals and bases are, according to Rám Ráz, made more systematically and afford a greater variety of proportions and ornaments than the Grecian and Roman ones. In the European architecture, the forms and dimensions of the pedestals and bases are fixed by invariable rules, with respect to the orders in which they are employed. In the Indian on the other hand, the choice is left much more open to the option of the artists.

About the capitals Rám Ráz writes that the Grecian ones mark the distinction of the several orders. In the Indian capitals the artist can vary at pleasure, though not without regard to the diameter and length of the shaft. There are not many similarities between the Indian – and Grecian capitals, but the plainest of the Indian ones are found at a distant view to bear some resemblance to the Doric and Ionic capitals. The more elaborate kind are sometimes so much overloaded with a sort of filigree ornaments, that they distract from the effect of the beautiful proportions of the whole. The Egyptian capitals are, according to Rám Ráz, much more elegant. They are supposed to have given the first idea of the Corinthian Capitals.

About the entablature Rám Ráz writes that the Indian order doesn't allow for much variety in composition as well in its relative proportions. In the Grecian and Roman architecture on the other hand the entablature is varied for each order both in form and in magnitude. The Indian entablature is also much heavier than the Grecian one. This is not seen as a problem by Rám Ráz. He thinks that the Indian one is unrivalled in its richness.

Another thing worth mentioning is that Rám Ráz establishes that in the existing treatises he studied no mention was made of any thing like a substitution of human figures for columns to support the entablature. But figures of demons and animals can be found on the shaft. Rám Ráz did see some human figures on the sides of pillars in temples and porticoes, but he concludes that these are by no means like the ones found in the Egyptian architecture.

## To conclude

The Indian Hindu temple architecture proves to be an architecture as developed as the western ones. It has clear rules how a building should be made. It starts with defining North, East, South and West. These directions form the basis for the building and it helps to construct the walls of the temple. Clear directions and tools can then be used to finish the building.

It has to be seen as a pity that not much focus has been given internationally and in India by scholars and others on the subject of the Indian orders. An example is the gnomon. In this essay the gnomon has been visually constructed for the first time in the correct way. It shows that there are still a lot of things to find out.

But I disagree with James Fergusson about who was written<sup>84</sup>: *‘James Fergusson, the architectural historian, analysed Indian architecture for the first time in his book, History of Indian and Eastern Architecture. Fergusson recognized two types of Architecture: Architecture of Intellect, with the Parthenon in Greece as its ideal, and Architecture of Emotions, with the Halebid Temple in India as the best of this form’*. There are some great differences between the Western and Indian orders, but as this essay hopefully proves was the Indian architecture not emotional. It was built in an intellectual way, with very clear rules how a building should be realised.

For this reason much more study on the similarities and differences between the Indian – and Western orders can be of great importance. It might change the way in which we see the orders in general.

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<sup>84</sup> Kamiya

## Basis of this essay

The basis of this essay is formed by the Mayamatam and Mánasára. These two both treat the Silpa Sastras. The Silpa Sastras most probably have their origin in the Vedas. These Vedas were a collection of texts which were most probably written in the period from about the 15<sup>th</sup> till the 5<sup>th</sup> century B.C.<sup>85</sup>. If Indian architecture examples have been used in this essay they have their origin in the early Calukya dynasty, which existed around the seventh – and eighth century A.D. This period was chosen because *“The formative stages of this (Southern temple architecture) can most clearly be traced, among the seventh- and eighth century monuments erected under the Early Calukya dynasty”*<sup>86</sup>. The Indian temple architecture of this period can be divided into two broad categories, the Nagara and the Dravida. These are associated respectively, but not exclusively, with northern and southern India<sup>87</sup>. In this essay the Southern Dravida style is discussed. While this style has its origins in the 7<sup>th</sup> century A.D. the style goes on till somewhere in the 10<sup>th</sup> century A.D. Somewhere in the 10<sup>th</sup> century the Dravida style changed to a style called Vesara<sup>88</sup>. The early Calukya dynasty existed from the 6<sup>th</sup> till the 8<sup>th</sup> century A.D. and the later Calukya dynasty existed from the 10<sup>th</sup> till the 12<sup>th</sup> century A.D.<sup>89</sup>.

In table 3 the source and origin of the chapters in this essay are shown.

Chapter	Source	Origin
Introduction	Silpa Sastra	1500 - 500 B.C.
Vastupurusa	Silpa Sastra	1500 - 500 B.C.
The system of measurement	Silpa Sastra	1500 - 500 B.C.
Orientation – The gnomon	Silpa Sastra	1500 - 500 B.C.
Zoning in the temple – Using the grid	Silpa Sastra	1500 - 500 B.C.
Defining the groundplan	Indor temple	8 <sup>th</sup> century A.D.
Going vertical – The temple as a house for the Gods	Early Calukya dynasty	7 <sup>th</sup> – and 8 <sup>th</sup> century A.D.
The Hindu order	Silpa Sastra	1500 - 500 B.C.
Intercolumniation	Silpa Sastra	1500 – 500 B.C.
The building order	Silpa Sastra	1500 – 500 B.C.

<sup>85</sup> Encyclopaedia Britannica – Vedic religion

<sup>86</sup> Hardy, tradition and transformation p181

<sup>87</sup> Hardy, tradition and transformation p181

<sup>88</sup> Hardy, tradition and transformation p181

<sup>89</sup> Encyclopaedia Britannica - Calukya Dynasty

The role of the architect	Silpa Sastra	1500 – 500 B.C.
The Indian order versus the Western orders	Greek architecture <sup>90</sup> Roman architecture <sup>91</sup> Egyptian architecture <sup>92</sup> Silpa Sastra	10 <sup>th</sup> till 6 <sup>th</sup> century B.C. 8 <sup>th</sup> and 7 <sup>th</sup> century B.C. 27 <sup>th</sup> and 26 <sup>th</sup> century B.C. 1500 – 500 B.C.

Table 3

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<sup>90</sup> The Columbia Encyclopedia, Sixth Edition - Greek architecture

<sup>91</sup> The Columbia Encyclopedia, Sixth Edition - Roman architecture

<sup>92</sup> The Columbia Encyclopedia, Sixth Edition - Egyptian architecture

Some pictures of South Indian Hindu temples

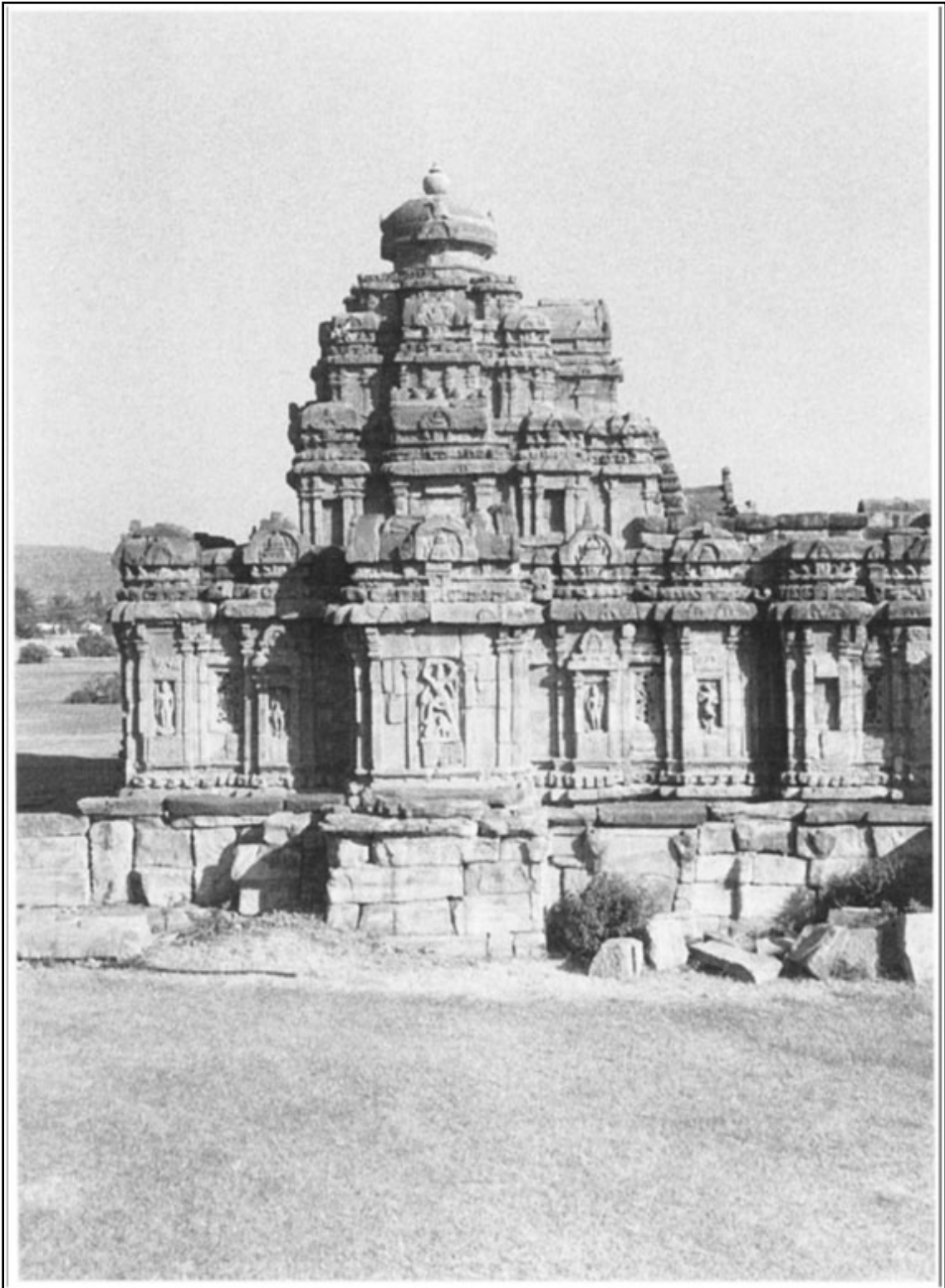


Figure 19 - Mallikarjuna temple, Pattadakal, c. 742<sup>93</sup>

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<sup>93</sup> Hardy, tradition and transformation p186

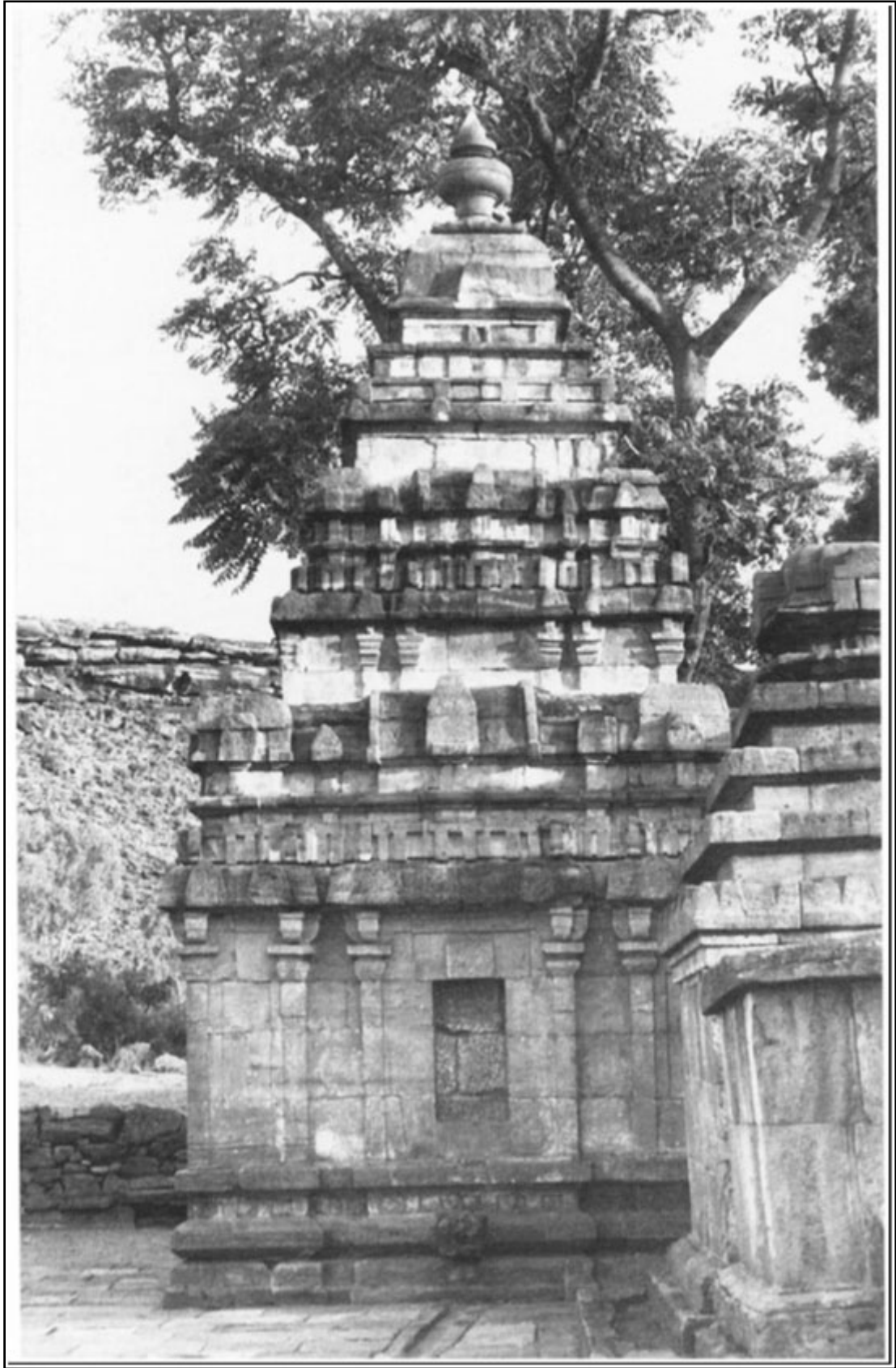


Figure 20 - BhGandtha temple, Badami, c. 730<sup>94</sup>

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<sup>94</sup> Hardy, tradition and transformation p186



Figure 21 – Ravana Phadi South Temple, Aihole, 8<sup>th</sup> century A.D.<sup>95</sup>

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<sup>95</sup> Tartakov p53



## Reason for the essay

In the summer of 2007 this essay has been written. The initial research focus was rather vague. On a website on a book<sup>96</sup> the next thing was written: *“James Fergusson, the architectural historian, analysed Indian architecture for the first time in his book, History of Indian and Eastern Architecture. Fergusson recognized two types of Architecture: Architecture of Intellect, with the Parthenon in Greece as its ideal, and Architecture of Emotions, with the Halebid Temple in India as the best of this form”*. He added that forms of architecture in the world lie between these two extremes. If there is something which could be referred to as ‘complete architecture’ it should exist somewhere in between these two monuments.

The plan was to try and study the differences and similarities between the two temples. After some study it became clear that this was not an easy task, since not much was known about the Indian architecture. The different sources mainly focussed on a specific part of Indian architecture, but a clear picture wasn’t available<sup>97</sup>. Furthermore were the most important works not really up to date. The most important works still used today in 2007 are all from before the 1990s.

Throughout the 20<sup>th</sup> century a wide variety of essays had been written by numerous people. Especially at the beginning of the 21<sup>st</sup> century these essays brought a new light on the subject of South Indian temple architecture.

Then the idea for this essay had been born. The goal was to connect the different puzzle pieces and to give a short and clear introduction on the system that was used to design a South Indian temple. This essay than could be used by other scholars as a basis for further research.

The method used to reach this goal has been one of several steps. First as much information as could be found was collected. Since on the subject not very much has been written that task was not too hard. Three places were of special importance for finding information. Those were the “National library of the Netherlands” in The Hague in The Netherlands<sup>98</sup>, the “Kern Institute” in Leiden in The Netherlands<sup>99</sup> and the website [jstor.org](http://jstor.org).

Then all this information was read and every time some useful information was found it was put in a document. After some time it became possible to put this information in a certain order. This process was repeated till enough information was found to understand a logical order for the essay. Then the writing of the essay could start and every time the information wasn’t sufficient enough there would be a new search through the sources till the essay was completed.

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<sup>96</sup> Kamiya

<sup>97</sup> There are some comprehensive works on Indian architecture, but they mainly focus on the Silpa Sastras or on the built environment. Connections between these in such book were not found during the research of this essay. A list with major works can be found in table 1 of this essay.

<sup>98</sup> [www.kb.nl](http://www.kb.nl)

<sup>99</sup> [www.kerninstitute.leidenuniv.nl/](http://www.kerninstitute.leidenuniv.nl/)

## Suggestions for further reading

Except for the books, essays and websites that have been written in the bibliography there are some other suggestions for further reading:

- Ames, Van Meter. "Aesthetic Values in the East and West." *The Journal of Aesthetics and Art Criticism*, Vol. 19, No. 1. , Autumn 1960: 3-16.
- McCarty, Richard. "'The Aesthetic Attitude' in India and the West." *Philosophy East and West*, 1986: 121-130.
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## Appendix 1 – Example of description given by Mayamatam and Mánasára

To show the extend to which the Mayamatam and Mánasára give instructions a part from chapter 17 from both of the books will be shown.<sup>100</sup> These chapters treat the joinery. These fragments are chosen to show that the same subjects are treated in a different way in the Mánasára and the Mayamatam.<sup>101</sup>

First lines 1 to 7 (of 62) from the Mayamatam are shown:

*Now the assembling of the oblique, vertical and horizontal pieces is explained. A single construction (is made) with many pieces (and results) from their being assembled. Weakness (being the characteristic) of the tops of trees the solidity increases with distance from it. It is prescribed that assemblies should be made with wood of good quality and of uniform type.*

*Varieties of assembly: There are six sorts of assembly: mallalila, brahmaraja, venuparvaka, pukaparva, devasandhi and dandika.*

*Rules for assembling: The architect, standing outside, at the four cardinal points, should first examine the house. Then he is to assemble, to the right and to the left, what is long and what is short, respectively. If his intention is to make an assembly at the centre and to the right, then he assembles a very long piece in the centre and long and short ones as before. Otherwise, pieces of uniform size should be assembled to left and right with a longer one in the middle; but, if there is no middle piece, then the pieces of equal size are assembled to left and right. This is the way assemblies are done, exterior (to the house).*

Now lines 1 to 15 (of 221) from the Mánasára are shown:

*Joinery and the rules thereof are now described: the joining of timbers in buildings is called joinery. The lower part (i.e. trunk) of a tree is strong and the upper part weak; the wise (architect) should, therefore, select (lit. join) all timbers from the lower part. The wood should be selected in this way and be matched by the carpenter. The timbers should never bend, broken or pointed.*

*(First) the malla-(sam)bandha, secondly the brahma-rajá, (then) the joineries called venu-parva, puga-parva, similarly the deva-sandhi, the rishi-sandhi, the ishú-parva, and the dandika these are stated to be the eight kinds of joinery (which are formed) by joining timbers (as stated below).*

*When two pieces of timber are joined there should be one joint: this is known as the malla-bandha. In joining three and four pieces of timber, there should be two and three joints respectively: this is called the brahma-rajá by the ancients versed in the science (of architecture).*

*With five pieces of timber there should be four joints: this is called the vanu-parva. With six pieces of timber there should be five joints: this is praised as the puga-parva.*

Now another part of the Mánasára is shown<sup>102</sup>. These are lines 203 till 211 (of 217) from chapter 12 that treats the foundation. This fragment is chosen to show that even though the texts may say that you are free to lay the bricks in the way you want too, there are still

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<sup>100</sup> Dagens p235 and Acharya p187

<sup>101</sup> Even though the contents of the texts are not really different.

<sup>102</sup> Acharya p120

very clear rules that still should be followed. In this sense there could be places where it seems that there is a lot of freedom in the texts, but in fact there is not<sup>103</sup>:

*In case of residential buildings the first brick should be laid in accordance with one's own desirable (i.e. customary) rules. It is stated that the figures of (the following) letters should be marked in order (namely) of sibilant S on the eastern brick, of palatal S on the southern brick, of dental S on the western brick, of the letter H on the northern brick, and of the mystic sign ohm on the central brick.*

*The eastern brick should extend towards the south, the southern brick towards the west, the western brick towards the north, and the northern brick towards the east.*

*The wise (architect) should lay at the centre the herbs and roots as stated before; both the chief architect and the master should do this work by turn.*

One last example will now be given from chapter 21 of the Mayamatam. It treats three storied temples and here lines 80b till 86a (of 99) will be shown. This part is chosen because it shows that also the sorts of motifs are described. The amount of freedom when designing a temple is thus limited for the architect<sup>104</sup>:

*Above a lotiform base a beautiful liana inclines in relation to the vase; above, a pilaster is decorated with intermingled foliage and creepers; above, (again), a lotus which crowns the abacus forms the summit of the kumbhalata. Such is the padmakumbhalata.*

*This may be done otherwise: above the upper joint (of the pilaster) is placed a dye ornamented with a human image; it is then a stambhakumbhalata whose upper part is like that of a stambhatorana. The motif is placed in the recesses of the walls of divine and human dwellings.*

*The vrttasphutita is as high as the colonettes of the arcature; its width is six, eight, ten, twelve or fourteen digits; its projection is half, two thirds or one third its width; the upper part is rounded and it comprises a dado ornamented with a sukanasi. It is the ornament of divine dwellings.*

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<sup>103</sup> In this fragment (and in the rest of the texts) not all the Indian words are written correctly. This is due to the possibilities of the soft – and hardware used to write this essay.

<sup>104</sup> Sometimes it even explains what kind of colours should be used by the architect.