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Indian Anthropometric Dimension (Madhya Pradesh)

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***Abstract*—Anthropometry is a tool which determines the body size. It is used mainly to understand the space required by a man to perform a specific task. Thus, the main motive of this paper is to present the anthropometric dimensions in accordance with Indian standard, comparison of Indian anthropometric standard with the other anthropometric standards that are in use at present. This study presents the anthropometric dimensions of 120 people of age group 7 years – 80 years of Madhya Pradesh. The data collected during the survey is measured with the help of various tools. Measurements taken in this survey includes different postures in the standing position and different posture in sitting position. After the data collections, it was found that there are some slight differences in the existing anthropometric dimensions and the dimensions which are measured. After the comparison of anthropometric data with Indian anthropometric data, the spaces required for various activity can be found with the help of Indian anthropometric dimensions.**

***Index Terms*—Anthropometry, Dimensions, Standards.**

I. Introduction

Anthropometry may be defined as the field which is used to study human dimensions and the space required by humans to perform a specific task. Anthropometry gives us proportions of the human body and their measurements for designing. The main aim of anthropometry is to provide restful movement to person so that he or she is capable to perform a specific task without any obstacle.

Anthropometry has a very important role in the field of architecture. Anthropometry and architecture are related to each other in various ways. Anthropometry gives us dimensions and measurements which are further used to calculate the spaces for proper functioning. Thus, we can say architecture and anthropometry are related to each other.

Indian anthropometry may be defined as the anthropometry or human body dimensions according to Indian standards. Indian anthropometry is the measurements of each part of Indian human body and this Indian measurement gives us the spaces, size, and areas required for designing in India. For the restful movement of a human, it is very important for Indians to have their own separate anthropometric standards.

Indian anthropometry has been divided into numerous components which helps in measuring human dimensions

- Body type - It is one of the main factors. There are many different body types which leads to different anthropometry. Two body types are male and female, whose anthropometry is different
- Body size: Different the body size, different is the anthropometry. Body sizes may be divided into endomorph, mesomorph, and ectomorph.
- Age – Age has another important role in the calculation of anthropometric standards. Each age group has its own different anthropometry.

Indian anthropometric dimensions help designers to design spaces, to perform a task with a flow. It is very essential for the Indian community to have their own measurements so that it becomes easy for designers to calculate spaces and areas to perform different tasks. India is a country in which we can see various culture and these culture leads us to different anthropometric measurements.

Indian anthropometry is different than the existing anthropometry thus there is a need for the Indian community to have their own anthropometric standards for designing

Madhya Pradesh in India is a region situated at the center of India. This region has mixed population of different regions of India. Anthropometry of 120 people from Madhya Pradesh of age group 7 years to 80 years has been measured by different tools.

II. Purpose of Study

The main aim of this study is to provide the Indian anthropometric data which can be used for designing spaces and find areas in the field of designing, which are comfortable for Indian people. This study also compares the anthropometric data which is available at present and the data which is estimated by conducting the survey for measurements of Indian anthropometric standards. With the help of Indian anthropometric standards, the spaces and areas of different sectors like the dining area, spaces for group sitting, movie theatre, gathering spaces and many other spaces required for designing can be calculated.

III. Research Methodology

Anthropometric dimensions of group of people were taken from the central part of India, Madhya Pradesh. People of different age group were considered during the survey. The total no of people examined for this study were 120 of different

age group (7 years to 80 years). This study contains the measurement of healthy humans.

Anthropometric measurements were documented for both male and female. Levelled horizontal plane was selected. All measurements were taken on a levelled horizontal plane. Measuring tape, weighing machine was taken for the measurement of an individual. The weight of each individual was measured with the help of weighing machine. Weight was calculated in kilograms

Anthropometric dimension for both static and dynamic positions was calculated. All the dimensions were measured for both male and female. The calculation of anthropometric dimensions was measured by measuring tape. All dimensions were taken in millimetres. After recording the data, the average of all the values were recorded.

TABLE I
BRIEF DESCRIPTION OF PARAMETERS WHILE STANDING

S. No.	Criteria for standing posture	Brief description
1	Weight (kg)	Weight of a person without shoes
2	Height	Length from floor to top of the head
3	Depth (full body)	Distance from back to the front of the chest
4	Forward arm length	Length from spine to Arm stretched while standing in forward the direction
5	Forward arm height	Height from the floor to the arm stretched while standing in the forward direction
6	Both arms stretched outwards	Distance between tip of the fingers when both arms stretch fully in such a way that it is perpendicular to the spine
7	akimbo	Distance between tips of an elbow to the spine while in akimbo position
8	Sideway arm length	Length from spine to Arm stretched while standing in the sideway direction
9	Sideway arm height	Height from the floor to the arm stretched while standing in the forward direction
10	Forward step	Stepping in the forward direction
11	Sideway step	Stepping in sideway direction
12	Bending forward length	Length between spine and tip of the finger while bending in the forward direction
13	Bending forward height	Height between floor and tip of the finger while bending in the forward direction
14	Upper Leaning length	Length between spine and tip of the finger while leaning forward
15	Upper leaning height	Height between floor to tip of the finger while leaning forward
16	Body depth during movement	Distance from back to the front of the chest during free movement

Later, Indian anthropometric data that was calculated, was then compared with the existing anthropometric data which is in use at present and results were recorded.

Anthropometric measurement in standing postures and in sitting postures was recorded.

The parameters considered for the calculation of anthropometric data in standing position includes the various position in which the height from floor plane and length of a body was measured.

TABLE II
BRIEF DESCRIPTION OF PARAMETERS WHILE SITTING

S. No.	Criteria for standing posture	Brief description
Cross-legged sitting		
1	Cross-legged width	Length from knee to knee while sitting cross-legged
2	Cross-legged sitting height (front)	Height from floor to top of the head while sitting cross-legged
3	Buttock knee length	Distance from butt to the knee while sitting cross-legged
Normal sitting		
4	Normal sitting	Sitting on a heightened plane, length from top of the head to sitting plane
5	Knee length	Height from the floor to knee while sitting normally
6	Straight sitting	Sitting with shoulder straight
7	Thigh height	Height from floor to thigh while sitting normally
8	Buttock-knee length	Length from buttock to knee during normal sitting.
9	Buttock-long leg	Length of buttock to leg while stretched forward
10	Buttock-full stretched leg	Length between buttock to the tip of the toe while Leg fully stretched while sitting
11	Buttock-mid stretched leg	Length between buttock to the tip of the toe while Leg mid stretched while sitting
12	Back Hip depth	Width of hip from the back while sitting
13	Relaxed depth	Distance between thigh to thigh while sitting normally in a relaxed position
14	Relaxed elbow	Distance between elbow to elbow while spreading arms
15	Closed leg	Knee to knee length while sitting with closed leg
16	sleeping	Length of Top of the head to the tip of the toe
17	Armchair length	Dimensioning armchair length

By considering these parameters, the measurements were taken. A direct method of measurements were used for the measurement of length, depth, breadth, and body weight.

IV. DATA-INDIAN ANTHROPOMETRY

The data compiled here gives the anthropometric measurements for both male and female. All age group (8 years-80 years) was considered for data collection.

The anthropometric measurements taken, contains minimum values and maximum values of anthropometric dimensions. The mean gives us the dimensions which may be considered as the average for all the values that have been measured.

Anthropometric measurements shown below gives us the measurements of standing posture for 120 people (with minimum, maximum and mean values)

All measurement taken here are in millimeters.

In Table-3, measurements for sitting posture has been recorded. Here, sitting posture has been divided into two categories- sitting on the floor with cross leg and sitting

normally on a heightened platform such that the toe rests on the floor.

All measurements here were measured according to these two sitting postures. Minimum values, maximum values and, mean values for 120 people (both male and female) of all age group has been recorded. All dimensions here are in millimeters.

TABLE III
MEASUREMENTS IN STANDING POSTURE

	Criteria for standing posture	Min (In mm)	Max (In mm)	Percentile (in mm)			Mean (in mm)
				5th	50th	95th	
1	Weight(kg)	35	108	42	58	78	59
2	Height	1228	1920	1426	1599	1700	1600
3	Depth (full body)	189	645	200	300	402	299
4	Forward arm length	580	1025	719	840	945	830
5	Forward arm height	1065	1800	1165	1328	1494	1329
6	Both arms stretched outwards	1389	2050	1445	1660	1800	1635
7	akimbo	645	1187	742	855	953	850
8	Sideway arm length	650	1129	735	852	955	847
9	Sideway arm height	925	1589	1167	1339	1475	1386
10	Forward step	300	990	400	594	780	590
11	Sideway step	300	1130	400	630	900	643
12	Bending forward length	420	1130	540	750	980	757
13	Bending forward height	55	1200	326	530	900	580
14	Upper Leaning length	315	1225	605	804	1000	803
15	Upper leaning height	1320	2120	1470	1724	1940	1711
16	Body depth during movement	370	750	415	557	697	580

V. COMPARISON OF INDIAN ANTHROPOMETRY

It is very important for Indians to have their own anthropometry. At present anthropometry used in India is not according to the Indian measurements. For proper flow of activity, it is important for Indians to have their own anthropometric data.

The above calculation obtained from the anthropometric data of Madhya Pradesh region can be compared with the anthropometric data which is in use at present.

While comparing the anthropometric dimensions of Madhya Pradesh and the existing anthropometry dimensions, it was found that there is a difference in the anthropometry of Indian standard (Madhya Pradesh).

The mean value presented in the above tables can be considered for the comparison of anthropometric data. The mean values here gives us the average anthropometric measurements of 120 people of Madhya Pradesh for both male and female

After the comparison, it was found that there is a difference in anthropometric standards

Due to the difference in anthropometric measurements of Indian human, it may be noted that there will be a difference in the spaces and their areas. The difference in spaces and areas will direct us to create new spaces according to Indian anthropometry.

TABLE III
MEASUREMENTS IN STANDING POSTURE

S. No.	Criteria for standing posture	Min (In mm)	Max (In mm)	Percentile calculation (In mm)			Mean (In mm)
				5th	50th	95th	
1	Cross-legged width	553	850	679	764	854	775
2	Cross-legged sitting height (front)	673	960	770	824	906	833
3	Buttock knee length	350	622	430	503	582	505
4	Normal sitting	650	940	700	799	890	796
5	Knee length	402	509	459	501	559	507
6	Straight sitting	668	990	743	825	899	820
7	Thigh height	298	545	370	425	470	421
8	Buttock-knee length	400	863	485	555	606	549
9	Buttock-long leg	540	770	535	660	780	657
10	Buttock-full stretched leg	870	1345	940	1070	1200	1070
11	Buttock-mid stretched leg	660	1215	740	900	1070	957
12	Back Hip depth	200	540	270	330	410	336
13	Relaxed depth	269	540	280	367	484	377
14	Relaxed elbow	325	820	380	490	630	500
15	Closed leg	132	350	160	180	249	196
16	sleeping	1228	1920	1426	1599	1700	1600
17	Armchair length	689	1310	798	1050	1180	1204

VI. SPACES AND AREAS

Space may be defined as the volume of an area to perform a specific task in such a way that the human movement is in a smooth motion without any obstacles.

Anthropometry is somewhat related to space and planning. Space planning and building designing always have an overlapping interest regarding the areas.

To design a building, it is important to have spaces such that

it becomes easy for human to perform a specific task without any obstacles. Thus, it is necessary for a country to have its own anthropometry so that spaces and areas to perform a specific task can be found.

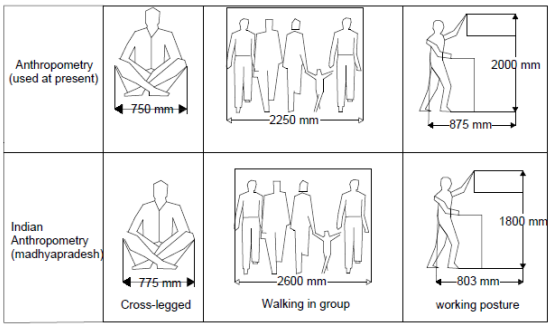

Fig. 1. Anthropometry

The diagram shows the difference in standards of anthropometry and space& area occupied to perform a specific task according to Indian anthropology.

VII. Conclusion

This research helps us to understand the anthropometry of humans according to Indian standards. From this paper, we can conclude that Indian anthropometric dimensions when compared to existing anthropometric dimension, a slight variation of values has been found. It is very important for India to have its own anthropometric standards for future development. This research gives us the measurements for some anthropometric posture while in sitting and standing posture.

Due to the slight differences in the standards of Indian anthropometry, there will be a difference in the spaces required to perform a task. This research helps us to create new space according to Indian anthropometry, which in turn will help designers to create spaces which will help us for smooth working.

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