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Implication of Alberti's Ratio on facade of Built form A drama of Proportions

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Abstract:- "Beauty lies in the eyes of the beholder"- Margaret Wolfe Hungerford. There is certainly more to the statement above. Over centuries people have pondered whether there is a rulebook for aesthetics. A lot of mathematicians, Architects, Physicists have tried to prove it in different ways. When we study design principles, we know that proportion is something that makes or mars a building. It plays an essential role in determining how humane or colossal a building is. But does it really? We shall find out by running tests on several randomly selected buildings. We shall determine how proportion theories given by several experts, especially Alberti's Proportion Theory in our case mathematically proves the aptness of proportion theories in relation to the aesthetics of the façade of built form.

Keywords:- *Alberti's Theory, Proportion, Façade.*

I. NEED AND CONCERN OF THE TOPIC

This research tries to understand the chronological relationship of Proportion theories proposed in the history of time. It concentrates on the proportion theory proposed by Alberti and then tries to see whether or not it relates to the idea of beauty of façade of built form.

This study will be in continuation to the research paper "Applicability of Golden Rectangle in Façade of Built Form" by Harshika Sahay and Neelam Kushwah (Volume - 9 | Issue - 11 | November - 2020 | PRINT ISSN No. 2277 - 8179 | DOI: 10.36106/ijsr)

II. CHRONOLOGY OF THEORIES

- Phidias- 500 BC – 432 BC studied Phi in detail and applied it to sculptures of the Parthenon
- Plato- (428 BC – 347 BC)
- Euclid (365 BC – 300 BC) Derived the theory of Mean ratio
- Vitruvius- Published the book 'De Architectura' in 13-15 BC
- Leonardo Fibonacci- In 1200AD he came up with Fibonacci Series
- Alberti made major contributions to proportion in Architecture ibetween1407-1472
- The Vitruvian Man was a sketch made by Leonardo da Vinci 1487 which revolutionized architecture
- Palladio proposed the Palladian Ratio which he applied to the interior proportion of his built form
- Divine Proportion term was 1st used in the 1500s
- "Golden Ratio" was coined in the 1800's by Martin Ohm
- Le Modular was a proportion theory proposed by Le Corbusier 1942-1948 which combined the Imperial and Metric unit for the 1st time.

A. Relationship of Proportion Theories

When we study all the theories proposed over centuries relating to architecture and arts it is observed that they are in some way or the other related to each other.

Golden proportion or Golden rectangle or Golden ratio is closely related to Phi. The value of phi again reflected in Euclid's ratio and Le Modular which was the latest addition to the theories of proportion also combines the value of phi and imbibes Golden ration itself.

III. ALBERTI'S THEORY OF PROPORTION

Leon Battista Alberti (1407-1472) had said- "We shall borrow all our rules for the finishing our proportions, from the musicians, who are the greatest masters of this sort of numbers, and from those things wherein nature shows herself most excellent and complete." (The Emergence of Modern Architecture: A Documentary History, from 1000 to 1810) Music with Arithmetic, Geometry and Astronomy, made up the Quadrivium, the four ways, or liberal arts, advocated in the Middle Ages as essential for the education of the human being, (together with their outward expression in Grammar, Rhetoric and Logic; the Trivium).

In the history of time the arithmetic and proportional aspect of music has had more relevance and importance that the mastery of musical instrument itself. Similarly, Composing and playing music was considered inferior to the instinctive faculties during the creative moment up to the end of the Middle Ages.

Eventually Alberti developed the relationship between the proportions of numbers and the measurement of areas. He had proposed three types of area.

- Short (1/1-1/1.5),
- Middle (1/1.8-1/2.25), and
- Long (1/2.7- 1/4)

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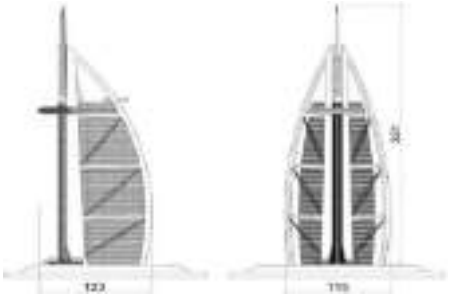
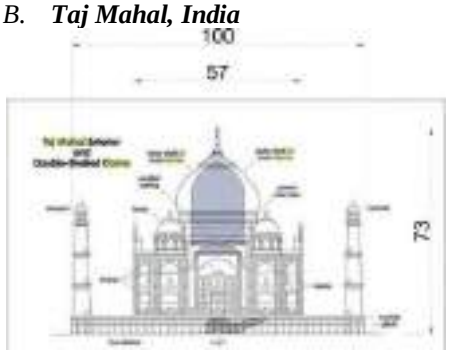
He said- "By the help of these Mediocrates the Architects have discovered many excellent Things, as well as with Relation to the whole Structure, as to its several Parts; which we have not Time here to particularize. But the most common Use they have made of these Mediocrates, has been however for their Elevations." As per him the middling ratio was the most appropriate and pleasing and therefore the most proportionate of them all.

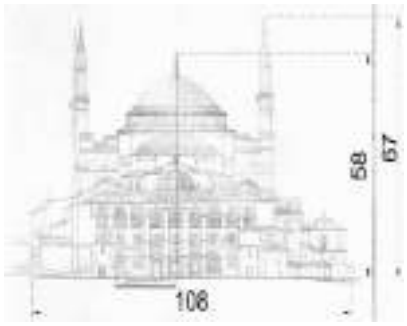
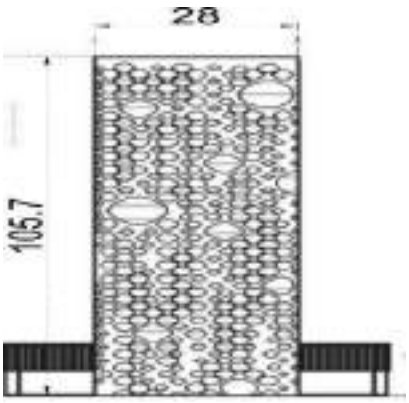
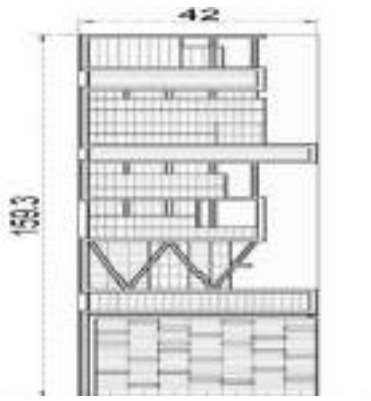
IV. THE EXPERIMENT

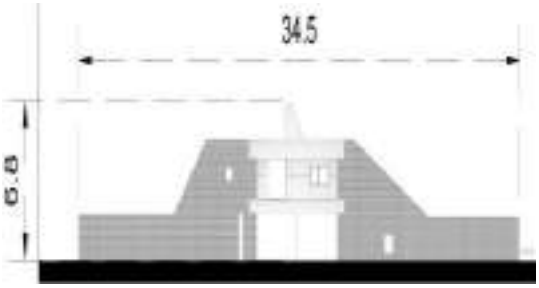
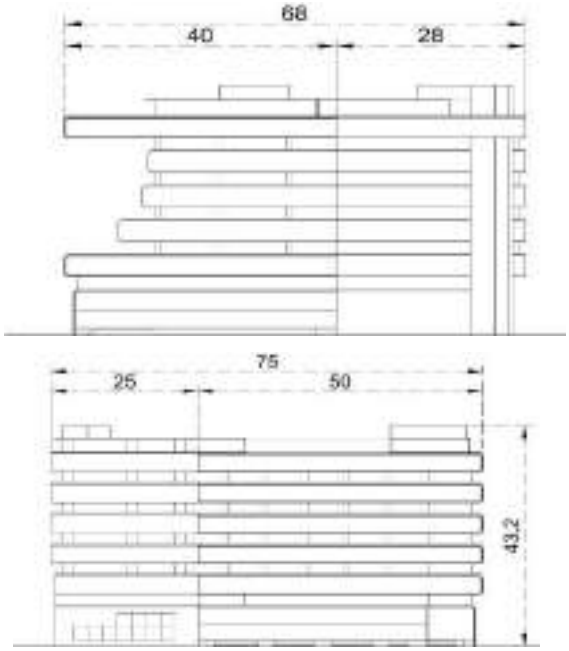
A survey was floated with 35 built forms selected randomly from across the world and was floated amongst the architecture fraternity to give their opinion on the façade of these selected build forms. The result of the survey was assessed and it was compared with the theoretical overlay of the Proportion proposed by Alberti. The survey was taken up by 106 participants. Following are the buildings that were selected out of the 35 buildings to run the test-

A. Burj Al Arab- 84%
B. Taj Mahal- 92%
C. Eiffel Tower- 87%
D. Milan Cathedral- 80%
E. Hagia Sophia- 84%
F. 0-14 Tower Dubai- 25%
G. Antilia- 32%
H. Ramkrishna House- 28%
I. Lal Bagh Palace- 44%
J. Apollo Premier- 67%

Five of the most appreciated buildings, three of the least appreciated buildings and Two buildings in Indore for local context were shortlisted to run the tests.

A. ***Burj Al Arab, Dubai***  *Figure 1 Sketch by Author- Dimension of Burj Al Arab*	Height (h)-321m Length (l)-123m Breadth (b)-115 m h:l = 2.61 l:b = 1.07 h:b = 2.79
B. ***Taj Mahal, India***  *Figure 2 Sketch by Author- Dimension of Taj Mahal*	Height (h)- 73m Length (l)- 100m Breadth (b)- 100m h:l = 0.73 l:b = 1 h:b =0.73
C. ***Eiffel Tower, Paris***  *Figure 3 Sketch by Author- Dimension of Eiffel Tower*	Height (h)- 325m Length (l)- 125m Breadth (b)- 125m h:l = 2.6 l:b = 1 h:b = 2.6

D. ***Milan Cathedral, Milan***  *Figure 4 Sketch by Author- Dimension of Milan Cathedral*	Height (h)- 108m Length (l)- 158.6m Breadth (b)- 92m h:l = 0.681 l:b = 1.72 h:b =1.174
E. ***Hagia Sophia, Istanbul***  *Figure 5 Sketch by Author- Dimension of Hagia Sophia*	Height (h)- 67m Length (l)- 145m Breadth (b)- 108m h:l = 0.462 l:b = 1.34 h:b = 0.62
F. ***O-14 Tower Duba***  *Figure 6 Sketch by Author- Dimension of O-14 Tower, Dubai*	Height (h)- 105.7m Length (l)- 36m Breadth (b)- 28m h:l = 2.936 l:b = 1.29 h:b = 3.775
G. ***Antilia, Mumbai***  *Figure 7 Sketch by Author- Dimension of Antilia*	Length (l)- 140 m Breadth (b)- 26 m h:l = 0.309 l:b = 5.38 h:b =1.662

H. ***Ramkrishna House, Ahmedabad***  *Figure 8 Sketch by Author- Dimension of RamKrishna House*	Height (h)- 6.8 m Length (l)- 34.5 m Breadth (b)- 13.2 m h:l = 0.197 l:b = 2.61 h:b =0.515
I. ***Apollo Premier***  *Figure 9 Sketch by Author- Dimension of Apollo Premier, Indore*	Height (h)- 43.2m Length (l)- 140 m Breadth (b)- 26 m h:l = 0.309 l:b = 5.38 h:b =1.662
J. ***Lal Bagh Palace, Indore***  *Figure 10 Sketch by Author- Dimension of Lal Bagh Palace, Indore*	Height (h)- 19.8m Length (l)- 136m Breadth (b)- 25m h:l = 0.146 l:b = 5.44 h:b = 0.792

V. CONCLUSION

Sl. No.	Name of Building	Height of building	Length of building	Width of building	Alberti		
		in meters	in meters	in meters	Short: 1/1-1/1.6 Middling: 1/1.8-1/2.25, Long:1/2.7- 1/4		
		h	l	b	l:h	b:l	b:h
1	Burj Al Arab	320.96	123	115	1/2.61	1/1.07	1/2.79
2	Taj Mahal	73	100	100	1/0.73	1/1.00	1/0.73
3	Eiffel Tower	325	125	125	1/2.6	1/1.00	1/2.6
4	Milan Cathedral	108	158.6	92	1/0.68	1/1.72	1/1.17
5	Hagia Sophia	67	145	108	1/0.46	1/1.34	1/0.62
6	0-14 Tower	105.7	36	28	1/2.94	1/1.29	1/3.78
7	Antilia	159.3	46	42	1/3.46	1/1.20	1/3.79
8	Ramkrishna House	6.8	34.5	13.2	1/0.2	1/2.61	1/0.52
9	Apollo Premier	43.2	140	26	1/0.31	1/5.39	1/1.66
		43.2	75	68	1/0.58	1/1.10	1/0.64
10	Lal Bagh Palace	19.8	136	25	1/0.15	1/5.44	1/0.79

	Short
	Middling
	Long

After running the tests the ratios l:h, b:l and b:h was calculated for all the buildings under consideration.

It was found that-

- Burj Al Arab,
- Milan Cathedral, and
- Apollo Premier

Are the closest to Alberti's Middling ratio. When we tally it with the findings of the survey taken at the beginning of the research, it was found that-

Burj Al Arab was preferred by 84% of the people which actually was the top of the cart.

Whereas Milan Cathedral was preferred by 80% of the people which was at the 4th place amongst the 35 buildings under consideration.

Only Apollo Premier was preferred by 67% people and was at the 13th place in the survey findings.

So, we can very well conclude that Alberti'd Middling Ratio has an important role to play in the aesthetics of any built form and thus it should be explored more by architects and artists alike while designing.

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