

STAIR IN BALINESE TRADITIONAL HOUSE AN ERGONOMIC APPROACH

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ABSTRACT

Stair in Balinese traditional house is a link between the open space (natah) and the building floor. Essentially, the rise and the tread of stair are defined strongly by the traditional norms and techniques. The stairs as product of traditional innovation is most likely the ergonomics aspect having been taken into account as an important aspect. Based on that reason, it is essential to conduct research in order to explore and investigate the ergonomics aspect of design stair on Balinese traditional house. The research shows that between the stair dimension and the anthropometrics of the house owner have closely relationship, and its design has required the safety and comfortable of the user.

Key Words: stair, dimension, traditional norm

INTRODUCTION

One unit of Balinese Traditional House principally consists of *Merajan* (shrine), *Bale Daja* (North pavilion), *Bale Dauh* (West pavilion), *Bale Dangin* (East pavilion), *Paon*/kitchen (Southern), *Jineng* (granary), *Natah* (open space in centre of building) and *Teba* (back yard of service area).

The elevation of Balinese Traditional House actually is discrepancy or deviation wherein its elevation can be set up from the highest is North pavilion, East pavilion, West pavilion, *Paon*/kitchen afterward *Jineng*/granary as the lowest. The allocation of house is as one reason why the stair requires in the Balinese Traditional House.

To determine the height and the depth of the stair more much depends on traditional norm and technique that based on the anthropometrics of owner. A design product is defined the owned of the ergonomics characteristics, if its all design is really appropriate with human/people as user (Pheasant, 1988).

This research would like to find out how far the relationship between the stair that is

designed by traditional norm/technique and the owner anthropometrics.

MATERIALS AND METHODS

2.1 Material

The research was conducted in Ubud Village, Gianyar on five original traditional houses with purposive sampling. The research had been accomplished on March 14th 2000.

2.2 Method

The method that is used in this research is through observation of the stair dimension and the house owner as well.

RESULT AND DISCUSSION

To design the stair on Balinese Traditional House essentially can not be released from the traditional norms and technique, for instance, the elevation of riser is measured by two times of grip while the tread is measured by one times the length of footprints plus one times the width of footprints of the owner of house or head of family (see Figure 1) (Gelebet, 1986).

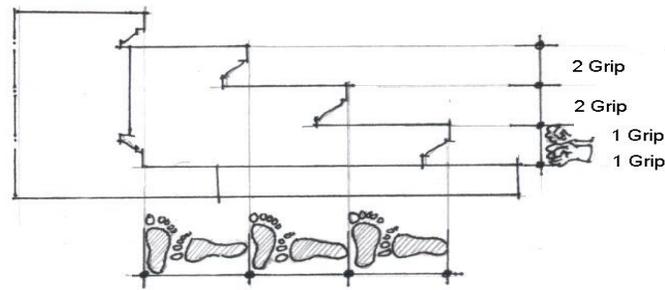


Figure 1. Technique of Determining the Stair Dimension

Source : Analysis, Year 2000.

The outcome of measurement can be seen in Table (1) and Table (2).

Table 1. Result of Stair Measurement

No	Rise (cm)	Tread (cm)
1	17,2	34,2
2	18,3	37,2
3	17,8	38,5
4	17,6	30,2
5	16,8	35,6
\bar{X}	17,54	35,14

Source : Analysis, Year 2000.

Table 2. The Anthropometrics of the House Owner

No	Footprint (cm)			Grip (cm)	
	Length (L)	Width (W)	L+W	G	2G
1	24,8	9,5	34,3	8,6	17,2
2	27,1	9,8	36,9	9,2	18,4
3	27,2	10,1	37,3	8,9	17,8
4	21,0	9,4	30,4	8,7	17,4
5	25,8	9,5	35,3	8,5	17,0
\bar{X}	25,18	9,66	34,84	8,78	17,56

Source : Analysis, Year 2000.

The amount of the tread should be determined in an appropriate way; to formulate the measurement of the last tread might fall into the proper dimension. The Balinese measurement has the specific terms, which are popularly used and believed affecting to the house owner. These terms are *candi* (good), *rebah* (bad), *gunung* (good), *rubuh* (bad) and this would be repeated regularly when the tread

is more than four (see Figure 2). This matter is a reason why the amounts of Balinese tread is usually odd. The dimension of treads quiet influences to the comfortable of walking when someone walks through a tread. The slope angle of stair also affects to how much energy have to consume to walk out it. The slope angle, which is theoretically considered safe and comfortable, is 25-30°(Grandjean, 1988).

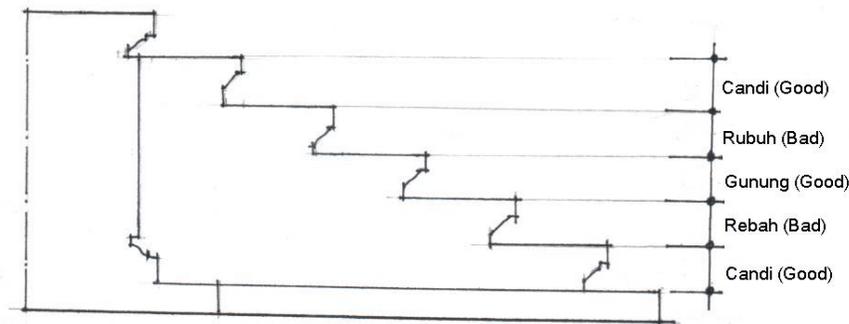


Figure 2. The Determination of the Amount of Tread
Source : *Analysis, Year 2000.*

The table 1 shows that the average of the rise is 17,5 cm. According to the traditional norm, the rise is measured by twice of grip (17,6 cm). Grandjean suggested that the rise that is safe and comfortable is 11-19 cm, while Kroemer recommended 12,5-20 cm. In terms of the anthropometrics of Indonesian grip for percentil 95 is 8,8 cm so the twice of it is 17,6 cm (Nurmianto, 1996), (Pheasant, 1988). It implies that the dimension of rise would have a position on the safe and comfortable limit to be passed by most people/human.

The dimension of tread, which can be seen on table 1, is average 35,1 cm. While, the traditional dimension can be found out from the sum of the length and the width of footprints. Its result is 34,8 cm. The tread, which is recommended, is 25-31 cm (Grandjean, 1988). Whereas, Kroemer suggested that it is 24-30 cm. The data of anthropometrics of Indonesian footprints for percentil 95 is 29,1 cm (the length) and 10,6 cm (the width). Its sum is 36 cm (Nurmianto, 1996), (Pheasant, 1988).

Based on the explanation above, the tread of Balinese traditional house has been in position of safe and comfortable limit to be passed. Due to the material that is used on tread is commonly natural stone. It might be used because it has the hard surface in order to ovoid the slick especially when it is wet.

CONCLUSION

The stair of Balinese traditional house, its dimension has been properly designed to be appropriate with the anthropometrics of the house owner through approach of the norm and technique traditional. It means clearly that the stair of traditional house has required the requisite of the ergonomics aspect.

The dimension of rise and tread and material as well has already reflected the requirement of safety and comfort for the user.

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