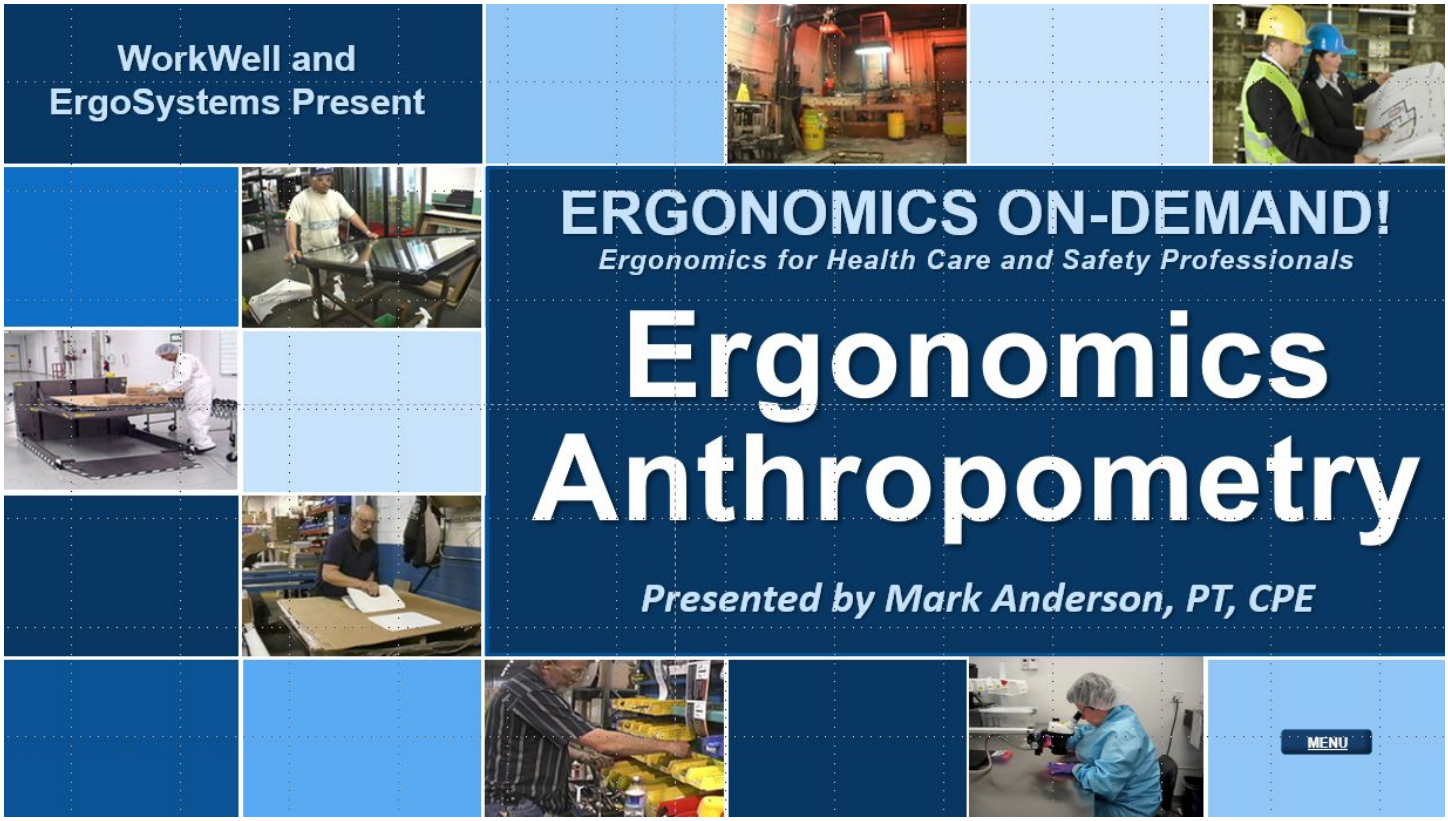
WORKWELL
Musculoskeletal Care for Organizations



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ERGONOMICS ANTHROPOMETRY TRACK

Welcome

Here is a question for you.

"How can we determine how far a person can reach or how high a workbench should be?"

Well, we could actually measure the individual to determine their specific reach or stature. And sometimes in ergonomics, this is exactly what we do. This is appropriate when the outcome is uniquely specific to a particular individual.

Hi everyone, welcome to the ***Ergonomics Anthropometry Track.***

I'm Mark Anderson. I am a Certified Professional Ergonomist and Physical Therapist. I have been fortunate to work in ergonomics over the past 30 years.

Anthropometry

Now, another strategy is to use anthropometry. For example, an engineer is designing a work station used by many different people. Countless design decisions have to be made. How high, how wide, how big, how long, will it fit, etc.? Anthropometry can help answer these questions.

The word 'anthropometry' is derived from two Greek words:

- anthrōpos (human being)
- metry (measuring)

Size and Shape

Anthropometry is the study of the physical dimensions – size, shape and weight – of the human body. Anthropometric principles are applied across the full spectrum of the practice of ergonomics. Design standards for workstations, tools and equipment:

- Machine guarding for tools and equipment
- Reaches and heights for workstation design
- Handle configuration for tools and materials
- Development of biomechanical models

Reference Illustrations and Data Tables

The basis for anthropometry is the careful measurement of the length, volume and weight of body part segments. From this, data tables have been generated that calculate a number of factors that include:

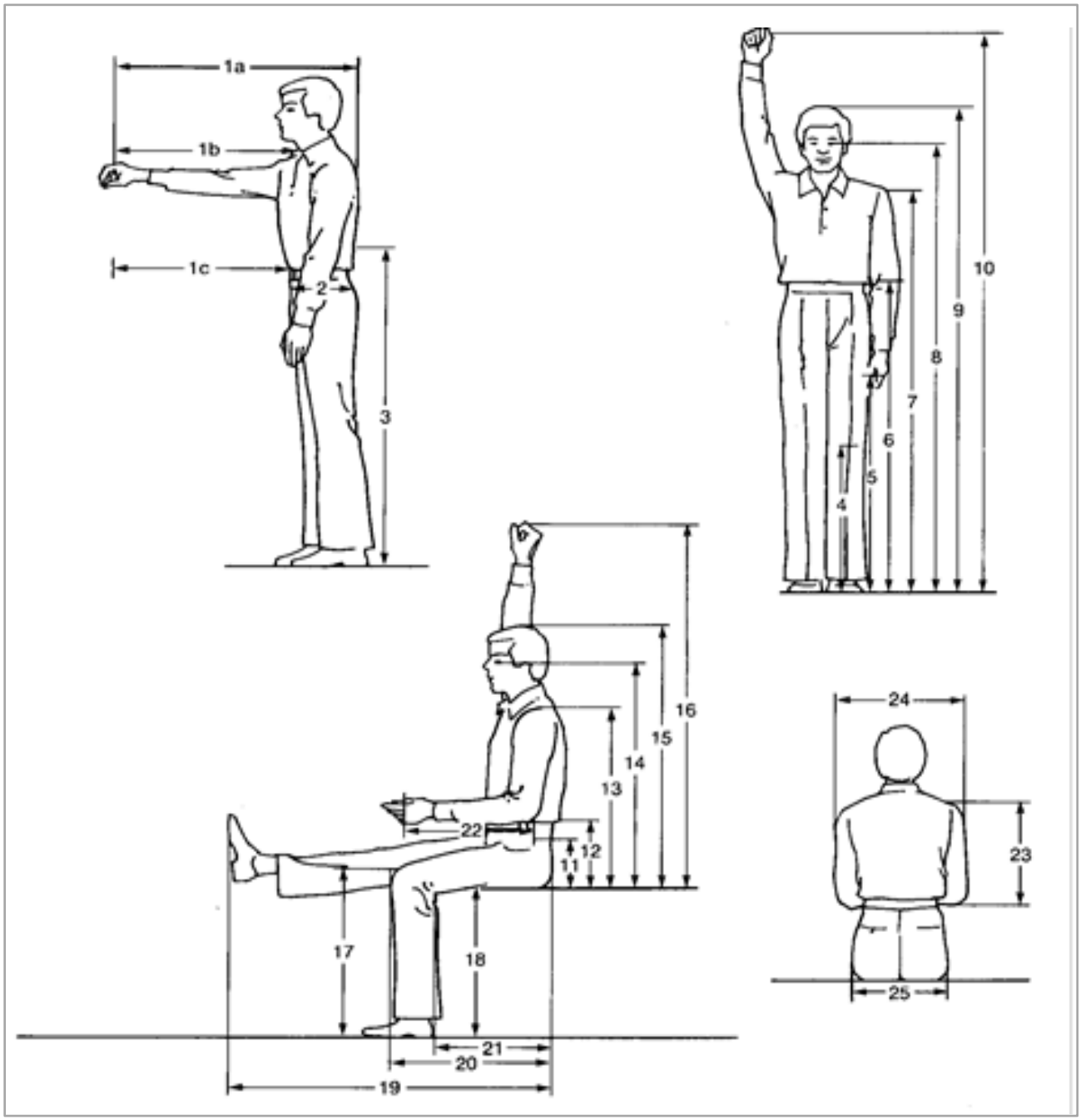
- Segment length
- Segment mass
- Center of mass

The outcome is a set of statistical data that describes the human size and form. Often the data is described in terms of the mean and standard deviations. 5th, 50th and 95th percentiles are calculated.

We will get into the statistical details in a bit but first let's examine the anthropometry Reference Illustrations and Data Tables to get a feel for what type of information is available.

Reference Illustrations

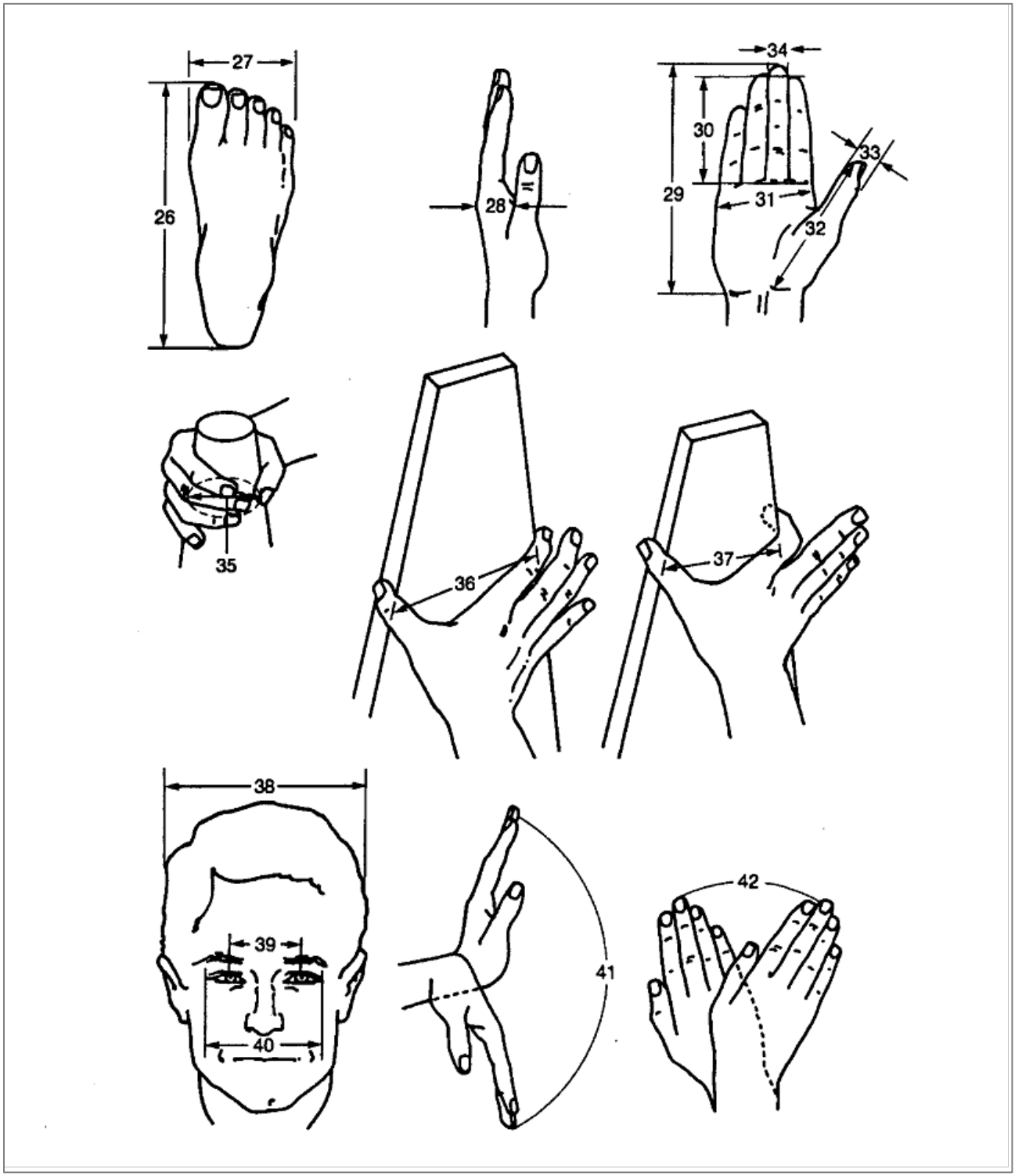
Take a look at the Standing and Seated Reference Illustrations.



On the Reference Illustrations for example, ***Stature*** is indicated by Length 9 in the illustration in the right upper corner.

The ***Functional Reach Zone*** is indicated by Length 1b *(Acromial Process to Functional Pinch)* in the illustration in the left upper corner.

Hand, foot and face information is also available.



Data Tables

On the Data Tables (following page) you will see the columns have the following information.

- Column 1 shows the segment lengths and corresponding numbers from the Reference Illustrations.
- Columns 2-7 provide the 5th, 50th and 95th percentiles respectively for males and females.
- Columns 8-10 show equivalent data for 50/50 mix of males and females.

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All measures are in inches. The data set is from U.S. Military personal with a sample size of several thousand.

Anthropometry Data Tables

Column 1 shows the measures and corresponding numbers from the body diagrams. Columns 2-7 provide the 5th, 50th and 95th percentiles respectively for males and females. Columns 8-10 show equivalent data for a 50/50 mix of males and females. All measures in inches. Data taken primarily from U.S. military personnel with sample size of several thousand.

	Males			Females			50/50 Males/Females		
	5th	50th	95th	5th	50th	95th	5th	50th	95th
STANDING									
1. Forward Functional Reach									
a. Includes body depth at shoulder	28.7	32.5	36.3	26.2	29.2	32.2	27.2	30.7	35
b. Acromial Process to Functional Pitch	23.5	26.9	30.3	22.0	24.6	27.2	22.6	25.6	29.3
c. Abdominal Extension to Functional Pitch	17.4	24.4	31.4	18.6	23.8	29.0	19.1	24.1	29.3
2. Abdominal Extension Depth	7.5	9.1	10.7	6.6	8.2	9.8	7.1	8.7	10.2
3. Waist Height	37.7	41.9	46.1	36.0	40.0	44.0	37.4	40.9	44.7
4. Tibial Height	15.7	17.9	20.1	14.7	16.5	18.3	15.3	17.2	19.4
5. Knuckle Height	26.5	29.7	32.9	24.8	28.0	31.2	25.9	28.8	31.9
6. Elbow Height	39.9	43.5	47.1	37.6	40.4	43.2	38.0	42.0	45.8
7. Shoulder Height	51.8	56.6	61.4	46.5	51.9	57.3	48.4	54.4	59.7
8. Eye height	59.9	64.7	69.5	55.2	59.6	64.0	56.8	62.1	67.8
9. Stature	63.5	68.7	73.9	59.0	63.8	68.6	60.8	66.2	72
10. Functional Overhead Reach	75.9	82.5	89.1	71.6	78.4	85.2	74.0	80.5	86.9
SEATED									
11. Thigh Clearance Height	4.6	5.8	7.0	3.9	4.9	5.9	4.3	5.3	6.5
12. Elbow Rest Height	6.9	9.5	12.1	6.7	9.1	11.5	7.3	9.3	11.4
13. Midshoulder Height	22.1	24.5	26.9	20.8	22.8	24.8	21.4	23.6	26.1
14. Eye Height	28.2	31.0	33.8	26.6	29.0	31.4	27.4	29.9	32.8
15. Sitting Height, Normal	31.1	34.1	37.1	29.0	32.2	35.4	32.0	34.6	37.4
16. Functional Overhead Reach	44.0	50.6	57.2	42.0	47.2	52.4	43.6	48.7	54.8
17. Knee Height	19.1	21.3	23.5	18.1	20.1	22.1	18.7	20.7	22.7
18. Popliteal Height	15.2	17.2	19.2	14.8	16.2	17.6	15.1	16.6	18.4
19. Leg Length	37.6	41.4	45.2	36.2	39.6	43.0	37.3	40.5	43.9
20. Upper-Leg Length	21.2	23.4	25.6	20.6	22.6	24.6	21.1	23.0	24.9
21. Buttocks-to-Popliteal Height	17.2	19.2	21.2	16.5	18.9	21.3	17.2	19.1	20.9
22. Elbow-to-Popliteal Height	12.4	14.2	16.0	10.5	12.7	14.9	12.6	14.5	16.2
23. Upper-Arm Length	13.1	14.5	15.9	12.6	13.4	14.2	12.9	13.8	15.5
24. Shoulder Breadth	16.3	17.9	19.5	13.8	15.4	17.0	14.3	16.7	18.8
25. Hip Breadth	12.2	14.0	15.8	13.0	15.0	17.0	12.8	14.5	16.3

Data tables excerpted from: Human Factors Section, Eastman Kodak Company, *Ergonomic Design for People at Work*, Van Nostrand Reinhold, 1983.

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Anthropometry Data Tables

	Males			Females			50/50 Males/Females		
	5th	50th	95th	5th	50th	95th	5th	50th	95th
FOOT									
26. Foot Length	9.5	10.5	11.5	8.7	9.5	10.3	8.9	10.0	11.2
27. Foot Breadth	3.5	3.9	4.3	3.1	3.5	3.9	3.2	3.7	4.2
HAND									
28. Hand Thickness, Metacarpal III	1.1	1.3	1.5	0.9	1.1	1.3	1.0	1.2	1.4
29. Hand Length	6.7	7.5	8.3	6.4	7.2	8.0	6.7	7.4	8.0
30. Digit Two Length	2.4	3.0	3.6	2.1	2.7	3.3	2.3	2.8	3.3
31. Hand Breadth	3.0	3.4	3.8	2.6	3.0	3.4	2.8	3.2	3.6
32. Digit One Length	4.2	5.0	5.8	3.6	4.4	5.2	3.8	4.7	5.6
33. Breadth of Digit One Interphalangeal Joint	0.8	0.9	1.0	0.7	0.8	0.9	0.7	0.8	1.0
34. Breadth of Digit Three Interphalangeal Joint	0.6	0.7	0.8	0.5	0.6	0.7	0.6	0.7	0.8
35. Grip Breadth, Inside Diameter	1.5	1.9	2.3	1.5	1.7	1.9	1.5	1.8	2.2
36. Hand Spread, Digit One to Two, 1st Phalangeal Joint	3.1	4.9	6.7	2.5	3.9	5.3	3.0	4.3	6.1
37. Hand Spread, Digit One to Two, 2nd Phalangeal Joint	2.7	4.1	5.5	1.8	3.2	4.6	2.3	3.6	5.0
HEAD									
38. Head Breadth	5.6	6.0	6.4	5.3	5.7	6.1	5.4	5.9	6.3
39. Interpupillary Breadth	2.0	2.4	2.8	1.9	2.3	2.7	2.1	2.4	2.6
40. Biocular Breadth	3.2	3.6	4.0	3.2	3.6	4.0	3.3	3.6	3.9
OTHER MEASUREMENTS									
41. Flexion-Extension, Range of Motion of Wrist Degrees	96.0	134.0	172.0	111.0	141.0	171.0	108.0	138.0	166.0
42. Ulnar-Radial Range of Motion of Wrist Degrees	34.0	60.0	86.0	39.0	67.0	95.0	41.0	63.0	87.0
43. Weight, in pounds	117.0	183.4	249.8	84.9	146.3	207.7	105.3	164.1	226.8

Note: All values may be affected by clothing and posture.

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User Population

Now that we have looked at the Anthropometry Reference Illustrations and the Data Tables, let's discuss how to access and interpret them.

The first design criterion in the use of anthropometry is to define the user population to which we will apply the findings.

- Is it predominately male or female?
- Northern European or Asian descent or some other?
- Or more than likely will it be a diverse population?

The data base we use is primarily based on a Northern European data set (US military personal). For a different population you may need to extrapolate the data. For example, an Asian population will typically be of a shorter stature (about 3% or so) and the Data Table results can be modified as needed.

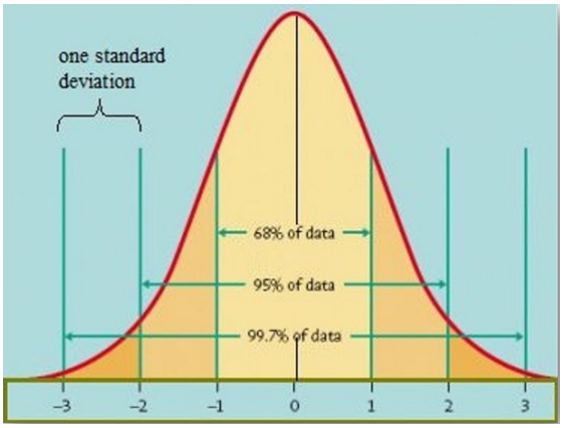
Anthropometric Guidelines

We have to make a decision about how much of the user population we will accommodate using the data. For example, within the given workforce, will this include the shortest person (certainly less than 5 feet/152 cm) and the tallest person (perhaps 7 feet/213 cm)? This is a very large range!

General anthropometric guidelines promote designs that attempt to ***accommodate the 5th percentile female to the 95th percentile male.***

How can we interpret this guideline?

Mean and Standard Deviation



Hopefully without dredging up too many bad memories from your past statistical analysis courses, please recall that in a normally distributed population the mean and standard deviations can be calculated.

Simply put, standard deviation tells us how spreadout the data is. It is a measure of how far each observed value is from the mean. In the distribution, about 95% of the values will be within 2 standard deviations above and below the mean.

5th to 95th Percentile

So, when we say the 5th percentile female and the 95th percentile male what does that exactly mean? Let's use stature as an example.

- When we use the 5th percentile female stature as the low end of the range, this means 95 percent of the population in the data base will be taller and only 5 percent will be shorter.
- When we use the 95th percentile male stature as the high end of the range, this means 95 percent of the population in the data base will be shorter and only 5 percent will be taller.

We recognize when we use this range, we will not include very short and very tall individuals, they will be excluded from the design criteria.

However, we will be able to include about 95% of the population.

We always want to be aware of individuals that fall outside of this range on either end and attempt to accommodate their particular needs as possible.

Workbench Example

Stature

To put this into a practical application, let's address the question of how high a work bench should be. As we discussed, we could look for the tallest person and make sure the workbench height accommodates that person. But, examining the tables we find that only a very few people are probably actually that tall.

95th percentile male and 5th percentile female

In fact, when we locate the stature of a 95th percentile male in the Data Table, we determine the stature is 73.9 inches/188 cm.

We could look for the average height individual in the data set. The 50th percentile height indicates half of the population is shorter and half is taller. But then this would accommodate only a small part of the population.

We could use the shortest person but again that accommodates a small part of the population. Within the Data Table we determine that the 5th percentile female stature is 59 inches/150 cm.

Allow tall person to fit

Generally, in terms of workstation height and other size considerations, we recognize using the 95th percentile male height as a guideline would allow the taller person to fit. Generally, it's considered easier to raise the shorter person to a higher level than lower the taller person.

Also, in practical use, we also have to consider the type of work being performed – general assembly, precision or forceful – as well as the size and shape of the material being worked on. Check out the ***Manufacturing Ergonomics*** and ***Ergonomics Design Guidelines Track***s for additional details.

In overview, one of the general anthropometric guidelines is to help the tall person fit.

Reach

Let's examine the other end of the continuum. A work station is being designed including the layout of parts and materials. How far away, at maximum, should the supplies be placed and still achieve a reasonable functional reach? What if we go with the taller individual who will correspondingly have a longer function reach?

Accessing the Data Table, we determine the 95th percentile male functional reach (Length 1b (Acromial Process to Functional Pinch) is 30.3 inches/77 cm. On the other end of the spectrum, for a 5th percentile female it is 22 inches/56 cm.

Allow short person to reach

So how should we interpret this?

In a fixed reach work station design, we need to look at the functional reach envelope of the smallest individual. The convention is to design for the 5th percentile female.

In reality, the best bet is to build in reach flexibility to accommodate both ends of the reach envelope. A 95th percentile male feels quite cramped at the 5th percentile female's reach.

So, by applying the principles of anthropometry as part of the overall systems design, objectives of enhancing human performance by controlling fatigue can be met.

Anthropometry Principles Summary

Ask any tall person trying to fit into an airplane seat or a short person trying to reach to a higher shelf or get their feet on the floor when seated in a chair and they will confirm the anthropometric considerations of designing to:

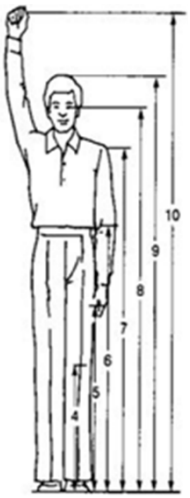
- Allow the tall person to fit
- Allow the short person to reach

Anthropometric Data Base (Tables)

We will discuss two methods of using the data base. One is to make use of the hard copy data tables we introduced and the other is using an Excel spreadsheet with macros. We appreciate some users may not be able to access the macro-enabled spreadsheet, so we will go through an example of using the hard copy data tables.

For those who are able to use the spreadsheets, please refer to that section in the manual for an example. Please note the results from the two methods will vary slightly based on the rounding calculations performed in the spreadsheet.

Anthropometry – Case Study



Let's design a workbench intended for an assembly process. We have a diverse user population of men and women. The work process is to perform assembly of a part with these criteria:

- Light weight material, parts and tools (up to 5#)
- Repetitive assembly job tasks
- Tasks performed at elbow level

Currently the workbench is at a fixed height of 36 inches/91 cm and we would like to convert it to a standing position, height adjustable workbench. Our objective is to develop the workbench height design specifications for a diverse user population with the assembly process performed while standing. The reference point of interest is ***Elbow Height – Stand (6)***

Workbench Height – Adjustable Height

Looking at the table for the 5th percentile female, the standing elbow height is 37.6 inches/96 cm. For the 95th percentile male the standing elbow height is 47.1 inches/120 cm.

Based on this result the ***recommended range of height adjustment of the workbench in in the range of 36 inches/91 cm to 48 inches/122 cm***. This provides for about a 1 inch/2.54 cm buffer added to the minimum and maximum height.

Anthropometry Data Tables

Column 1 shows the measures and corresponding numbers from the body diagrams. Columns 2-7 provide the 5th, 50th and 95th percentiles respectively for males and females. Columns 8-10 show equivalent data for a 50/50 mix of males and females. All measures in inches. Data taken primarily from U.S. military personnel with sample size of several thousand.

	Males			Females			50/50 Males/Females		
	5th	50th	95th	5th	50th	95th	5th	50th	95th
STANDING									
1. Forward Functional Reach									
a. Includes body depth at shoulder	28.7	32.5	36.3	26.2	29.2	32.2	27.2	30.7	35
b. Acromial Process to Functional Pitch	23.5	26.9	30.3	22.0	24.6	27.2	22.6	25.6	29.3
c. Abdominal Extension to Functional Pitch	17.4	24.4	31.4	18.6	23.8	29.0	19.1	24.1	29.3
2. Abdominal Extension Depth	7.5	9.1	10.7	6.6	8.2	9.8	7.1	8.7	10.2
3. Waist Height	37.7	41.9	46.1	36.0	40.0	44.0	37.4	40.9	44.7
4. Tibial Height	15.7	17.9	20.1	14.7	16.5	18.3	15.3	17.2	19.4
5. Knuckle Height	26.5	29.7	32.9	24.8	28.0	31.2	25.9	28.8	31.9
6. Elbow Height	38.3	43.5	47.1	37.6	40.4	43.2	38.0	42.0	45.8
7. Shoulder Height	51.8	56.6	61.4	46.5	51.9	57.3	48.4	54.4	59.7
8. Eye height	59.9	64.7	69.5	55.2	59.6	64.0	56.8	62.1	67.8
9. Stature	63.5	68.7	73.9	59.0	63.8	68.6	60.8	66.2	72
10. Functional Overhead Reach	75.9	82.5	89.1	71.6	78.4	85.2	74.0	80.5	86.9

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Workbench Height – Fixed Height

We have to appreciate not all workbenches will have the adjustable height option; many will be at a fixed height. What will be most beneficial fixed height for all operators? We would like the operator to maintain a neutral upright body position as possible and operate within their appropriate reach zone to handle tools, parts and materials. Here are some considerations.

We could set the work bench height for shorter individual at 37 inches/94 cm. This will force the taller individual to bend at waist to position hands at workbench and places their hands lower than recommended reach zone. This increases biomechanical stress into spine and shoulders.

We could set the work bench height for taller individual at 47 inches/119 cm. This will force the shorter individual to reach their hands up to the work bench and places their hands higher than recommended reach zone. This increases biomechanical and physiological stress into shoulders and arms.

Mixed Population of Men and Women

Another option is to calculate values for a mixed population of men and women. We can use the mix of 50% men and 50% women. So, the 50th percentile for the mixed group results is a 42 inch/107 cm workbench height.

Shorter individuals will be working in the top end of their reach zone range and taller individuals will be working in the bottom end of their reach zone range. We could provide foot platform for shorter workers with a maximum recommended height of a single step foot platform of 6 inches/15 cm. This foot platform is comparable to 5th percentile female working at workbench height of 36 inches/91 cm.

Case Study Caveats

Worksurface height recommendations also need to reflect the task being performed; for example, if higher force levels are required or a high level of precision is needed.

Higher Manual Handling Force Levels and or Higher Downward Force Levels

If higher force levels (> 5 lbs/2.3 kg) to manually lift parts and materials or if higher downward force is needed (e.g., using torque wrench, pushing down on parts, etc. we need to be concerned about requiring shorter individuals to exert force in the upper part or even outside of their reach zone thereby compromising arms and shoulders.

Modifications are to recommend a workbench height 3 to 5 inches/7.6 to 12.7 cm lower than elbow height. ***So, 37 inches/94 cm for a fixed workbench height and an adjustable height range of 32 to 44 inches/81 to 112 cm.***

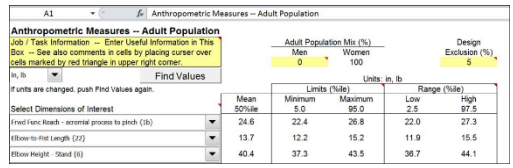
Precision activities

For precision activities we want to position the parts/materials high enough to limit excessive tilting the head down to see the task. We may need to consider supporting the weight of arms to unload neck and shoulders.

In this case, the recommended workbench height is 3 to 5 inches/7.6 to 12.7 cm higher than elbow height. ***This equates to a fixed height at 45 inches/114 cm and an adjustable height range of 40 to 52 inches/102 to 132 cm.***

Check out the ***Ergonomics Design Guidelines Track*** for additional information. If you want to learn about the Excel Spreadsheet version, check out the manual.

Anthropometric Data Base (Excel Spreadsheet)



Now that we have been through an example using the hard copy data tables, let's introduce the ***Anthropometry Reference Data Base.xlsm***, (Excel spreadsheet found in your training materials.)

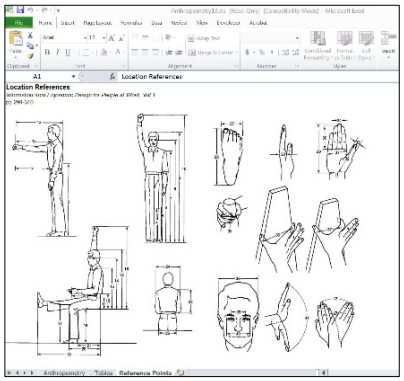
Based on information from ***Ergonomic Design for People at Work, Vol 1, pp 299-310*** it was developed by Thomas E. Bernard, University of South Florida, College of Public Health, Tampa FL 33612-3805. It provides easy access to the data base. You can select either inches or cm and lbs or kg for the calculations.

Anthropometric Case Study

A workbench is being designed for an assembly process. A diverse user population will perform light weight (up to 5#) repetitive assembly job tasks at elbow level from a standing position. ***Workbench height is the point of interest.*** Using anthropometric data, we can develop the design specifications for the workbench height.

Standing Workstation Guidelines and ***Standing Workstation Specifications*** are based on the anthropometric data and determined as follows.

Accessing the Anthropometric Data Base, in the ***Reference Points*** sheet in the Excel spreadsheet identify the metric of interest:

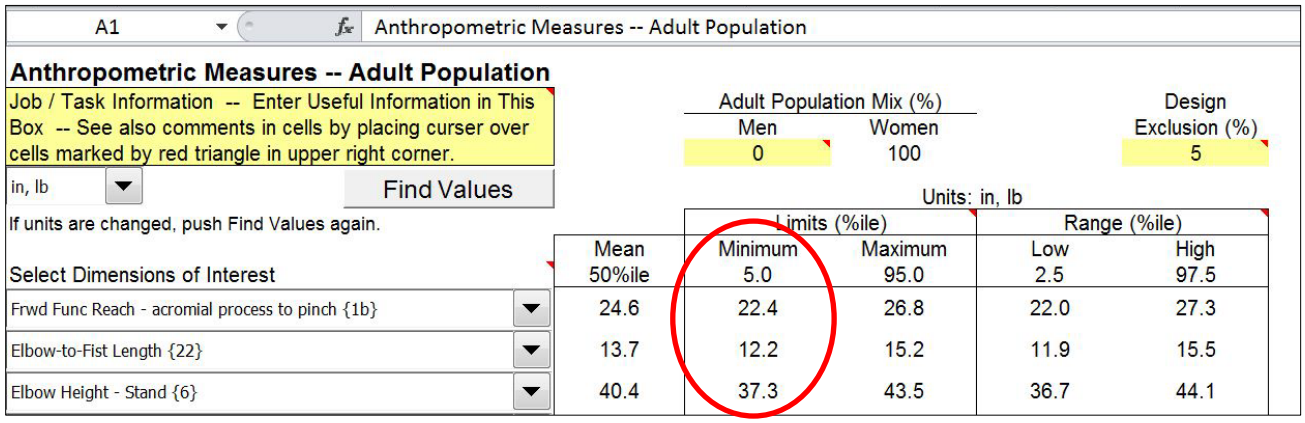


Elbow height – Stand (6) (used to determine workbench height)
Select the ***Anthropometry*** sheet in the Excel spreadsheet. In the ***Select Dimensions of Interest*** pull down menu select:

Elbow height – Stand (6)

5th Percentile Female calculation:

In the ***Adult Population Mix (%)*** input 0 for Men, Women 100 will be automatically input
In the ***Design Exclusion (%)*** input 5, this will calculate 5th and 95th percentiles
Click Find Values



95th Percentile Male calculation:

In the ***Adult Population Mix (%)*** input 100 for Men, Women 0 will be automatically input.
In the ***Design Exclusion (%)*** input 5, this will calculate 5th and 95th percentiles
Click Find Values

A1 | Anthropometric Measures -- Adult Population

Anthropometric Measures -- Adult Population

Job / Task Information -- Enter Useful Information in This Box -- See also comments in cells by placing curser over cells marked by red triangle in upper right corner.

in, lb | Find Values

If units are changed, push Find Values again.

Adult Population Mix (%) Men	Adult Population Mix (%) Women	Design Exclusion (%)
100	0	5

Units: in, lb

Select Dimensions of Interest	Mean 50%ile	Limits (%ile) Minimum 5.0	Limits (%ile) Maximum 95.0	Range (%ile) Low 2.5	Range (%ile) High 97.5
Frwd Func Reach - acromial process to pinch {1b}	25.1	22.4	27.9	21.8	28.5
Elbow-to-Fist Length {22}	15.2	13.8	16.5	13.5	16.8
Elbow Height - Stand {6}	43.5	40.6	46.5	40.1	47.0

Interpretation

For the 5th percentile female and the 95th percentile male, we now have determined standing elbow height (*Elbow height – Stand (6)*).

Workbench Height – Adjustable

So, with the 5th percentile female standing elbow height at 37.3 inches/94.7 cm and the 95th percentile male at 46.5 inches/117.9 cm we can specify the recommended range of adjustment of the workbench. Based on this result the ***recommended range of height adjustment of the workbench in in the range of 36 inches/91 cm to 48 inches/122 cm***. This provides for about a 1 inch/2.54 cm buffer added to the minimum and maximum height.

Workbench Height - Fixed

If a height adjustable workbench is not an option, we have to consider what will be the most beneficial fixed height for all operators. We would like the operator to maintain a neutral upright body position as possible and operate within their reach zone to handle tools, parts and materials. We could set the work bench height for shorter individual at 37 inches/94 cm. This will force the taller individual to bend at waist to position hands at workbench and places their hands lower than recommended reach zone. This increases biomechanical stress into spine and shoulders.

We could set the work bench height for taller individual at 47 inches/119 cm. This will force the shorter individual to reach their hands up to the work bench and places their hands higher than recommended reach zone. This increases biomechanical and physiological stress into shoulders and arms.

One option is to calculate the values for a mixed population of men and women. We can manipulate the *Adult Population Mix (%)* to consist of 50% men and 50% women.

A1 | Anthropometric Measures -- Adult Population

Anthropometric Measures -- Adult Population

Job / Task Information -- Enter Useful Information in This Box -- See also comments in cells by placing curser over cells marked by red triangle in upper right corner.

in, lb | Find Values

If units are changed, push Find Values again.

Adult Population Mix (%) Men	Adult Population Mix (%) Women	Design Exclusion (%)
50	50	5

Units: in, lb

Select Dimensions of Interest	Mean 50%ile	Limits (%ile) Minimum 5.0	Limits (%ile) Maximum 95.0	Range (%ile) Low 2.5	Range (%ile) High 97.5
Frwd Func Reach - acromial process to pinch {1b}	24.9	22.4	27.5	21.9	28.0
Elbow-to-Fist Length {22}	14.4	12.5	16.2	12.2	16.5
Elbow Height - Stand {6}	42.0	38.0	45.8	37.3	46.5

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The ***Elbow Height – Stand 50th*** percentile for the mixed group would indicate a 42 inch/106.6 cm workbench height:

- Some shorter individuals would be working in the top end of their power zone range.
- Some taller individuals would be working in the bottom end of their power zone range.

So, for a 50/50 Adult Population Mix, a 42 inch/106.6 cm fixed workbench height could be a reasonable compromise.

We can also provide a foot platform for the shorter workers. Maximum recommended height of a single step foot platform is 6 inches/15 cm. For a fixed height workbench this would be comparable to a 5th percentile female working at workbench height of 36 inches/91 cm.

Honestly, we try to avoid the use of foot platforms based on issues of inadvertently stepping off the platform, need to move the platform in and out of position, etc.; but it can be a viable option when no alternative to a fixed height workbench exists. Please refer to the Caveats section above.

Anthropometry Case Study

I hope our discussion has been helpful to you. To gain a little more experience, please refer to the Anthropometry Case Study in your training materials. You will have the opportunity to develop the design specifications for a height adjustable workbench where the worker can sit and stand.

For this exercise you will access the hardcopy ***Anthropometry Reference Data Base Tables***. You can also use the Excel spreadsheet version if you are able to use the macro enabled version. Remember the results vary slightly based on rounding in the calculations.

Anthropometry – Important Component

Applying anthropometric principles and design criteria is an important component in ergonomics.

I can't tell you the number of times I have been asked by an engineer, a safety professional, a manager and a worker how high that workbench should be or how far can a person reach.

I believe it has added a great deal of value to my work with my clients and I believe it will for yours as well!

Thanks for your time and attention!