AN OVERVIEW INTO THE PROPORTIONS OF THE BUDDHIST STUPA

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DECLARATION

This is to certify that the Seminar entitled ***Pritam Roy*** submitted by me is a record of my own work carried out under the supervision of ***Ar. Vishakha Kawathekar*** . The matter embodied in this seminar work, other than that acknowledged as reference, has not been submitted for the award of any degree or diploma in this or any other institute.

School of Planning and Architecture — Pritam Roy

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December - 2011

CERTIFICATE

It is certified that the declaration given above by ***Pritam Roy*** regarding his/her Seminar work is true to the best of our knowledge.

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A Seminar Report

BACHELOR OF ARCHITECTURE

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I would like to express my gratitude to my MENTOR PROF. VISHAKHA KAWATHEKAR for the useful comments, remarks and engagement through the learning process of this research. Furthermore I would like to thank PROF. SANDEEP ARORA for introducing me to the topic as well for the support on the way.

ABSTRACT

Stupa is essentially **a Buddhist commemorative monument** housing sacred relics associated with *Buddha* or other saintly persons. The hemispherical form of the stupa seems to have been derived from the pre-Buddhist burial mounds in *India*.

While conducting case studies for my thesis project, "*Buddha Smriti Stupa and Buddha Samyak Darshan Sangrahalaya in Vaishali, Bihar*", I have come across various instances which has revealed that, in addition to the various elements that make a stupa, the structure is built to "certain proportions".

This study aims at understanding the basic structure of the stupa in accordance to these proportions. These very proportions are to be initiated into designing of the *Smriti Stupa* at Vaishali for the thesis.

AIM:

An investigation into the sizes and proportions of stupas and synthesising the data such that it can be used to design the Buddha Smriti Stupa in the project site at Vaishali.

OBJECTIVE:

- To study, decipher and understand the inherent proportions of the Buddhist stupas.
- An analysis into the idea: do the differently sized stupas from varying eras and locations indeed follow a strict proportion or do they vary through time.
- If the proportions do vary, what proportions should be considered in designing the Smriti Stupa.

SCOPE:

The scope of this seminar presentation is limited to the study of three stupas in India that has been constructed through different periods of time.

The intention is to determine the proportions of the ancient Indian stupa, investigate their co-relation in proportions with a live case study: that is a stupa constructed with modern methods and come to conclusion of a proportion that can be followed for the thesis.

METHODOLOGY:

- To gather information on the basic dimensions of the ancient stupas, as they stood when completed.
- Find the relative proportions of the stupa with regard to span, height and angles.
- Comparison of the relative proportions.
- Infer a ratio that can be considered while designing the stupa for the thesis.

1. INTRODUCTION

The study of Buddhist architecture of India has attracted the fascination of scholars throughout the world.
The earliest structures were residential. They were meant for inhabitation, were secular in origin and have been reported from the early historical periods. With the increase in religious ideology of differing forms and beliefs, the religious buildings came into existence. In the history of Indian civilization, since the 7th century BCE, Buddhism has been a way of life and a socio-cultural system. After its advent in Magadha, present day Bihar,

The Stupa is so linked to the Buddhists way of life that they were not content to erect monuments alone: sculptors represented them on stones, and we find them abundantly represented on panels on the Stupa monuments itself, on the railings-balustrades surrounding it, on cave walls, structural, monolithic made out of varied material starting from clay, stone, wood, ivory, metals, terracotta etc. the study material is abundant and spreads over time and space. {Chauley, 2013}

The Stupa is regarded as a monument for veneration. But it also seems to be associated with votive and commemorative and offering purposes; moreover Stupa was related to the ritualistic and commemorative with sectarian, affiliation with school of philosophical obligatory and was bound by aspects of social-economic life.

The Buddhist texts like the *Avadana, Satakam, Mahavadana* and *Stupavadanam* mentions about the commemorative aspects of the Stupa even the Jaina literature like *Raya Pasenaiya Sutta* refers to it. Probably in the later period, due to deep desire of the common mass to worship the lord for the sake of salvation, Stupa acquired its votive character as well. {Chauley, 2013}

Early Stupas were devoid of art maybe since Ashoka's time Stupa architecture acquired prominence in the socio cultural life of the country and art began to develop around the Stupa structure.

According to A. Cunningham, Maisey and Foucher the remains of the Stupa found at Sanchi can be classified into three categories (Cunningham, 1847)

- Religious edifies or Stupa dedicated either to the celestial or the Adi-Buddha or to the mortal Buddha.
- Funeral Stupa erected over the relics of mortal Buddha or over his disciples.
- Stupa for commemorative Buddha.

2. The PROPORTIONS

A variety of Buddhist architecture was conceived and constructed in various parts of India. Of these, the Stupa Architecture is a significant part. Its origin, evolution and the structural arrangement remains an exciting process.

The reasons very aptly quoted by Susila Panth (Panth 1976: xi) in the following words:-

"Probably in no other religion, except Buddhism, a particular Structure has been recommended by its founder either for the worship or for commemoration or as a means of salvation. It is the Stupa that has been commended by the Tathagata himself. It is, therefore, not only religious but it symbolizes the presence of the lord, though without any icon. Bit it creates the same sense of reverence and fear in the minds of the people and similar reaction as found in the Brahmanical practices of idol worship, but, at the

same time, it avoids all the formal ritualistic performances of the latter. It epitomizes the essence of Buddhism and suggests the path to Nirvana. It satisfies the psychological urge to worship, and, simultaneously stands for a crusade against ritualistic and cult-image worship. It is in this respect that it is a 'magic instrument."

Despite that, later incarnation of the stupas has been created with an idolized representation of the Buddha in the cardinal directions, the basis of the notion of this religious structure remains the same.

Benisti Mireille very aptly states {Benisti, 1981}-
"The Stupa's profile is extremely varied, depending on the epoch and country, but it is always recognizable, as if it has conserved within itself, through all its transformations, something permanent which characterizes it. Object of worship and veneration, center of attraction of the pious people, solemn or familiar, it carries within itself, a part of history and Buddhist doctrine: it is a sign and a set of signs".

3. The SUBJECTS of the study

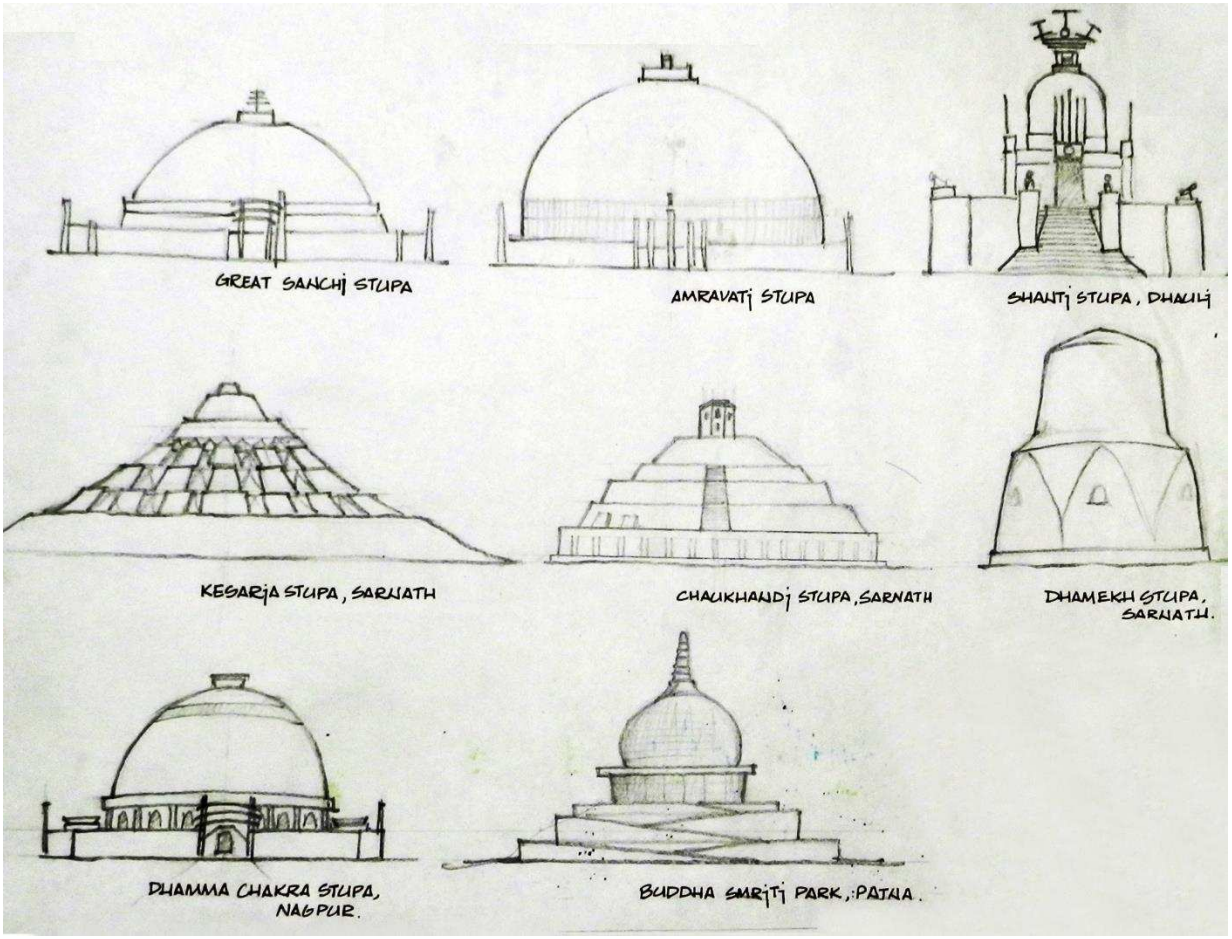


Figure 1: Forms of Stupa in India

There are various forms of the Stupa all across the country. But the project requirement specifically states a religious hemispherical Stupa of stone masonry.

Hence, the stupas that have been considered for the study have been selected on the basis of their varying periods of construction, shape and importance.

The GREAT SANCHI STUPA, and the ruins of the AMRAVATI STUPA are among the most celebrated Buddhist Stupas in India. The VISHWA SHANTI STUPA, on the other hand has been constructed in 1996 out of modern materials of

reinforced concrete, and fibre glass. Its physical and visual proximity to the project site was the main reason behind its selection.

4. The PARAMETERS of the study

The relevance of the study is to be construed upon the proportions between various dimensions of the parts of a stupa. They would be inclusive of the following:

- Base Diameter (D)
- Base Circumference (Cb)
- Total Height (H)
- Height of stupa/dome from the ground level (Hs)
- Height of Vedica from the ground level(Hv)
- Height of Harmika from the ground level (Hh)
- Individual Heights of the dome, the Harmika and the Chatri

The data obtained will be calculated in terms of their proportions with respect to each other. The final deductions would be based on the results of a basic super-imposition of the acquired data from the three stupas in relation to each other to formulate a basic proportional analysis on the basis of the repeated proportions, if any.

This data would help determine the final proportions of the designed stupa.

5. The RATIOS

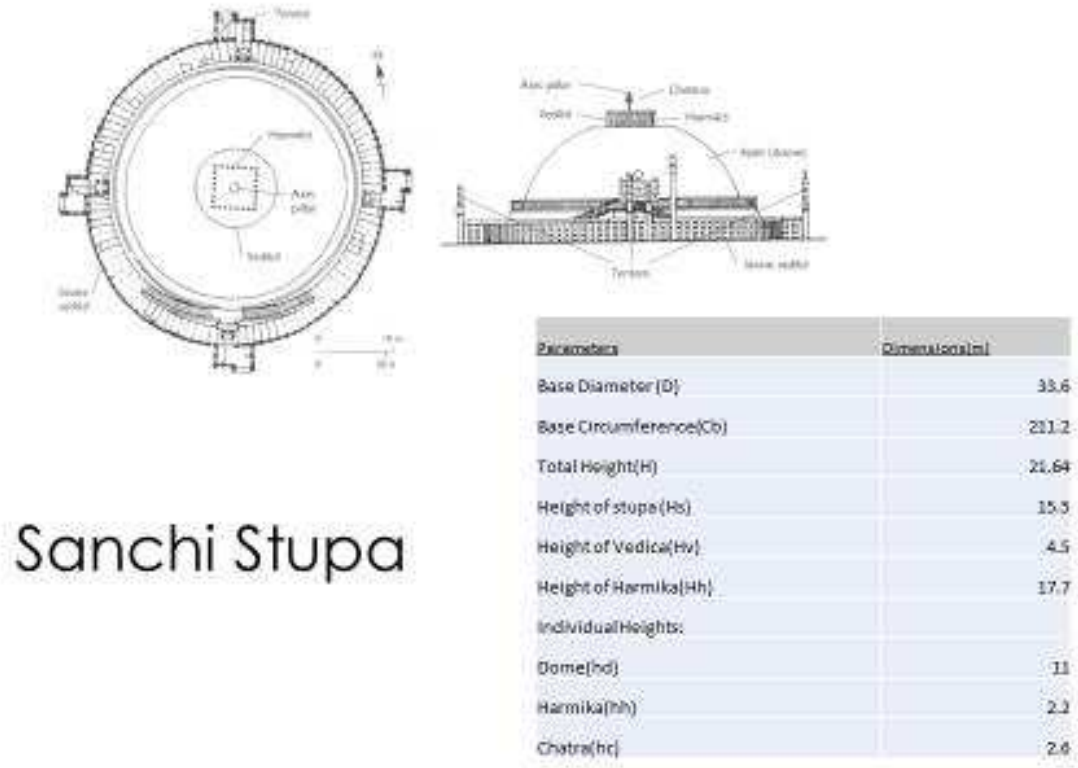
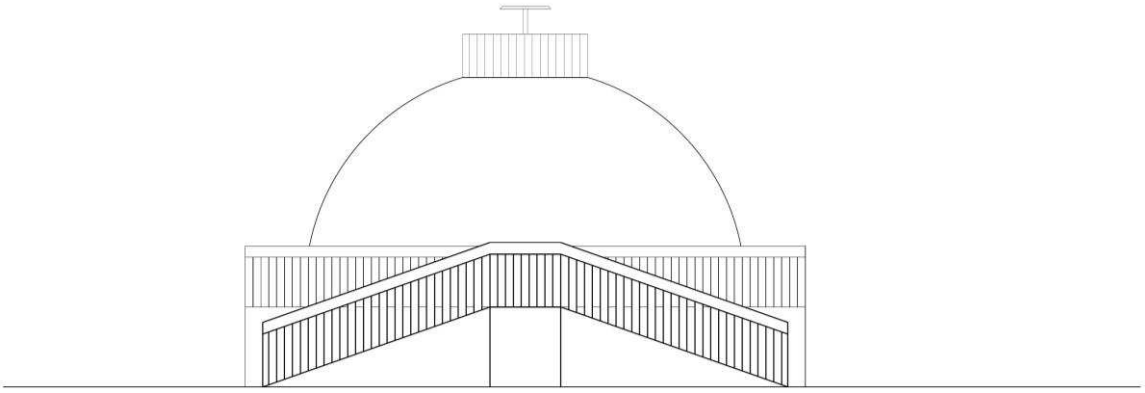


Figure 2: Sanchi Stupa

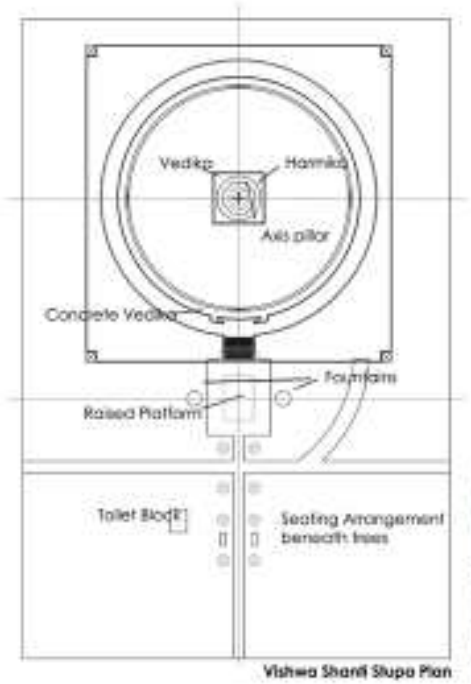
	D	Cb	H	Hs	Hv	Hh	hd	hh	hc
D	1	0.159091	1.55268	2.167742	7.46667	1.89831	3.05455	15.2727	12.9231
Cb	6.285714	1	9.759704	13.62581	46.9333	11.9322	19.2	96	81.2308
H	0.644048	0.102462	1	1.396129	4.80889	1.2226	1.96727	9.83636	8.32308
Hs	0.46131	0.07339	0.716266	1	3.44444	0.87571	1.40909	7.04545	5.96154
Hv	0.133929	0.021307	0.716266	0.290323	1	0.25424	0.40909	2.04545	1.73077
Hh	0.526786	0.083807	0.81793	1.141935	3.93333	1	1.60909	8.04545	6.80769
hd	0.327381	0.052083	0.508318	0.709677	2.44444	0.62147	1	5	4.23077
hh	0.065476	0.010417	0.101664	0.141935	0.48889	0.12429	0.2	1	0.84615
hc	0.077381	0.012311	0.120148	0.167742	0.57778	0.14689	0.23636	1.18182	1

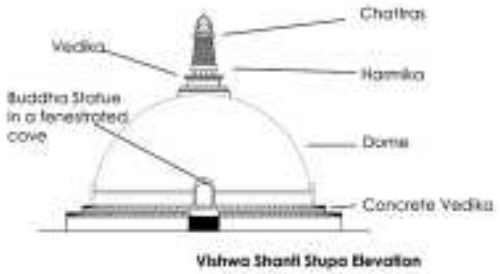
Table 1:Ratio of the Elements of Sanchi Stupa



Parameters	Dimensions(m)
Base Diameter (D)	22
Base Circumference(Cb)	138.3
Total Height(H)	15.1
Height of stupa (Hs)	13.9
Height of Vedica(Hv)	1.5
Height of Harmika(Hh)	15.1
Individual Heights:	
Dome(hd)	9.2
Harmika(hh)	1.5
Chatra(hc)	1

	D	Cb	H	Hs	Hv	Hh	hd	hh	hc
D	1	0.159074	1.456954	1.582734	14.6667	1.45695	2.3913	14.6667	22
Cb	6.286364	1	9.15894	9.94964	92.2	9.15894	15.0326	92.2	138.3
H	0.686364	0.109183	1	1.086331	10.0667	1	1.6413	10.0667	15.1
Hs	0.631818	0.100506	0.92053	1	9.26667	0.92053	1.51087	9.26667	13.9
Hv	0.068182	0.010846	0.92053	0.107914	1	0.09934	0.16304	1	1.5
Hh	0.686364	0.109183	1	1.086331	10.0667	1	1.6413	10.0667	15.1
hd	0.418182	0.066522	0.609272	0.661871	6.13333	0.60927	1	6.13333	9.2
hh	0.068182	0.010846	0.099338	0.107914	1	0.09934	0.16304	1	1.5
hc	0.045455	0.007231	0.066225	0.071942	0.66667	0.06623	0.1087	0.66667	1





Vishwa Shanti Stupa

Parameters	Dimensions(m)
Base Diameter (D)	36
Base Circumference(Cb)	114
Total Height(H)	36
Height of stupa (Hs)	25.6
Height of Vedica(Hv)	5.6
Height of Harmika(Hh)	28.1
Individual Heights:	
Dome(hd)	20
Harmika(hh)	2.5
Chatra(hc)	7.9

Figure 3:Vishwa Shanti Stupa, Vaishali

	D	Cb	H	Hs	Hv	Hh	hd	hh	hc
D	1	0.315789	1	1.40625	6.42857	1.28114	1.8	14.4	4.55696
Cb	3.166667	1	3.166667	4.453125	20.3571	4.05694	5.7	45.6	14.4304
H	1	0.315789	1	1.40625	6.42857	1.28114	1.8	14.4	4.55696
Hs	0.711111	0.224561	0.711111	1	4.57143	0.91103	1.28	10.24	3.24051
Hv	0.155556	0.049123	0.711111	0.21875	1	0.19929	0.28	2.24	0.70886
Hh	0.780556	0.246491	0.780556	1.097656	5.01786	1	1.405	11.24	3.55696
hd	0.555556	0.175439	0.555556	0.78125	3.57143	0.71174	1	8	2.53165
hh	0.069444	0.02193	0.069444	0.097656	0.44643	0.08897	0.125	1	0.31646
hc	0.219444	0.069298	0.219444	0.308594	1.41071	0.28114	0.395	3.16	1

Table 2:Ratio of the Elements of Vishwa Shanti Stupa Stupa

6. INFERENCE

The inference is drawn on the basis of comparing the similarities observed in

the different stupas on the basis of the proportions across different elements of them.

Table 3: Comparison Chart a

Sanchi III

	D	Cb	H	Hs	Hv	Hh	hd	hh	hc
D	1	0.159074	1.456954	1.582734	14.6667	1.45695	2.3913	14.6667	22
Cb	6.286364	1	9.15894	9.94964	92.2	9.15894	15.0326	92.2	138.3
H	0.686364	0.109183	1	1.086331	10.0667	1	1.6413	10.0667	15.1
Hs	0.631818	0.100506	0.92053	1	9.26667	0.92053	1.51087	9.26667	13.9
Hv	0.068182	0.010846	0.92053	0.107914	1	0.09934	0.16304	1	1.5
Hh	0.686364	0.109183	1	1.086331	10.0667	1	1.6413	10.0667	15.1
hd	0.418182	0.066522	0.609272	0.661871	6.13333	0.60927	1	6.13333	9.2
hh	0.068182	0.010846	0.099338	0.107914	1	0.09934	0.16304	1	1.5
hc	0.045455	0.007231	0.066225	0.071942	0.66667	0.06623	0.1087	0.66667	1

Sanchi

	D	Cb	H	Hs	Hv	Hh	hd	hh	hc
D	1	0.159091	1.55268	2.167742	7.46667	1.89831	3.05455	15.2727	12.9231
Cb	6.285714	1	9.759704	13.62581	46.9333	11.9322	19.2	96	81.2308
H	0.644048	0.102462	1	1.396129	4.80889	1.2226	1.96727	9.83636	8.32308
Hs	0.46131	0.07339	0.716266	1	3.44444	0.87571	1.40909	7.04545	5.96154
Hv	0.133929	0.021307	0.716266	0.290323	1	0.25424	0.40909	2.04545	1.73077
Hh	0.526786	0.083807	0.81793	1.141935	3.93333	1	1.60909	8.04545	6.80769
hd	0.327381	0.052083	0.508318	0.709677	2.44444	0.62147	1	5	4.23077
hh	0.065476	0.010417	0.101664	0.141935	0.48889	0.12429	0.2	1	0.84615
hc	0.077381	0.012311	0.120148	0.167742	0.57778	0.14689	0.23636	1.18182	1

Vaishali

	D	Cb	H	Hs	Hv	Hh	hd	hh	hc
D	1	0.315789	1	1.40625	6.42857	1.28114	1.8	14.4	4.55696
Cb	3.166667	1	3.166667	4.453125	20.3571	4.05694	5.7	45.6	14.4304
H	1	0.315789	1	1.40625	6.42857	1.28114	1.8	14.4	4.55696
Hs	0.711111	0.224561	0.711111	1	4.57143	0.91103	1.28	10.24	3.24051
Hv	0.155556	0.049123	0.711111	0.21875	1	0.19929	0.28	2.24	0.70886
Hh	0.780556	0.246491	0.780556	1.097656	5.01786	1	1.405	11.24	3.55696
hd	0.555556	0.175439	0.555556	0.78125	3.57143	0.71174	1	8	2.53165
hh	0.069444	0.02193	0.069444	0.097656	0.44643	0.08897	0.125	1	0.31646
hc	0.219444	0.069298	0.219444	0.308594	1.41071	0.28114	0.395	3.16	1

Table 6: Comparison between Sanchi I and Sanchi III Stupa

Similarities between the Sanchi I and Sanchi III Ratios

	D	Cb	H	Hs	Hv	Hh	hd	hh	hc
D		0.15		1.6 and 2					
Cb	6.2								
H	0.6	0.1							
Hs		0.1 and 0.07				0.9 and 0.87			
Hv		0.01 and 0.02							
Hh		0.1 and 0.08		1.08 and 1.1			1.6		
hd		0.06 and 0.05		0.67 and 0.7		0.6			
hh	0.06	0.01	0.09 and0.1	0.1		0.09 and 0.1	0.2		
hc	0.05 and 0.07	0.007 and 0.01			0.6	0.06 and 0.1			

Table 7: Similar Ratios in the three stupas

Similarities between the Sanchi I and Sanchi III in comparison with the Vishwa Shanti Stupa

	D	Cb	H	Hs	Hv	Hh	hd	hh	hc
D				1.6 and 2 and 1.4					
Cb									
H	0.6 and 1								
Hs		0.1 and 0.07 and 0.02				0.9			
Hv		0.01 and 0.02 and 0.04							
Hh		0.1 and 0.08 and 0.2		1.08 and 1.1 and 1.09			1.6 and 1.4		
hd		0.06 and 0.05 and 0.1		0.7		0.6 and 0.7			
hh	0.06	0.01 and 0.02	0.09 and0.1	0.1 and 0.09		0.09 and 0.1 and 0.08	0.2 and 0.1		
hc		0.007 and 0.01 and 0.06			0.6 and 1.4				

7. Conclusion

Most of the ratios considered, were a mismatch. But a few matched (within the scope of mathematical rounding up).

Even with the construction of these stupas taking place in different centuries, under different artisans and patrons, the small proportional similarities in the designing of the stupa is striking. Among them are:

- Height of the Vedika proportional to the
    - Diameter of the stupa
    - Circumference of the base and
    - the Height of the Stupa
- Height of the dome proportional to the Height of the Stupa
- Radius of the Dome proportional to the Circumference of Base and Height of the stupa.
- Height of the Harmika proportional to the Diameter of the Stupa, The Circumference of the Base and overall Height of the Stupa.
- The Height of the Chatri proportional to the Diameter of the base

Within the limitations of the considerations taken to simplify the comparison, it can be easily concluded that the design of the Stupas are based on certain Proportions.

The very proportions are to be followed when designing the Thesis project.

Material Type	In-Text Example	Reference List Example
Book: Single Author	Panth, 1976	Sushila Panth, South Asia Books, February 1976, Origin and Development of Stupa Architecture in India.
Book: Single Author	Benisti, 1981	Mirielle Benisti, 1981, Contribution a L'Etude Du Stupa Bouddhique Indien, obtained through interpretation.
Thesis: Unpublished	Chauley, 2013	Meenakshi Chauley, 2013, A study of Stupas and Votive Stupas, PhD. Thesis, Deccan College of Post-Graduate and Research Institute.
Journal	Cunningham, 1847	Alexander Cunningham, 1847, Journal of the Asiatic Society of Bengal, Vol-III