

Guide to

Dimensions in designing for elderly people

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Committees responsible for this British Standard

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AFRC Institute of Engineering Research
 British Airways
 British Industrial Truck Association
 British Occupational Hygiene Society
 British Telecommunications plc
 Chartered Institution of Building Services Engineers
 EEA (the Electronics and Business Equipment Association)
 Engineering Employers' Federation
 Ergonomics Society
 Furniture Industry Research Association
 Health and Safety Executive
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 Institute of Management Services
 Institute of Occupational Medicine
 Loughborough University of Technology
 Ministry of Defence
 National Union of Mineworkers
 Society of Motor Manufacturers and Traders Limited
 Society of Occupational Medicine
 Trades Union Congress

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Foreword

This British Standard has been prepared under the direction of the Personal Safety Equipment Standards Policy Committee. It supersedes BS 4467:1969 which is withdrawn. This revision provides information on a more comprehensive and realistic range of applications than the previous edition and is based on new data. To facilitate the use of this standard, indexes of anthropometric dimensions and their applications are given in Appendix A and Appendix B respectively. The sources of the data on which this standard is based are given in Appendix C.

The standard has been prepared for the guidance of those responsible for the design of equipment and buildings for elderly people. The method of presentation has been developed in consultation with a reference group of actual and potential users.

Due to a lack of suitable data, guidance on hand function and the forces that elderly people are able to exert could not be included.

For information on architectural provisions that should be made when providing housing for disabled people, reference should be made to BS 5619. BS 5810 provides a code of practice for access for disabled people to buildings and BS 5588-8 provides a code of practice for means of escape for disabled people from buildings.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 14, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

1 Scope

This British Standard provides guidance relevant to the design of equipment and buildings for elderly people. Guidance is given in terms of anthropometric dimensions and by giving examples of applications of this data for particular types of facility. The standard does not cover design for seriously disabled and non-ambulant elderly people.

The guidance is based upon the dimensional requirements of elderly women but the guidance will also prove suitable for the majority of elderly men.

The dimensions given include an allowance for clothing and low heeled shoes.

Due to lack of suitable data, no guidance is given on hand function and forces that elderly people might be able to exert.

NOTE The titles of the publications referred to in this standard are listed on the inside back cover.

2 Characteristics of ageing

The body and its various systems show changes with age. Physiologically, the net result of these changes is that the systems and processes work less effectively in old age than in youth. Some of the physical changes are obvious, e.g. body weight may alter and changes in the skeletal system may reduce height.

With varying frequency and to a varying extent, the normal effects of old age can be accompanied by certain illnesses and infirmities. The most common type of disorder is rheumatism: strength and dexterity in all kinds of physical activities can be cut down as a result of arthritic symptoms in the hands and feet.

The implications of these changes for the design of the domestic environment are considerable. The needs and capabilities of elderly people have to be considered when specifying work surface heights, the situation of cupboards and windows and the forces required to operate door handles and window latches. Some elderly people, for example, might need to sit whilst carrying out activities customarily undertaken standing up, such as ironing or preparing food.

Reduced elasticity in almost all tissues of the body may result in varying degrees of restriction of movement in the legs and arms. Walking and climbing become harder, especially with arthritis of the knees and hips. Movement of the back may be inhibited by arthritis of the spine. Very often, particularly in women, there is emphasized curvature of the upper back.

Problems of maintaining balance become increasingly common due to the incidence of underlying medical conditions, and there is a greater prevalence of deafness due to causes other than wax in the ear.

Eyesight deteriorates with age. Long-sightedness starts by the mid-forties and continues into old age. The lens becomes increasingly opaque and less elastic. The pupillary reflex becomes slower and the diameter of the pupil decreases. Recovery from glare takes longer. There are also deteriorations in dark adaptation and colour vision. As a result, elderly people require a high level of well-directed illumination which can be over three times that required by a twenty year old. It is important, with such high levels of illumination, to avoid glare in the visual environment which may obscure important features and distract the person.

Some elderly people may also undergo a slowing down of their ability to process information: this is due to physiological changes in sensory capacity. Yet for many individuals, despite limitations in joint mobility and muscle power, their motor skills remain relatively unimpaired and may be more reliable than those of younger people. It is important to remember that there is very great individual variability in the capacities of elderly people, and some may have greatly reduced mental functions leading to quite severe and debilitating loss of memory. This means that it is important to design for the proportion of the population which is more disadvantaged. This may mean that it is necessary to augment the intensity of any stimulus, e.g. emphasizing the nosings of stairs with good lighting and/or contrast.

3 Designing for elderly people

3.1 Information presented

3.1.1 General

The information contained in this standard is presented as follows:

- a) anthropometric dimensions (see Figure 1 to Figure 8);
- b) examples of applications (see Table 1 to Table 8).

When using this standard, a design problem can be approached in any one of the following three ways:

- 1) by application (see **3.2**);
- 2) if a designer knows which anthropometric dimension is important, e.g. maximum upward grasp then, by using the index in Appendix A, it is possible to go straight to the figure(s) illustrating that dimension (see **3.1.2**);

3) if a designer is seeking advice on an application, e.g. maximum shelf heights for storage then, by using the index in Appendix B, it is possible to go straight to the table(s) giving examples of the different applications of the anthropometric dimensions (see 3.1.3).

NOTE Some anthropometric dimensions may be relevant to more than one application: hence it has been necessary to repeat some diagrams within the figures. For ease of cross-reference, each diagram has been given a designation (from 001 to 025) and these designations are used in Appendix A and Appendix B.

3.1.2 Anthropometric dimensions

Each anthropometric dimension (illustrated in diagrams 001 to 025) is accompanied by three different values, which are:

- a) the fifth percentile (5 percentile) which relates to the smallest or weakest 5 % of the population;
- b) the mean, which is a notional value which relates to the average size or strength of the population and rarely has a practical application;
- c) the ninety fifth percentile (95 percentile) which relates to the largest or strongest of the population.

For some dimensions or applications it will be the fifth percentile value which determines design, e.g. shelf height, since it is clearly important that all small people should be able to reach the shelf.

For other applications, such as knee clearance between a chair and a table, it will be the ninety fifth percentile value which is critical since there has to be room for larger people to get their legs under the table. There are very few, if any, instances where the mean value should be applied, but the data is included for the sake of completeness.

Designing for the mean or average user will only result in large sections of the population being excluded from using equipment and buildings.

To help in the use of these different dimensions, wherever appropriate the critical value has been given in bold below the diagram.

Appendix A gives an index of the anthropometric dimensions covered.

3.1.3 Examples of applications of anthropometric dimensions

Examples of different applications of the various anthropometric dimensions are shown in Table 1 to Table 8 beneath the figures. The applications given are examples to indicate ways in which the data could be used: they are not intended to be an exclusive or comprehensive list of all possible applications.

Appendix B gives an index of the applications covered.

3.2 Functional grouping of applications

To facilitate the design process, the examples of applications have been grouped according to activities to which they relate. Examples include:

- a) kitchens;
- b) storage;
- c) living and dining rooms;
- d) doors and windows;
- e) bathrooms.

Such groupings should not be considered as exclusive, since many of the applications, e.g. storage, could be considered as appropriate for all the rooms of a dwelling. However, the groupings have been used to assist the architect or designer who wishes to design a particular facility.

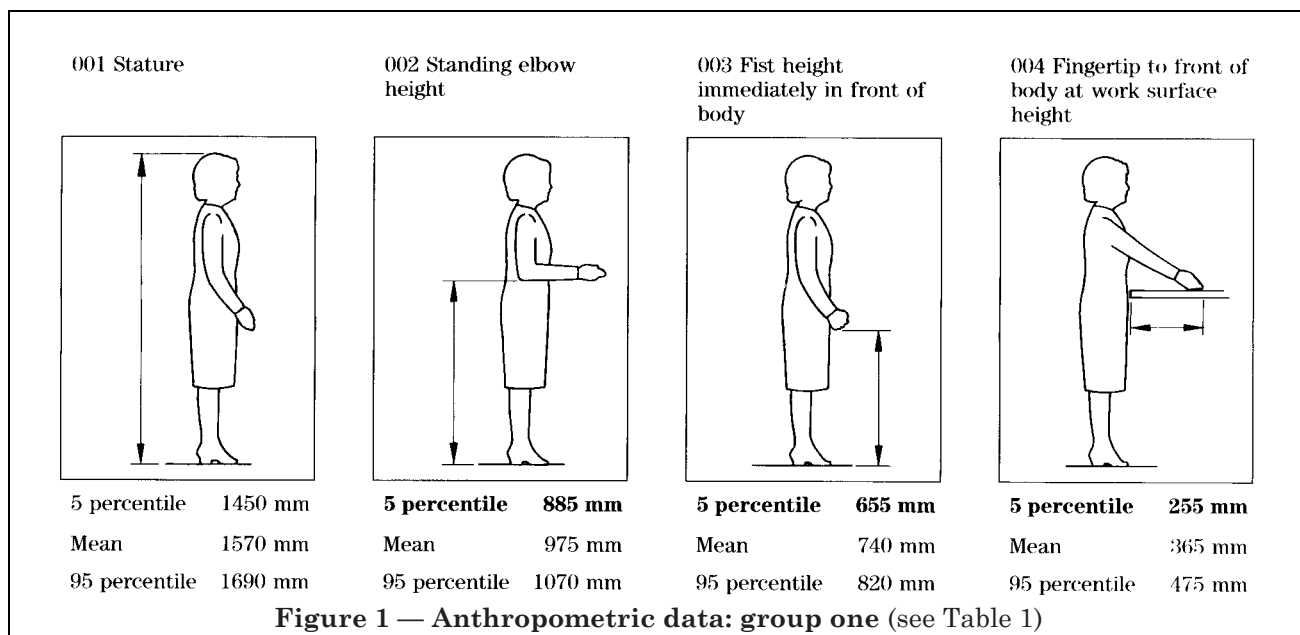






Table 1 — Examples of the application of anthropometric data: group one (see Figure 1)

Application	Dimensions
	mm
Work surface: height depth	
800 to 900 600	
	
Sink bowl height Clearance behind taps	690 40 min.
	Electrical sockets: above work surfaces above floor
150 to 290 1 040	
	Controls/light switches
800 to 1 200	
NOTE A typical use of such data would be in the design of kitchens.	

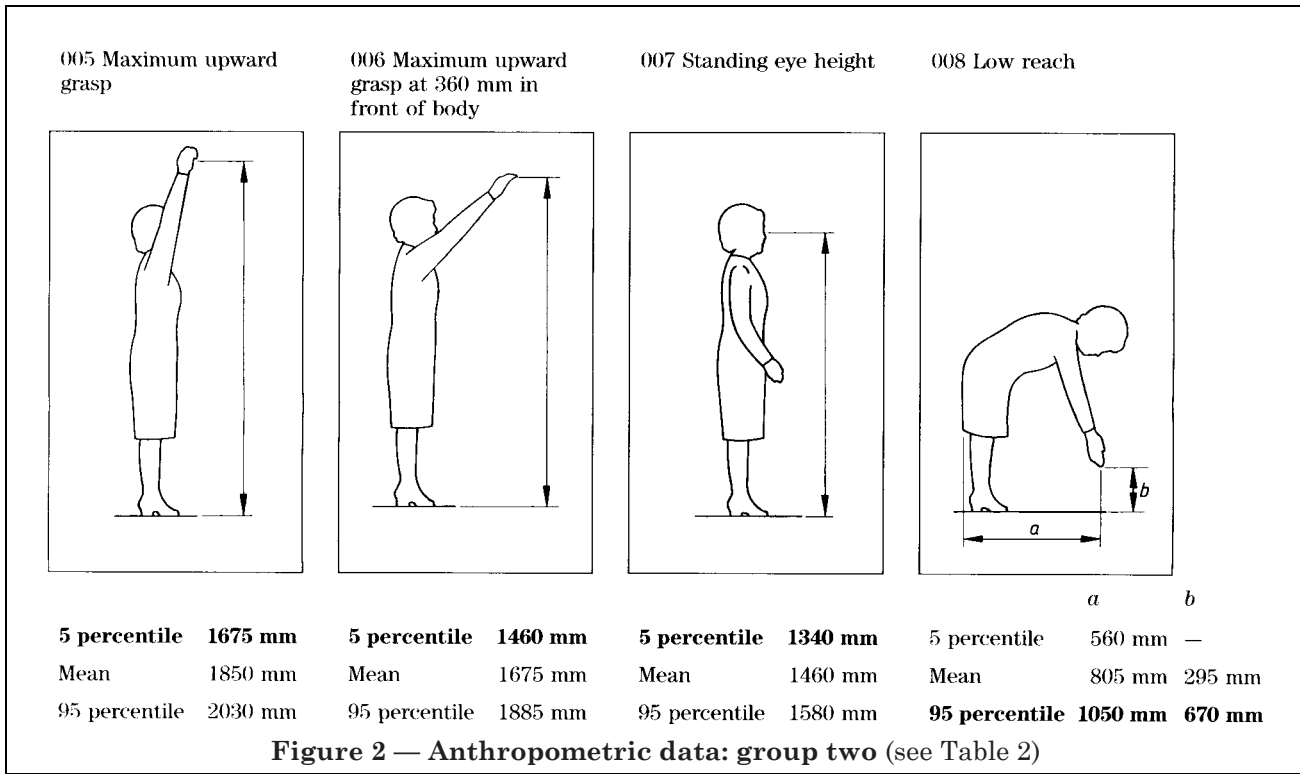








Figure 2 — Anthropometric data: group two (see Table 2)

Table 2 — Examples of the application of anthropometric data: group two (see Figure 2)

Application	Dimensions
	mm
 Shelving above work surface: two-handed access single-handed access	1 350 from floor max. 1 400 from floor max.
 Highest shelf for: two-handed access single-handed access	1 400 from floor 1 450 from floor
 Lowest, narrow shelf	300 from floor
 Height of shelf on to which all can see	1 330 from floor
 Height of shelf in floor units	500 from floor min.
 Floor units: handle heights drawer handle heights	650 to 900 300 min.

NOTE A typical use of such data would be in the design and placement of storage areas.

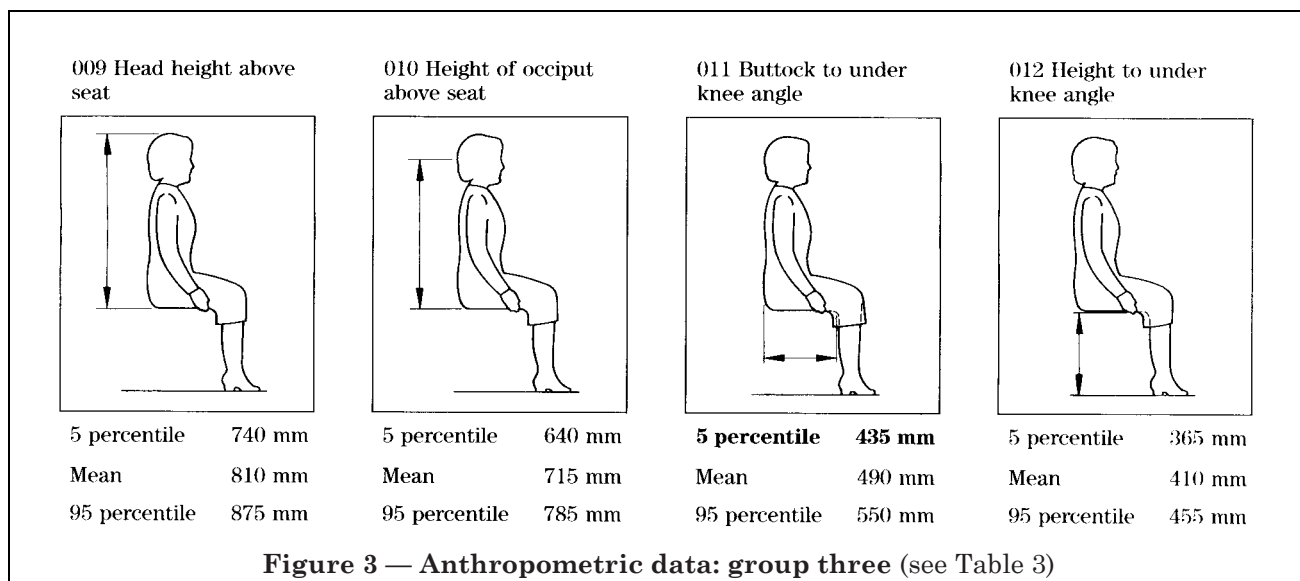






Table 3 — Examples of the application of anthropometric data: group three (see Figure 3)

Application	Dimensions
	mm
 Seat height	430
 Seat depth	435
 Armrest height above seat	150 to 200
 Centre of headrest above seat	610 to 810

NOTE A typical use of such data would be in the design of living and dining areas.

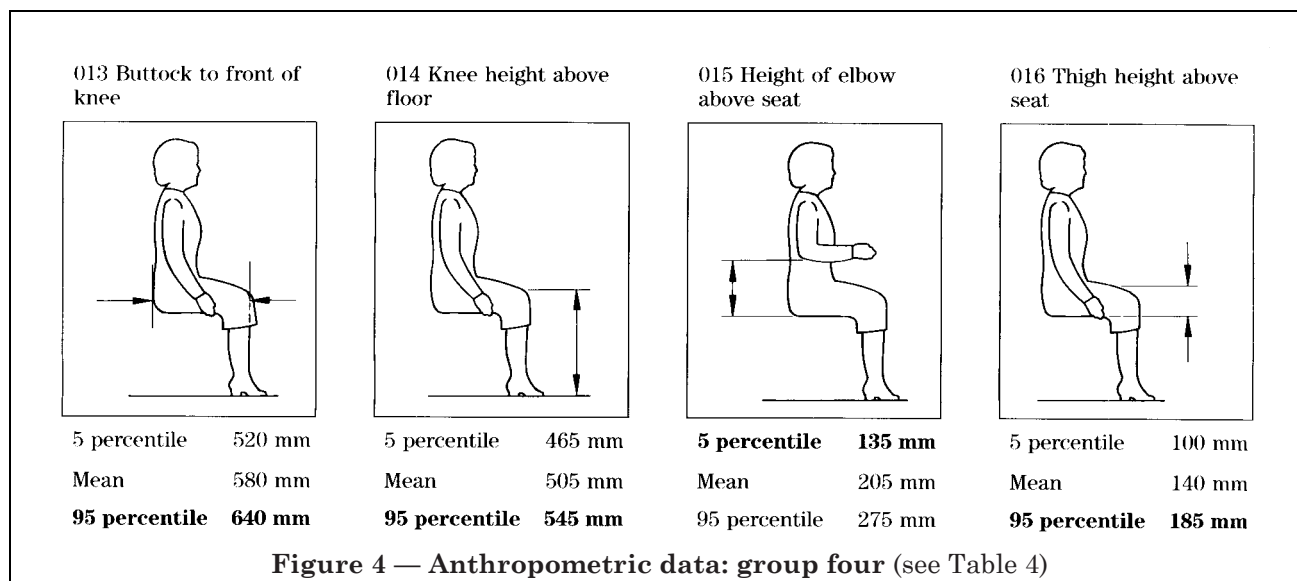





Table 4 — Examples of the application of anthropometric data: group four (see Figure 4)

Application	Dimensions
 Table top height	700 mm
 Vertical clearance between seat and near edge of the table	220 min.
 Height beneath table to allow knee clearance	610 min.

NOTE A typical use of such data would be in the design of living and dining areas.

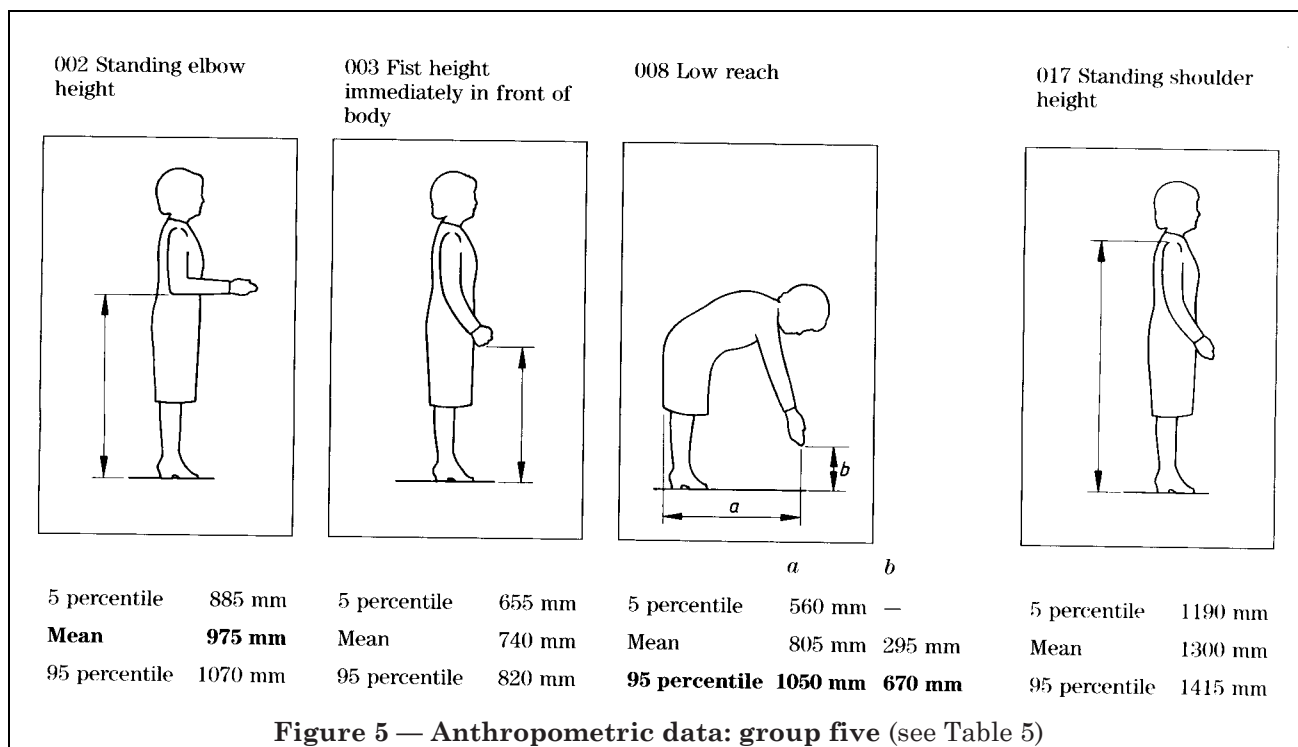








Table 5 — Examples of the application of anthropometric data: group five (see Figure 5)

Application		Dimensions
	Door bolt: upper lower	mm 1 600 from floor max. 300 from floor min.
	Threshold	0
	Height of cylinder lock (Turning strength for rectangular knob)	1 000 to 1 350 (0.4 N m max.)
	Peephole	1 300
	Height of door handles	900 to 1 000
	Clearance between handle and door (Turning strength for handle)	40 min. (5.4 N m max.)

NOTE A typical use of such data would be in the design of doors.

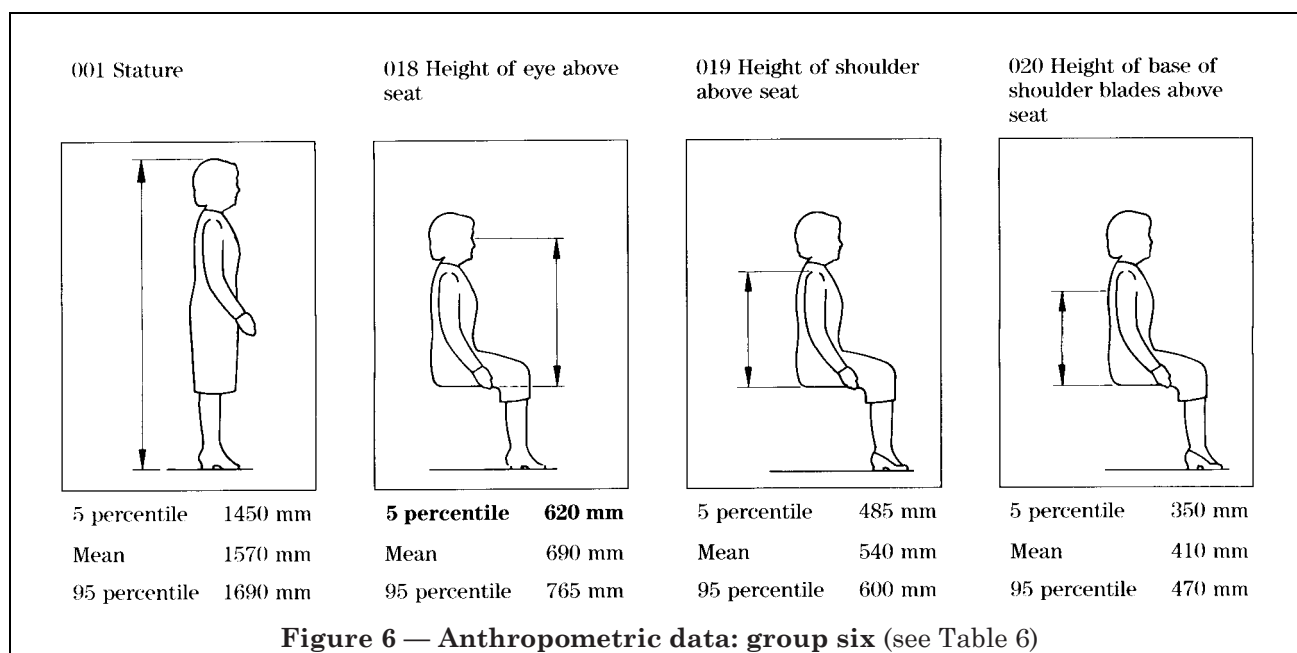






Table 6 — Examples of the application of anthropometric data: group six (see Figure 6)

Application	Dimensions
	mm
Window latch/lock heights: obstructed by sink unit or similar	1 300 max.
	600 to 1 600
unobstructed access	
	800 max.
Sill heights: to see out, seated	
	1 200 max.
to see out, standing	
NOTE A typical use of such data would be in the design and placement of windows.	

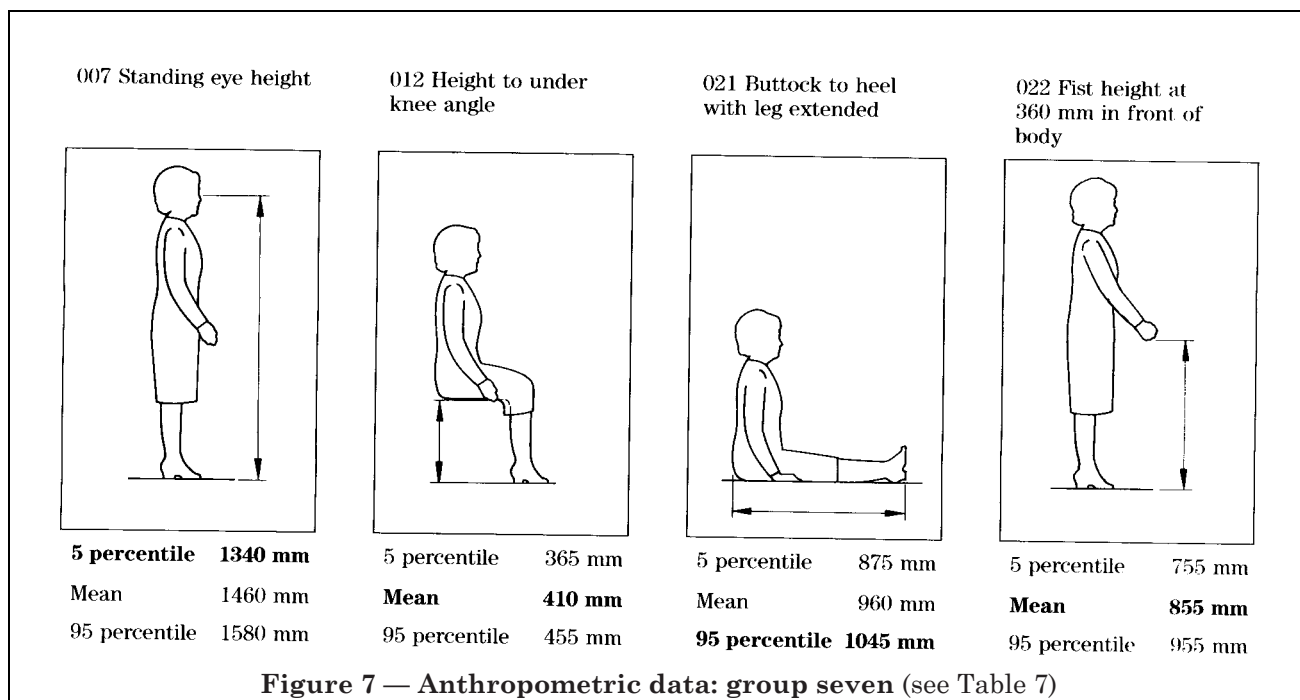






Table 7 — Examples of the application of anthropometric data: group seven (see Figure 7)

Application	Dimensions
	mm
Bath: rim height length (external) width(external)	450 preferred 1 600 to 1 700 700 to 800
	
Basin: rim height bottom of basin clearance behind taps	850 to 925 710 min. 40 min.
	
Toilet seat height	430 to 500
	
Mirrors: lower edge upper edge	1 100 from floor max. 1 700 from floor min.
NOTE A typical use of such data would be in the design of bathrooms.	

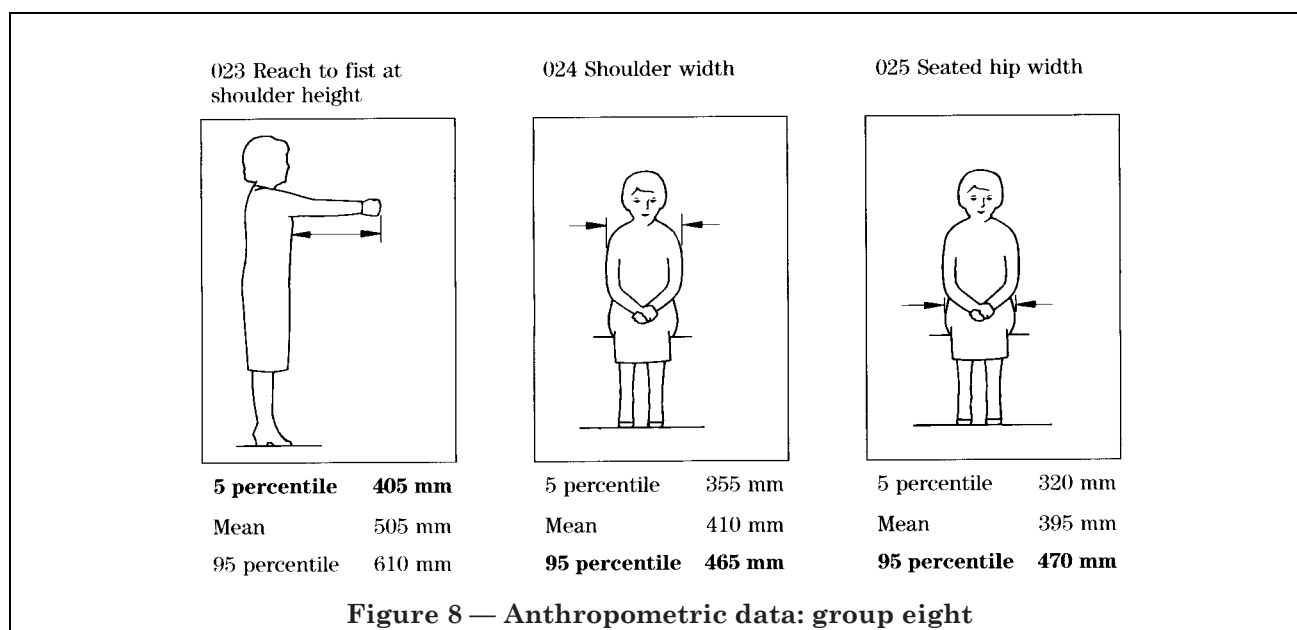


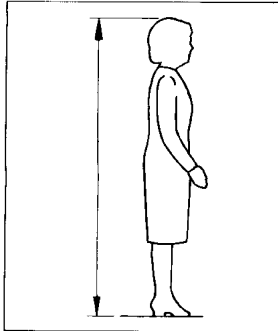


Table 8 — Miscellaneous examples of application

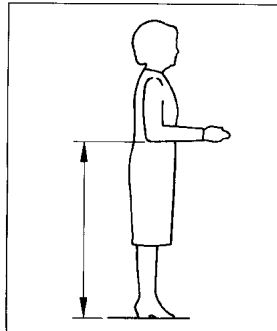
Application	Dimensions
 <p>Stair riser Stair tread depth</p>	<p style="text-align: center;">mm</p> <p>170 265 to 290</p>
 <p>Hand rails: diameter height above nosing clearance between rails and wall</p>	<p>40 to 50 840 to 910 40 min.</p>
NOTE A typical use of such data would be in the design of stairs.	

Appendix A Index of anthropometric dimensions

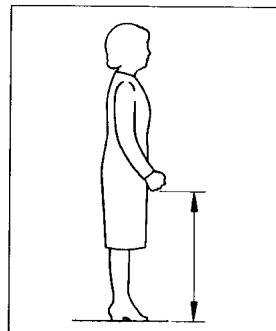
001 Stature



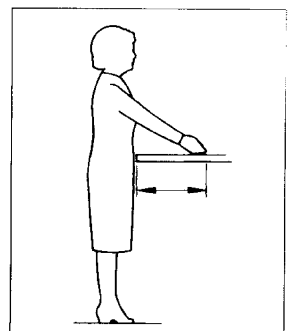
002 Standing elbow height



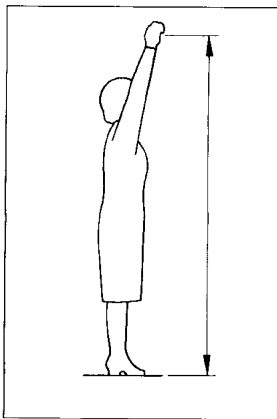
003 Fist height immediately in front of body



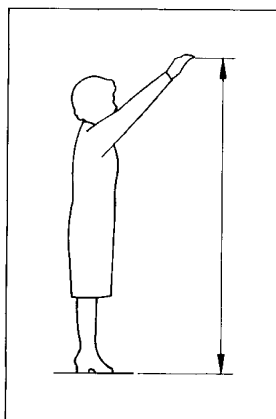
004 Fingertip to front of body at work surface height



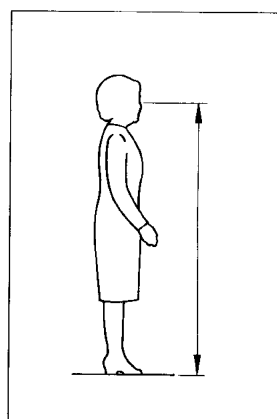
005 Maximum upward grasp



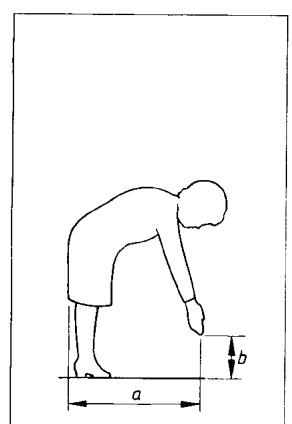
006 Maximum upward grasp at 360 mm in front of body



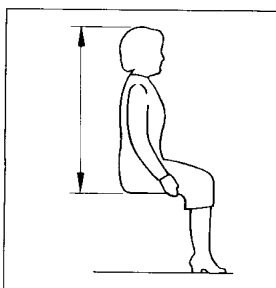
007 Standing eye height



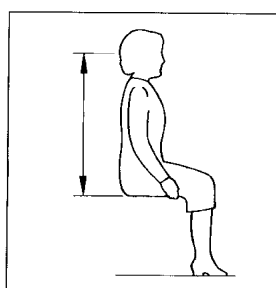
008 Low reach



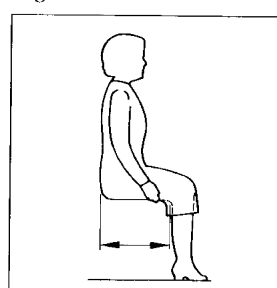
009 Head height above seat



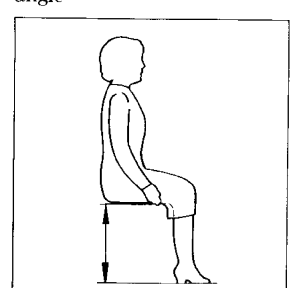
010 Height of occiput above seat



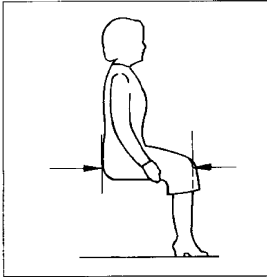
011 Buttock to under knee angle



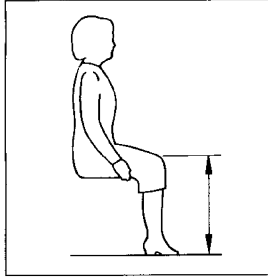
012 Height to under knee angle



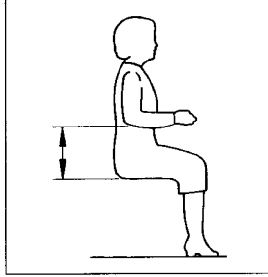
013 Buttock to front of knee



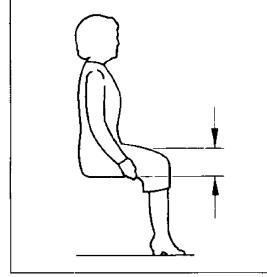
014 Knee height above floor



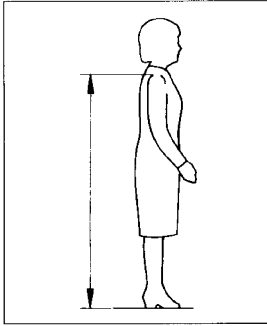
015 Height of elbow above seat



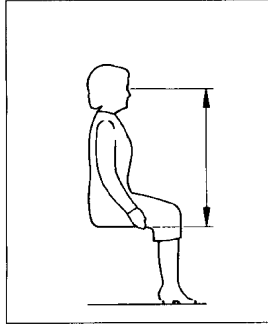
016 Thigh height above seat



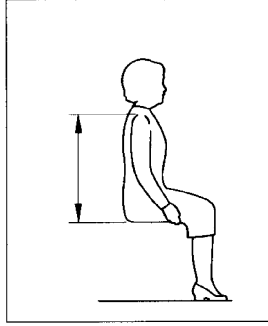
017 Standing shoulder height



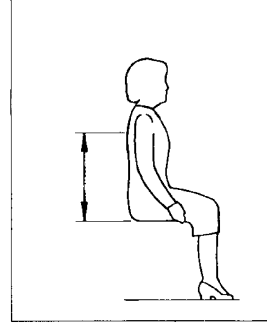
018 Height of eye above seat



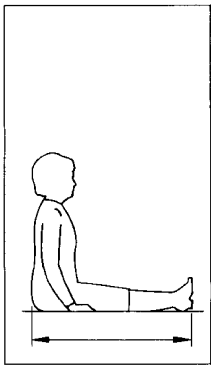
019 Height of shoulder above seat



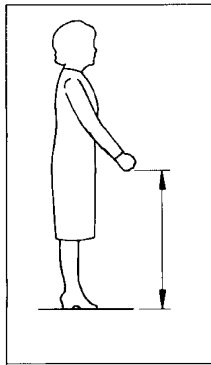
020 Height of base of shoulder blades above seat



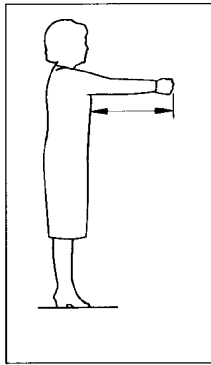
021 Buttock to heel with leg extended



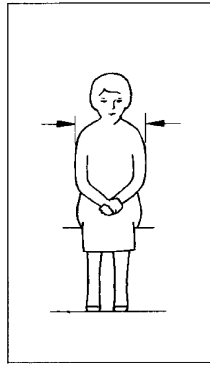
022 Fist height at 360 mm in front of body



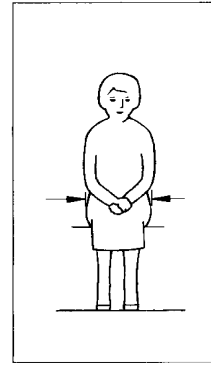
023 Reach to fist at shoulder height



024 Shoulder width



025 Seated hip width



Appendix B Index of applications

Facility	Application	Figure	Table
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	Turning strength for rectangular knob	Figure 5	Table 5
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	Door bolt (upper)	Figure 5	Table 5
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	Height beneath table to allow knee clearance	Figure 4	Table 4
Toilet	Seat height	Figure 7	Table 7
Windows	Sill height to see out, seated	Figure 6	Table 6
	Sill height to see out, standing	Figure 6	Table 6
	Latch/lock height where window is obstructed by sink unit or similar	Figure 6	Table 6
	Latch/lock height with unobstructed access to window	Figure 6	Table 6
Work surfaces	Height	Figure 1	Table 1
	Depth	Figure 1	Table 1

Appendix C Bibliography

C.1 Anthropometric references

Buzzell, P.R., Lafond, L. and Michaud, F., *Anthropometric measurements guide of elderly women and men*. 1979. University of Montreal, Canada.

NOTE This gives data for over 300 men and 600 women, aged 65 years and over.

Diffrient, N., Tilley, A. and Bardajy, F., *Humanscale 1/2/3*. 1974. MIT Press, Cambridge, Massachusetts.

Goldsmith, S., *Designing for the disabled*. 3rd Edition. 1976. RIBA, London.

NOTE This gives data for women aged 60 years and over.

Grandjean, E., *Ergonomic aspects of ageing and the built environment*. 1976. Proceedings of the 6th congress of the International Ergonomics Association "Old World, New World, One World" and technical program of the 20th annual meeting of the Human Factors Society.

NOTE This gives data for women aged 60 years and over.

Institute of Consumer Ergonomics. *Seating for elderly and disabled people Report No. 2: Anthropometric survey*. 1983. ICE, University of Technology, Loughborough.

NOTE This gives data for over 700 subjects, approximately 240 men and 500 women aged 65 years and over.

Rennie, A.M., *Design of dwellings for the elderly: the measurement of optimum height of shelves and spaces required for various domestic activities*. 1981. ICE, University of Technology, Loughborough.

NOTE This gives data for eleven subjects, male and female aged 60 years and over.

Stoudt, H.W., *The anthropometry of the elderly*. 1981. Human Factors, **23**, 1, 29 — 37.

NOTE This gives data for 1 600 men and 1 800 women aged between 65 and 74 years.

Thompson, D., Barden, J.D., Kirk, N.S., Mitchelson, D.L. and Ward, J.S., *Anthropometry of British women*. 1972. ICE, University of Technology, Loughborough.

NOTE This gives data for 260 women aged between 65 and 80 years.

Ward, J.S. and Kirk, N.S., *Anthropometry of elderly women*. 1967. Ergonomics, **10**, 1, 17 — 24.

NOTE This gives data for 176 women aged over 60 years.

C.2 Applications data

Chapanis, A., *Human engineering environments for the aged*. 1974. The Gerontologist, **14**, 3, 228 — 235.

Goldsmith, S., *Op cit*.

Grandjean, E., *Op cit*.

Grandjean, E., *Ergonomics of the home*. 1973. Taylor and Francis Ltd, London.

McClelland, I. and Ward, J.S., *Ergonomics in relation to sanitary ware design*. 1976. Ergonomics, **19**, 4, 465 — 478.

Noble J., *Activities and spaces*. 1982. Architectural Press.

Raschko, B., *Physiological and behavioural characteristics of the elderly: a basis for design criteria for interior space furnishings*. 1974. Rehabilitation Literature, **35**, 1, 10 — 15.

Raschko, B., *Housing interiors for the disabled and elderly*. 1982. Van Norstrand Reinhold Company Inc.

Rennie, A.M., *Op cit*.

Rennie, A.M., *Dwellings for the elderly: recommended dimensions and space requirements for design*. 1981. ICE report to the Housing Development Directorate, Department of the Environment.

Resendiz, A.J., *Kitchen layout and dimensions for the ambulatory and wheelchair bound elderly*. 1985. Texas A and M University.

Scottish Development Department. *Scottish housing handbook 5: Housing for the elderly*. 1980. HMSO.

Publication(s) referred to

(See also Appendix C.)

BS 5588, *Fire precautions in the design and construction of buildings*¹⁾.

BS 5588-8, *Code of practice for means of escape for disabled people*.

BS 5619, *Code of practice for design of housing for the convenience of disabled people*¹⁾.

BS 5810, *Code of practice for access for the disabled to buildings*¹⁾.

¹⁾ Referred to in the foreword only.

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