

**THE EVOLUTION OF ANCIENT ARCHITECTURAL AND  
ENGINEERING TECHNOLOGY WITH EXPERIENCE IN  
ANURADHAPURA PERIOD: BASE ON THE  
ANCIENT STUPES IN ANURADHAPURA**

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**Introduction**

There were many evidences in Mahavansa and some other pali chronicles, which are written record of the history of the Island from the 6<sup>th</sup> Century BC throughout two Stūpas built during the life time of Buddha, vividly records gives details of Stūpas constructed by the many rulers and peoples of Sri Lanka before came to Buddhism. Historically, during the third century BC, when King Devanampiya Tissa was the king of Sri Lanka, the Buddhism came to Sri Lanka from India. After the establishment of Buddhism in Sri Lanka, Stūpa was built as monumental structure to honours Lard Buddha. These ancient Stūpas in Sri Lanka are great creations of ancient knowledge in Engineering and socioeconomics as well as Architectural aspect. Specially, can be identified development of engineering knowledge under the construction of Stūpas relationship between experiences and their technology.

**Objectives**

To Identification and investigation of evolution of ancient architectural and engineering knowledge with experiences also its development in Anuradhapura Period.

**Methodology**

Fieldwork was performed to record observations of the physical properties including the cultural evidences of the surficial landform, and to comparative

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study from literal evidences. Developed graph between the constructed time and “D” (EQ 1.0).compare with engineering techniques.

### **Study area**

The most significant historical Stūpas include Thuparamaya, Mirisaweti, Ruwanveli, Abhayagiri, and Jethawana, situated at ancient city of Anuradhapura while present conserved monuments was selected for this study.

### **Result and Discussion**

The first historical Stūpa of Thuparama (Height 19.2 m) built by King DevanampiyaTissa (307-267 B.C.) in the then ancient city of Anuradhapura, is considered the oldest Stūpa in Sri Lanka. The Mirisaveti (Height 55 m) and the Ruwanveli (Height 91.4 m) great Stūpas were built by great king Dutugemunu during the 2<sup>nd</sup> century BC. Ruwanveli Stūpa, aptly called the Great Stūpa because when it was built there were no other shrines rivaling it in size not only in Sri Lanka but in the whole of the Buddhist world, is the most revered stupain Sri Lanka, and is also the tallest (height 91.4 m) at present. After the 1<sup>st</sup> Century AD the Abayagiri Stūpa, this attained a full height of 106.7 m, which in turn was overtaken by Ruwanveli Stūpa. Later, the Jetavanarama Stūpa, which attained a full height of 121.9 meters, turn was overtaken by any Stūpas in Island as well as at that time the third tallest structure in the world. Due to the failure of a part of its spire, its present height is 70.7m above the platform, but its volume of 233,000 cubic meters, still makes.

Table 1: Architectural details of studied Stūpas in Anuradhapura (Ranaweere M.P, 2004)



Neme of Stupa	Period	Dome shape	Present Height from Platform (m)	Dome Diameter at Platform (m)	Founder King
Thuparama	3 <sup>rd</sup> Century B.C	Bell	19.2	18	Devanampiyatissa
Mirisaweti	2 <sup>nd</sup> Century B.C	Bubble	55	43	Dutugemunu
Ruwanveli	2 <sup>nd</sup> Century B.C	Bubble	91.4	90.8	Dutugemunu
Abhayagiri	1 <sup>st</sup> Century A.D	Paddy-heap	73	99.1	Walagambha
Jetanawana	4 <sup>th</sup> Century A.D	Paddy-heap	70.7	102	Mahasen

Table 1 shows that, with time size of the Stūpa getting bigger as experience and technology of the building construction got improved. Great attention had paid for the foundation of the structure. Ranaweera M.P, (2010) described that according to the Mahāvamsa "First the land was dug out to a depth of 6 metres and then crushed stones were stamped down by elephants whose feet were bound by leather. Then butter clay was spread over the stones and bricks were laid over the clay. Over these rough cement and a network of iron was laid. Finally a sheet of copper and a sheet of silver were laid". It is more like reinforce concrete foundation with earthquake resisting. Ratio between Dome diameter at platform and Present height from platform was named in 'D' as shown in Equation 1.

$$D = [Dome\ diameter\ at\ platform / Present\ height\ from\ platform] \dots EQ (1.0)$$

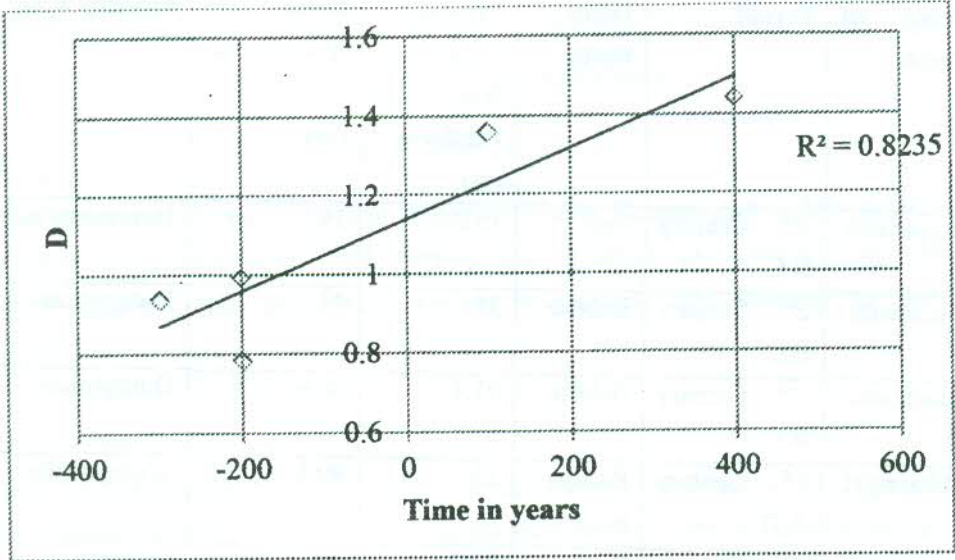


Figure 1: Developed graph between Time and D

That not only used material for Stūpa construction was special and even today materials. When compare with compressive strength of ancient bricks and bricks nowadays use (Table 2).

Table 2: Mechanical properties of some ancient modern bricks(Ranaweere M.P, 2004)

Source	Density (kg/m <sup>3</sup> )	Young's Modulus (Gpa)	Poisson's ratio	Compressive strength (Mpa)	Tensile strength (Mpa)
Sandagiri	1840	9.79	0.27	11.6	1.54
Jetavana	1723	4.5	0.25	8.50	0.85
Modern					
Stūpa brick	1768	1.92	0.21	5.30	0.55

## References

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