

NATIONAL COLLEGE OF ART & DESIGN

INDUSTRIAL DESIGN

TITLE: UNIVERSAL DESIGN - IT'S ORIGINS PRESENT STATE AND FUTURE PROSPECTS

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#### INTRODUCTION

Universal design is by definition deriving a universally valid solution to design problems. This in context means encompassing the needs of as many people as possible in the design of products. It is achieved by considering those outside the realm of "normal" capabilities and is obtained through the study of scientific and psychological data. This application of design benefits all individuals physically because of better suited design. It has further psychological benefits for the less abled minorities due to increased independance and integration into society.

Universal design has been a logical progression from good design and design for the disabled. It originated from the hgih interaction between professions of design, physiotherapy, psychology, engineering and ergonomics.

The criteria for universal design is a combination of that for both abled bodied and disabled design. The difference in the application of this criteria, as is discussed in Chapter I, explains the difference in the three forms of design. Earliest care of the disabled in Sweden through to modern care of the disabled shows how universal design developed and progressed and this is discussed further in Chapter II. The present state of universal design is discussed in Chapter III, the advantages and problems encountered, using examples of existing products. The analysis of these chapters conclude to determine the future prospects of universal design.



## CHAPTER I

#### INTRODUCTION

At the moment there exists three different types of design; design for the able bodied, design for the disabled and universal design. Universal design is a recent movement in design which has developed from design for the disabled. This movement is concerned with the thorough design of products where high standards will benefit both the able bodied and the disabled, resulting in a more integrated society.

This chapter concentrates on the functional aspects of design to show how all three types of design differ.

## 1.1 ABLE BODIED DESIGN

'A designer works through and for other people concerned primarily with their problems rather than his own'. (24, P19). This definition of a designer stresses the importance of designing products that satisfy the users needs. This functional aspect of a product ensures that a majority of the population can use the product comfortably and safely. This is more scientifically known as the ergonomic quality of a product. The users needs are better satisfied, when the product is more ergonomically designed.

Designing ergonomically, does not necessarily mean designing for the average person. In, for example, the design of a building, any architect will have a rough idea of how tall the average person is, how high he can reach and what gradient of stairs he can manage comfortably. Knowing that people do vary in shape and size, the architect also knows where it is a good idea to add a few centimeters (door height and width) or take them away (topmost shelves and window heights, door handles and switches). But an architect could predict (using scientific ergonomic data) with more accuracy the exact measurement for the width of a door, height of door handles or switches, and thus accommodate 90% of the population.



Fig. 1. The frequency distribution (or probability density function) for the stature of adult British men. This is an example of the normal or Gaussian distribution. (Data from Knight, 1984). A distribution graph of the anthropometric data of the heights of men in Britain is shown in figure 1.1. This frequency distribution with its characteristic symmetrical bell-shaped curve is usually known as a 'normal' or 'Gaussin' distribution. The scientific use of anthropometric data gives the ergonomic values, required for a well designed product.

As this curve is symmetrical it can be said that 50% of all men are shorter than average and 50% are taller. Therefore, in this distribution, the mean is equal to the 50th percentile (50th % ile). To cater then for 90% of the population in a design, the stature range of those between the 5th and 95th percentile is used. It is important to remember that percentiles refer to a specific group and to a specific dimension. The 95th percentile stature for the general population of men, 1850mm in the graph, would possibly only equal 5 percentile stature of another group such as the New York professional basketball players, whose heights are considerably above the average.

To apply this then, to an architect designing a house, the 95 percentile stature of the population would be the measurement used to judge the height of a doorway. When judging the height of the topmost shelves the 5 percentile reach of the population would be used. In both situations 95% of the population are catered for but in the overall design of a house the needs of 90% of the population have been addressed.

It is considered both practical and economical to base design criteria on characteristics of the 5-95 percentile population. There would be a wastage of space if all topmost shelves accommodated the 5th percentile population.

When design is for a large market area it can be mass produced thus reducing the manufacturing costs and thus retailing prices. If 98.5% of people, other than children, can climb stairs without discomfort (derived from statical data, 14, Appendix 5) it follows that, for smaller buildings, a staircase rather than a lift would be the more economical answer. Otherwise this would add enormously to the cost of the building. The designing for the remaining 1.5% is a more specialised situation covered by the area design for the disabled.

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## 1.2 DESIGN FOR THE DISABLED

Designing products for the disabled is not specialised Industrial design, but is Industrial design for those with special needs. It is a product area in which user participation as well as intensive ergonomic factors are most important. Some products designed for the disabled satisfy a more general purpose such as wheelchairs, hearing aids or books in braille, however other products such as cutlery have to satisfy specific needs of a variety of users. Therefore designers in this area not only have to work with the users but also work in colaboration with the medical and paramedical professions such as physicians, physiotherapists and rehabilitation experts.

It is important at this juncture to distinguish between impairment, disability and handicap. The following definitions formulated by the World Health Organisation, are consistent with Selywn Goldsmith and other writers on the subject. They make the distinction between an impairment which is an individual characteristic (something that that person is born with), and disability, which is the result of that impairment or development of it (a limitation of a function such as walking, hearing or ageing). The word, handicap, is a more general word. It does not refer to a characteristic or disability in particular but refers to a persons relationship with the environment, in effect the social consequences of impairment or disability.

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INJUR y			
DISORDER OR DISEASE			
IMPAIRMENT	SKELETAL	SENSES	DISFIGUREMENT
	(LEGS PARAL ySED	EYES DUE TO	
		CATARACTS)	
DISABLEMENT	WALKING	SIGHT	
	(INABILITY TO	RESTRICTION	
	WALK)		
HANDICAP	MOBILITY	ORIENTATION	SOCIAL
		SIGHT	INTEGRATION

These definitions imply, firstly, that disabled people do not experience handicaps in every situation. Secondly, it implies that it is a lacking in the social environment that constitutes a handicap. To explain this, a person in a wheelchair travelling along the street does not experience any handicap as he is mobile, like every one else, but when he comes face to face with steps his progress is prevented and he now experiences a handicap. If lifts and ramps were provided wherever steps occur people in wheelchairs would not experience this handicap again, although this would not solve all of their problems. There are many other aspects in the environment that pose handicapping situations for wheelchair users: narrow doorways, small toilets, heavy doors and access to public transport to name but a few. If society recognised more of these needs of the disabled and provided a more accommodating environment, there would be less potential for people with disabilities to experience handicaps in daily life.

Apart from the environmental needs there are many technical aids required by the handicapped. These aids, as mentioned earlier, have to satisfy the specific needs of a variety of users. It can be very complicated and sometimes impossible to find one solution that would satisfy all needs.

Ergonomi Design Gruppen (EDG), one of the biggest design companies in Sweden experienced this when designing an 'EAT-DRINK PROJECT'. They were commissioned by their major client, RFSU-Rehab, in 1989, to develop a range of tableware products. The basic demand, in addition to ergonomic requirements, was that the cutlery should be lightweight, attractive and suitable for a dishwasher.

Maria Benktzon and Eric Sven Juhlin, the main design team dealing with the above project, discovered that when they tested their first prototypes, the cutlery did not work as they had intended, so they began to study the patterns of movement of the users.

Their findings confirmed that a single design solution would not meet the needs of people with different disabilities, as hand-arm movements varied with different impairments. As a result three types of eating utensils were developed; utensils with large diameters

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fig. 1. MARIA BENKTZON

intended primarily for people with decreased ability of closing their hands, related to those with arthritis; another set with long, slim handles for those with muscular weakness (muscular dystrophy and some types of arthritis). Longer handles made it easier to lift food to the mouth; and a third set, dual purpose cutlery - fork/knife and spoon/knife for people who have only the use of one hand.



fig. 2. LARGE DIAMETER CUTLERY BY EDG



The 'Eat-Drink' series was eventually expanded to a whole service; a drinking glass, a plate with a raised edge and a beaker with holder.



fig. 3. DUAL PURPOSE CUTLERY BY EDG

The entire series was included in an exhibition at the Department of Architecture and Design in New ork's museum of Modern Art in 1989: Designs for Independent Living. These specialised products proved successful and have influenced the development of cutlery in other countries. Versions of this cutlery shown below are available for the disabled throughout Europe. These copies are sold here in Ireland.

This thoroughness and specialisation is needed when designing for the disabled. The more a product is specialised, the more expensive it becomes. For the more generally handicapped, products do not need such a degree of specialisation. Many products require greater ergonomic designing to facilitate needs of the disabled. The advantages of well designed products are that these products can be mass produced for the general market and therefore cost less. These products are considered universally designed products, as they satisfy the needs of a broader user group.



4. Drinking Goblet, Plate and Beaker by EDG

## 1.3 UNIVERSAL DESIGN

Universal design is the development of design for the disabled. It is a recognition that good design is needed not only for the disabled but also for the able bodied to prevent impairments occuring. It is then by definition a versatile design to ensure a comfortable and integrated environment for all people, and not just the disabled.

To achieve this goal the main considerations for Universal Designers have been (1) to acknowledge the broadest group who will use the product and (2) to apply scientific ergonomic information that suit the minimum abilities of this group. Not everyone with disabilities may be included in the specified user group.

In his study, 'The Rehabilitation of Housing for the Physically Handicapped' in 1984, William H. Hastings grouped the disabled as being either generally, seriously or severely handicapped. The generally handicapped are those who experience problems with products designed for the model user. This type of handicap can be experienced by those who are left handed, too tall, too short, too fat or pregnant and even a mother carrying a child in one arm rendering her practically one handed. It would also include weakness and stiffness due to old age.

The seriously handicapped are those who are likely to need special equipment and sometimes special environments (such as wheelchairs and wheelchair environments). Their needs are slightly different from the general population but they can live reasonable independent lives and use most products used by the general population.

The severely handicapped are very dependant on someone else to cater for their needs. Their problems are more medical than environmental and they would use very few general products themselves.

The minimal ergonomic needs that universal designers consider when designing would include the needs of the generally and seriously disabled but would not include those of the severely disabled population. Victor Papanek, in his first book, 'Design for the Real World', gives a good example of what it means to broaden a user group.

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5. Victor Papanek

Papenek's mother was unusually short at four feet two inches. Apart from in the kitchen where the sink and worktops were uncomfortably high, she had problems when trying to reach goods placed on upper shelves of supermarkets.

When Papanek approached his boss with this problem he was told that this section of the population was too small for concern. On the advice of a past tutor, Papanek decided to make a list of the people who experience this problem. He estimated that there were at least 100,000 similiarly, short older ladies in North America (he discovered later that the actual figure is closer to 250,000). It stood to reason then that there were 100,000 short men also. He then considered other countries. By virtue of the fact that in most of the world there is a lack of decent nutrition, minerals and vitamins, he realised that almost the entire population of Asia, Africa, South and Central America, the Middle East, Mexico and Micoronesis, the Pacific Islands and some parts of Southern Europe could be added to his list. He now had 1,500,200,000 people. And of course all of us are betwen four and five feet tall at some time between our ninth and sixteenth birthday. All those in wheelchairs are also below five feet. This would add another 300,000,000 to his list. This number of potential non-average users turned out to be large enough to be a concern in any product design.

The theory of universal design is that once the user group has been defined only then design for the minimum abilities of this group can be carried out. One example of a universally designed product is the Swedish kitchen knife. Ergonomi Design Gruppen redesigned the kitchen knife keeping in mind the users and their abilities. Sven-Eric Juhlin of EDG, involved in this project said that the knife had to take into account the needs of the old, arthrities and people with stiff hands and fingers. He discovered that ordinary carving

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knifes put pressure on weaker muscles in the hand and also puts pressure on the wrist at an awkward angle which induces wrist strain or makes carving a torture for those with weak wrists. The main problem was to redesign the handle of the slicing knife so that correct hand and arm posture would produce less fatigue in the wrist of the user. Below is the example now sold in British and Irish



fig. 6. KITCHEN BOARD AND CUTTINGBOARD

markets. They are popular and can be found in many homes. It was so successful in reducing wrist fatigue that a meat slicer and frozen food cutter have been added to the range in Sweden. When intensive ergonomic analysis is done on a product the product can then be redesigned in a way that is most beneficial to individual needs.



The improvement in functionally efficiency of these designs, such as the kitchen knife, may pass unnoticed, but the effects of this application in the long term however, can be profound. It includes such critical matters as reduced muscular disease, less discomfort, better performance while carrying out any task and a more active and comfortable old age. In effect these designs reduce wear and tear on the ageing of the body.

There are many products on the market at the moment that can be classified as universally designed. These well designed products integrate the disabled and the able bodied by either promoting the independance of disabled people, promoting the well being of able bodied or by being useful for both able and disabled people. Products in this latter group would include voice operated word processors, automatic can openers, time swithches, tea and sugar dispensers, automatic kettles, lever door handles and the jug tilter and milk saver , a glass disk that prevents liquids boiling over.

Products aimed at the independance of the disabled include the cutlery designed by Maria Benktzan, special route buses in Sweden and San Francisco which have a suspension system that lowers the entrance side of the bus, then changes the steps to form a ramp which allow wheelchair access from the pavement. High technology products are also included such as Myoelectric limbs, shown in fig. 7, and the standing wheelchair, shown in fig. 8.



fig. 7 MYOELECTRIC LIMBS



fig. 8 STANDING WHEELCHAIR



Universal design aimed at the able bodied include well designed workstations. These are important, because of the quantity of time spent there. An uncomfortable environment has been proven to produce poor workmanship and a higher percentage of absenteeism. (13, PP 26-30).

All these products promote an integrated society by aiming at a more comfortable environment for all people.

1.4 Everyones needs cannot be catered for in every design. The basic needs of the majority of the population can be met in design for the 5th-95th percentile market. This form of design, for the able bodied is the most widely practiced design today. This is because mass production of standard products keep the prices within the range of most consumers and many products do not require a high ergonomic standard of design due to little interaction with the user. A good example being disposable cutlery which is not used long term to justify high ergonomic standard.



fig. 9. DISPOSABLE CUTLERY

Design for the disabled is a contrast to this. Products are expensive and require intense ergonomic input. Some of these products such as, books in braille, hearing aids, etc. do not overlap into design for abled bodied. These specialised products have a small market but nonetheless there is a need for them.

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By virtue of the high standard of design involved in universal design the products produced tend to be more expensive than ther less well designed counterparts - these being produced moreover for commercial and production values rather than user needs. However universally designed products often are less expensive than specifically dedicated products for the disabled. It is therefore important for universal products to be well marketed so as to inform the public of the extra and long term benefits that justify the cost.



## CHAPTER II

### SWEDEN AND PROGRESSION OF UNIVERSAL DESIGN

In Chapter I it was discussed how universal design is a more superior ergonomically advanced form of design but it takes more than this one aspect of a design to make it a universal success. In this chapter other important aspects for the flourishing of universal design are discussed in relation to the rapid progression of Unviversal design in Sweden.

Universal design was pioneered in Sweden and its progression is more advanced there than in any other country. It is not by accident that this is so. Sweden have a tradition of looking after their minorities. They are renowned for their high standard of design for the disabled. They are also renowned for their high standard of social services. In Sweden like in most countries design for the disabled relates to the development of social services and the legislation for the disabled in that country. The development of good social services, in Sweden, helps explain why design for the disabled is progressing towards universal design. This chapter demonstrates this by answering the questions; why do social services for the disabled differ in each of these countries - Sweden, Ireland and Britain?; how do they differ?; what relationship exists between social services and products for the disabled?; and how has this affected the progression of universal design in Sweden?.

To answer these questions, the earliest care of the disabled, through to modern care of disabled is compared in each country. This includes a comparison of products that are produced in these countries.

## 2.1 EARLIEST CARE OF THE DISABLED

In Sweden the earliest steps to relieve and care for the sick and disadvantaged were taken, as in many countries, by the established Catholic Church. This changed after the 16th century with the transition from Catholism to Protestantism. The reformed church could no longer afford to support charity work, so peasant farmers took th elocal administration of the parish upon themselves. In time


parishes assumed secular as well as religious responsibilities. This included looking after the poor and the sick, elementary education and later, welfare. This system still remains with them today. In 1862 when local government reformed, local communes were given power to raise taxes to cover education, poor relief and welfare. This meant that services for the disabled were not based on charity but were seen as a state responsibility.

In Britain and Ireland care for the disabled was originally organised by the Catholic Church. In Ireland this remained relatively unaffected by early social services. The foundations of many existing social services in Ireland were laid by the British government before independence had been achieved. Examples of early state interventions in various social services include the Elementary Education Act (1831), the Children's Services Act (1908), the Non-Contributory Pension Scheme (1908), the Unemployment and Sickness Benefit Acts (1911) and the Poor Law (1838). The Poor Law was the only relevant law for the disabled. Their official recognition was that they were included in the vast army of poor. General care and services for the disabled continued to be on a charity basis. The result of this is that in Ireland today there is still no legislation guaranteeing the rights of the disabled; there are only recommendations. (43).

In Britain after the transition from Catholism to Protestantism organisations for the disabled were still voluntary based but had the support of the Royal family. These organisations flourished. As early as 1868 organisations for the blind became centralised with the establishment of the Royal Nations Institute for the Blind (now the largest organisation for disabled in the world). Associations for the deaf and crippled followed later in the century. These organisations worked towards statutory rights for the disabled. They instigated the Report of the Royal Commission on the Blind, Deaf and Dumb in the U.K. in 1889. This report recommended education for the disabled as likely to reduce the number of paupers. At the end of the century the state, prompted by the report, established the Elementary Education (Blind and Deaf Children) Act.

Voluntary organisations also established rehabilitation centres for the disabled. The government commissioned more rehabilitation centres which were initially confined to war casualities. Voluntary organisations were given control of these centres, because of their reputation up to that point, organisations still work as agents for statutory bodies.

In Britain the state did recognise responsibility for the disabled but the majority of the responsibility still lay with the voluntary bodies.

Social Services regarding the disabled therefore developed differently in each country. In Sweden, the disabled were given a better foundation in securing their rights to social services because they were not seen in a "charity" light as they were, and still are to an extent in Ireland and England.

### 2.2 EXISTING SERVICES FOR THE DISABLED

Between 1945 and 1970 good economic growth provided a number of radical reforms which have directly or indirectly affected the disabled population in Sweden. There was a reasonably rapid implementation of these reforms. The main reasons for this are

- (a) There existed a strong central government with many autonomous local governments.
- (b) Their health care was not charity based, public health care was traditionally localised with parishes obliged to help all poor and disadvantaged.
- (c) "Folkrorelser" or popular movements flourished including a strong disabled movement.

The difference between the disablement movement in Sweden compared to similar movements in Ireland or England is that the Swedish movement consisted of a high degree of organisations which were run by and not for the disabled.

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The government in Sweden has a strong base because it works on a decentralised basis. The state consists of a parliamentary government and seventy different central administrative agencies. It is the responsibility of the state to prepare laws and overall strategy. Government agencies give general instructions on how laws and regulations should be enforced and how they should relate to the general development of society. Local authorities then work out what is best for that general area. They work in conjunction with local movements so that the movements for the disabled are able to decide for themselves what is required for the disabled in that area.

Due to a decentralised government the social services developed into a decentralised system. Originally the social services were individually orientated organisations. However, in 1965 the social services Act was introduced. This act made a distinction between services that were

(a) Structurally orientated services.

(b) Generally orientated services.

(c) Individually orientated services for the disabled. Now more emphasis is given to structurally and generally orientated services. An example of this is participation in community planning, the local environmental and informational facilities regarding social problems such as child care, old age and disabled. Individually orientated services are now focused within generally and structurally orientated projects. It deals with the areas of special needs, advisory services, special care and treatment, and means testing for grants and subsidies. In this context it plays a better and more appropriate role.

Decentralisation encouraged new reforms and those dealing with handicapped people expanded to include educationalists, architects, engineers, occupational therapists and so on. This development caused a major design input in itself. In effect it was an educational experience relating to handicap in Sweden. This resulted in the solution that society's designers are responsible for the quality of life of all citizens and not just the healthy people between the ages of 18 and 45.

The 1976 Government Bill formulated the objectives of handicap policy as follows:

The goal of Swedish policy must be to make the society accessible to all, to give disabled the opportunity to share in life of the community and to live a life which is as far as possible equal in quality to that of others.

There is no special act as such with the aim of securing the rights of disabled persons. Instead the legislation is such that where discrepancies occur (for example buildings, environment, transport, communications and leisure) special paragraphs concerning the disabled have been inserted in the relevant codes of practice (such as the Buildings Act and the Social Services Act), to bring them up to new standard requirements. The disabled in Sweden are therefore not seen as a special group of people, integrated legislation ensures them receiving services equally available to the able bodies.

In Ireland there is still no legislation regarding rights of the disabled. However, the National Rehabilitation Board (NRB) publishes recommendations on all aspects of services for the disabled. The NRB, establsihed in 1967 by the minister for health is a centralised, state sponsored body. Though there are still many charity based organisations that run services for the disabled, the NRB is charged with the tasks of supervising, operating or arranging for the operation of these and other services. They deal with all kinds of disability; as a result of physical defect or injury, mental handicap or mental illness.

These services include:

- (a) informing the disabled of grants for transport, housing, communication etc.
- (b) arranging medical treatment
- (c) assessing disability and giving vocational guidance
- (d) training or making arrangements for training the disabled for suitable employment
- (e) arranging educational provision in ordinary or special schools.



Published recommendations include the following; Employers in relation to employing disabled people, premises requirements for the disabled and accessibility and design of buildings. The information is available but society's designers have, partly because of the lack of legislation, been slow to acknowledge and use it.

In Britain legislation to help the blind, deaf and epileptic dates back to the nineteenth century but services of a more comprehensive nature for the disabled as a whole, did not come into effect until the 1946 National Health Service Act and the National Assistance Act of 1948. Though this gave local authorities a general responsibility for the needy, voluntary organisations continued to work on their behalf. This developed so that voluntary organisations worked as agents for statutory bodies and received grants from local authorities and the central government. Voluntary provision can be very uneven both across geographical areas and between different types of disability. For example, in 1975 the Spastics Society received £100 per head compared to 25p received by MIND, an association concerned with mental illness and mental deficiencies. (28 PP 129-142).

Overall, national care of the disabled became more official since the 1970 Chronically Sick and Disabled Person's Act. This came about after a national survey and the shocked realisation that there were 3,000,000 impained people living in private households, many of whom had difficulty coping with normal daily activities, were often isolated, practically housebound, unknown to any official agency and received little if any assistance. This act has put a responsibility on local authority to seek out the disabled. Since then services available for the handicapped have grown, providing more equal opportunities for people with disabilities.

## 2.3 SOCIAL SERVICES AND DESIGN

Industrial design may have the biggest input into the technical aids aspect of disability. Sweden is an affluent country and has a superior social services system. Because of this they can afford to



supply all technical aids free of charge to the individual. The aids are supplied without a means test and there is no upper limit for the cost of the aid. Standard goods such as vacumn cleaners, washing machines, microwaves and so on are included in the aids list because there are people who are unable to function in certain essential daily activites without them. This list of aids is published by the Swedish Institute for the Handicapped and states the necessary standards for over 50% of the aids. In many cases the aids included in the list are a result of the Institutes participation in, and support for, the research and the development of the aids. Tests are carried out periodically on all products. The results of this testing provides the basis for another list of specific products that are on the market which are elligible for subsidy and prescribable by the rehabilitation doctors. As this presents a potential increase in the market for manufacturer's equipment, considerable interest has been shown by manufacturers in the possibilities of incorporating features which are both acceptable to handicapped and non-handicapped sections of the population. This in effect produced a natural progression to universal products and thus universal design.

In Ireland welfare and provision of aids is based on a means test. There are two main types of medical assistance for the disabled; the Medical card and the Long Term Illness Book. Medical cards are issued to those who are not self sufficient. This entitles the (disabled) holder to free medical services including technical aids. The long term illness book is issued to those who have certain disabilities or illnesses that were listed at the time of introduction. They are entitled to free medical services but may be means tested depending on affluence or necessity for some technical aids.

All technical aids are issued strictly on assessment by the community occupational therapist employed by the local Health Board. There are many technical aids that cover all areas but not to the extent of areas covered in Sweden. If, the recommended aid is not available from an Irish supplier it is ordered from abroad and supplied free of charge. There is no upper limit on the cost of the aid.

For those disabled not entitled to either of the above assistance schemes there is free medical and rehabilitational advice however other services and technical aids have to be paid for personally.

The lack of legislation concerning the disabled has resulted in a lack of awareness of the disabled such as in employment, for example Employers, including the public service, have not reached half the recommended 3% quota of disabled in employment. Furthermore in the product design area there are very few aids and no recommended technical aids for the disabled researched, designed or manufactured here in Ireland. The majority of technical aids sold here are produced by English manufacturers who have outlets in Ireland.

In Britain apart from invalidity pensions, introduced in 1971, all medical services for the disabled are provided free of charge without means testing. This is also true of technical aids. The drawback with the British system is that all free aids are confined to a standard list published by the Department of Health and Social Services (DHSS). There is not the choice of a more suitable aid as there is in Ireland and Sweden. These aids do have to pass British standards and are tested and selected by occupational therapists and research assistants. They are not tested periodically which has resulted in some antiquated aids still being issued but the system is changing slowly with some non-standard products now being issued.

So originally designing for the disabled in Britain consisted mainly of medical and engineering input. There has been an increase since the 1970 Act in the number of companies designing, manufacturing and marketing products in Britain. They cover all areas of design and also supply Ireland with the majority of aids used here. They have been influenced in this area of design by other countries including Sweden, the renowned leaders in this field.



### 2.4 COMPARISON OF PRODUCTS

Here is a comparison of products that have been researched, designed, manufactured, and marketed in both Sweden and Britain.



# fig. 10. <u>ELITE</u> SWEDISH WHEELCHAIR



- (1) The "elite" in figure 10 is a Swedish wheelchair. It is a manually operated indoor or outdoor wheelchair for adults. It has been designed for the very mobile wheelchair user. It's philosophy is your wheelchair should adapt to you, not the other way around. It concentrates on being very adjustable, versatile, stable and easy to use. It is small when folded and very light making it easy for car transfers.
- (2)

The "victor" in figure 11, is a British equivalent. It is also designed for active adults and is especially suitable for travellers. It is lightweight and can be easily dismantled and folded away.

Both models are examples of good design. The Swedish model is more aesthetically pleasing which is an important factor in Swedish design. Both Ergonomi Design Gruppen and A & E Design stress this when designing their products. Maria Banktzan's (of EDG who designed the kitchen knife mentioned in Chapter I) philosophy is that "we try to make these products unobtrusive. They should be as neutral and reserved as possible so as not to draw attention to their function as adaptive aids. We've also tried to make them attractive to non-disabled users". In making products look good the "disabled" stigma lessens which also contributes to integration especially when able bodied people can see themselves using the same products.



fig. 12 DINNER SET BY EDG

The Address in Figure 11, 10 s britten contraint. It is also designed for add second to and to constain; suitable for crowelloca. It is lightweight add an be easily disconded and cales from.

(3) One such neutral project EDG designed was a dinner set shown in figure 12. This set includes the cutlery described in Chapter I. They also created a drinking glass in goblet form which has a stem long enough for the whole hand to fit around and a large base to make it stable. It is tall enough to reduce the necessary lifting distance. The goblet is produced in transparent poly-carbonate plastic to make it as light as possible, which is very important in design for the disabled. This goblet which was designed to be as aesthetically pleasing and as normal as possible had a surprising side-effect. "Afterwards we were told by some county authorities that the goblet was too attractive and looked too normal".

The dinner plate has a lip to push against making eating convenient for people who can only use one hand.

(4) The British eating utensils are not as aesthetically pleasing. The cutlery shown in Figure 13 are the standard cutlery supplied by



13. British Design Cutlery





Homecraft, one of the biggest suppliers of home products in England. Their crutches and walking aids shown in fig. 14 also perform their

### fig. 14. BRITISH DESIGNED CRUTCHES AND WALKING AIDS



function but are equally unattractive, compared again to those designed by EDG. The walking aids in figure 15 were also redesigned ergonomically. The handle on the cane maximises load-bearing



fig. 15. EDG WALKING AIDS

capacity while removing strain from the hand, with a handle angle which is adjustable to each individuals needs. The cane is also lighter than average canes.

In the case of elbow crutches our design was aimed at people with an active walking problem. It improves on the conventional crutch by having an optimised handle shape and lower weight. The other crutch, aimed at persons with limited mobility in several joints, is characterised by having the upper part leaning further backwards and a larger angle between the handle and the upper part. Crutches and cane are structurally sound, functionally perfect, and would make a user comfortable, confident, and proud to use them.



One of the best designs for the disabled that has come from Britain is the Parker bath shown in fig. 16. This design offers maximum



fig. 16. PARKER BATH

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independence to hospital patients, the elderly and the disabled. When the bath is upright it can be accessed from the side. The foot well is prefilled and the bather may then sit or transfer directly from a wheelchair onto it. When the watertight door is closed the bath is then gently reclined with an easy up and down movement of a hydraulic handle. A release lever returns the bath to the upright position. There is also a special feature in the hospital model which adjusts the height of the bath.

Both Britain and Sweden are producing good products for the disabled. The quality of most British designed products for the disabled does not contribute to integration of the disabled : The difference in Swedish products is that they have considered a more universal approach to the design, (by using intense ergonomics, to give the disabled optimum chances of becoming independant, and by designing aesthetically which lessens the handicap stigma). The Swedes design products that integrate the disabled more into society. This is why all of the Swedish products discussed here can be classified as universal designs. Universal design in Sweden has been a natural progression from good design.

### 2.5 UNIVERSAL DESIGN IN SWEDEN

Sweden has the foundations to produce universal design. Sweden's interest in minorities resulted in the disabled being integrated in Social Services from the very beginning. In Ireland and England the disabled continued to be a responsibility of charity organisations, consequently there has been less legislation on their behalf. Legislation for the disabled in Sweden is integrative, in that extra paragraphs ensuring equal opportunities for the disabled, have been inserted into all relevant acts. One result of this legislation is that a variety of aids including household product are available free of charge to enable the handicapped live as independant a life as possible.

Sweden has the resources to provide all essential aids free and also to fund research and development to promote a high standard of these aids. All products are tested periodically with a view to them being used by the disabled. A list of high standard products is then published. This educates the public to what are considered good quality products. This also encourages manufacturers to produce good designs that facilitate the needs of the disabled as well as the able bodied. This has led Sweden to produce universal standard products.



### CHAPTER III

### UNIVERSAL DESIGN AS "ADAPTABLE HOUSING"

Universal design in the context of homes is called, "adaptable housing". This concept is of a house designed to accommodate the changing needs of a family, from youth to old age. This is a recurring theme in the design of homes. In this chapter the advantages of an adaptable home are discussed in relation to the design of kitchens.

### 3.1 SEGREGATION

The earliest recommended standards for people with disabilities were concerned with accessiblity. At this stage accessibility was ensured by seperate but equal facilities. One entrance to a building might have been ramped, one seperate wheelchair accessible toilet might have been installed, 10% out of dwelling units might have been fitted with special features. Overall it meant that handicapped people became segregated. An extreme example of this segregation is Het Dorp, a village in the Netherlands, that was built especially for the handicapped. All the residents lived in private apartments. These consisted of a sittingroom and bedroom, but no kitchen. One apartment in ten was occupied by an able-bodied person so as to ensure that help was always near should the need arise. As far as possible the villagers took part in the running of the village. was a solution that seemed successful at the time, but this system has its disadvantages. The handicapped became dependant both environmentally and phychologically on a specialised environment. Another disadvantage was that they were rarely seen and thus consequently, a negative atmosphere surrounded the handicapped. This strengthened unfavourable attitudes people had towards the disabled. (3, 47). Because of this as Selwyn Goldsmith states it; the person with a disability is doubly handicapped, firstly because of what physical disability he has, causing social, financial and emotional deprivations. Secondly because of public attitude towards him. (14, P.4). People often perceive those with handicaps as their handicap. Here is an extract from "images of ourselves", Sue's story:

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### fig. 17. VIEW OF DISABLED

My weak grasp on my identity was no real match for the massed forces of society who firmly believed themselves as normal and myself just as firmly as abnormal. I found myself inhabiting a stereotype. I became my illness. I was of interest only because of it.

(6, P.49)

In Sue's story the wheelchair is a barrier people can't see past. Most people don't want to. A reason for this attitude is that people see themselves in relation to others. The "abnormal" jolts their sense of rightness, their confirmed expectations of consistency in an ordered world. It contributes a threat to people's sense of security. As a result of this attitude designers were slow to take responsibility for the needs of the disabled.

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### 3.2 INTEGRATION

This trend has now reversed, latest developments are concepts of life span design and universal design 'adaptable houses' in the context of. According to Ran Mace, President of Barier Free Environments (BFE) and an architect:

"The home or apartment building of the future will not have special concessions for disabled and elderly people. The idea is to remove that expensive special label from products and designs and at the same time, eliminate the institutional appearance of many current accessible designs.

### (33, P1)

A compromise has to be reached to integrate homes for able bodied and disabled.

As Alvar Aalto once said, concerning design, it is always a compromise, but it is a compromise which is best reached by the study of man at his weakest.

### (36, P.8)

The compromise here is that all houses do not have to be fully equipped for a seriously disabled person. Permanent features that provide for an adaptable house are such as a downstairs bathroom and bedroom, an entrance at ground level or entrance served by a ramp, doors with minimum clearance at 800mm, sufficient floor space in bathrooms and kitchens to allow wheelchairs or walkers to manouevre, light switches, thermostats, fire alarms and towel racks located no higher than 1,200mm, electrical outlets, telephone jacks and television antenna hookups mounted no lower than 220mm from the floor. These simple features make a housing unit useful for non-disabled or disabled tenants.

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કે ફ્રીપ્રિકાર સ્પૂર્ણના પ્રતાસ પ્રદીણ સાથે છે. જે માટે પ્રતાસ પ્રતાસ કરે છે. દેશ પ્રદારભાષ પ્ર વિસ્તાર પ્રતિવાર પ્રતાસ છે. જે તે આ ગામના સ્ટેલ્ટ્રેટ ગામ છે. જે ગામ બાદ કે સમજાવાર પૂર્ણ દેશ પ્રતિ કે લો પ્ર પ્રદારભાષ આ ગામ તે આ ગામ છે.
There are good reasons for this direction in design. Many people when buying, do choose homes in which they intend spending the rest of their lives and others may have an eldery relative move in with The changing uses of a house as a young family grows to young them. adults and elderly make it unsurprising that the adaptable house is a recurring theme in design. Such a dwelling is some way from practical reality because of high cost and needs of society, but with the greatly increased rate of social and economic change the adaptable house is becoming a national necessity. Demographic statistics show that the growth in numbers of elders and disabled is continuing. At the moment about 11% of the total population is aged 65 years or more and it is predicted that by the year 2035 more than one in five, 20% of the population will be elderly. (10, PP 26 - 32)

Another valid reason for life-span design is that elderly people would be able to continue looking after themselves and leading an independent life. This is important in the lives of those whose mobility is curtailed, have reduced ability to react, or diminished mental ability. A typical consequence of these effects of ageing, is often seen in psychological changes, such as depression, a common result of lonliness or uselessness. A house designed for the life span of people therefore would enable the handicapped to continue independence and this would be a contributory factor in combating depression.

In the latest publication on the value of adaptions, (1989 Government White Paper) it is emphasised that

For many handicapped or elderly it is better to adopt their existing home, if suitable for adoption, than to rehouse them in purpose built accommodation. This means above all that they do not have to move away from their familiar area and friends. (10, P.45).

It does seem pratical in the long term to have a house that adapts with the needs of the user.



### 3.3 ADAPTABLE KITCHEN

Of the rooms in the home the kitchen needs to be adaptable more so than most other rooms. There have only been a few adaptable kitchens designed, The Symphony Groups <u>Esprite</u> and Deiter Borders' kitchen program, being two which are discussed later, but it is in this room that the average woman spends most of the working day. For the handicapped and the elderly participation in the kitchen indicates their independance. It also relieves boredom and feelings of uselessness.

fig. 18 TIMES SPENT IN VARIOUS ROOMS BETWEEN 0700 AND 1900 HOURS.

Room	Time spent in minutes		
	Women	Men	
Kitchen	378	68	
Living Room	65	31	
Bedroom	63	24	
Bathroom	39	8	
Remaining rooms	88	26	
Outside the home	87	563	
Total	720	720	
(15, P.3	15)		

fig. 19. USE OF THE KITCHEN By 160 PEOPLE IN SWITZERLAND (given as % of those participating in the survey)

Activity	%	
Cooking	100	
COOKINg	100	
Breakfast	68	
Midday Meal	55	
Evening Meal	57	
Washing and Ironing	64	
Children Playing, Working	15	
Reading, Knitting, Playing	18	
(15, P.317)		



From the above information it can be seen that most meals are eaten in the kitchen, all cooking, washing and drying, childrens play and other leisure activities take place in the kitchen. A kitchen therefore has to be comfortable and safe to spend time in.

A standard kitchen has many draw backs for the elderly and the disabled. Even in specially designed schemes kitchens have come out badly in surveys. In a survey done by the Department of the Environmnet the following points of relevation were made, 249 people were surveyed 114 had difficulty with the kitchen because:

fig. 20. POINTS OF DIFFICULT IN THE KITCHEN (Base = 114 people all those who had difficulty)

Difficulty	Number	Percentage
Shelves too high	59	52%
Windows too high	15	13%
Sink too high	9	8%
Shelves too low		
Need sliding doors	7	6%
Worktops too high		
Kitchen too small	6	5%
Sink too low		

Some of these people of course, may have had difficulty with reach and grip and would have had problems using shelves whatever height they were. In spite of these difficulties many of the respondents were able to do more because of their purpose designed kitchens, but there is still obvious room for improvement in wheelchair kitchens if more seriously handicapped people are to be able to live independantly. (18, P.25).

The Symphony Group, an English kitchen manufacturing company, tackled some of these problems. They designed an adaptable kitchen range Esprite for the disabled and the elderly. See figure 21. The system



fig. 21. SyMPHON¥ DESIGNED ELITE KITCHEN



is based on wall hanging brackets, see fig. 22, which allow the



fig. 22. BRACKET SYSTEM

cabinets and worktops to be positioned in precisely the right place for the current occupant. If the needs change then everything can be easily adjusted, up or down on the wall by 120mm, simply and quickly without expensive refurbishment. This variety of dimensions covers the recommended heights given by the National Rehabilitation Board (NRB) for Wheelchair users and ambulant disabled (see appendix 2).

In the kitchen range five sizes of wall unit and six styles of base unit ensure any size of kitchen can be fully fitted. Features include pull out worktops deep pan drawers, corner carousels and drawer packs. Pull out worktops can be supplied with cutouts for mixing bowls if required. A trolley unit, ovens with side opening doors, hobs with front and top controls and a variety of easy to use cooker hoods complete this adjustable kitchen. This kitchen does integrate disabled but the future success of this design is still indeterminable.



23. Deiter Berdel

### 3.4 UNIVERSALL DESIGNED KITCHEN

In the mid 1980's an Austrian design company did an even more intensive study of kitchen requirements and came up with some interesting results. Dieter Berdel is chairman of the Institute of Social Design (ISD) and co-founded the Institute in 1975. ISD carry out research, planning, and designing towards a more humane environment. Priority has been given to the problems of rehabilitation of the handicapped and aged as well as the development of better living conditions for all who are in a wide sense "handicapped". Their kitchen programme demonstrates the institutes methodology, which involves intensive use of ergonomic and anthropometric data coupled with close liaison with the user group.

The goal, Berdel said 'was not to develop a special kitchen for disabled persons, quite on the contrary, we searched for a universally valid solution which would meet the needs of non-handicapped and younger people as well as handicapped and elderly people in a "kitchen for all". Therefore it as not our aim to design a special "image" kitchen but more to lead the producer to the realisation that all types of kitchens have to fulfill fundamental requirements'.

A detailed study of the nature of kitchen work and the physical requirements of people in all user groups was drawn up. From this it was deduced that there are four main user groups: non-handicapped people, elderly people, persons with standing problems and wheelchair users (see figure 2 - 5). These user groups have distinct differences in their needs. Below is an example of variation of body measurements in the first two groups mentioned, non-handicapped and elderly:



fig. 24. AVERAGE SHORTER BODILY MEASUREMENTS OF OLD WOMAN COMPARED TO THOSE OF NORMAL POPULATION OF WOMEN.

Standing Height	-60mm
Elbow Height When Standing	-30mm
Eye Level When Seated	-40mm
Elbow Height Over Seat Surface	-10mm
Heel to Knee Back (Hollow)	-20mm

# (15, P.329)

An important factor to determine the required worktop heights is in terms of physical labour, the nature of kitchen work. These can be described as delicate work, light manual work and heavy manual work.

The basic body measurement used to determine appropriate worktop heights is the height of the elbow from the floor when in a standing position. This measurement minus 15 centimeters is the optimal height for worktops activities of light manual work. Heavy manual work requires a worktop height further from the elbow; delicate work, requires a worktop closer to the elbow. See figure below.

LOW STRAIN MEDIUM STRAW HEAVY STRAIN

25. Heights recommended for types of work for men and women



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In the ISD kitchen system the individual worktop heights can be altered by adjusting the base. The cabinets are adjusted by a sophisticated bracket system giving a choice of seven different heights as apposed to a choice of four in the espirit range of Symphony.



# fig. 26. RANGE OF ISD KITCHENS



A seperate range of worktops and cabinets was designed for each of the four user groups, but the furniture elements are interchangeable for all groups so the elements can be combined for a family's personal needs. In contrast to other kitchen systems the ISD designed system allows the user to choose between 15 different heights altogether.

Another rich revelation was that one of the best arrangements of a sink, preparation surface and cooker is to position them around an arc of 135 degrees: (refer to figure 27). With this arrangement you have a minimum of movements and the best overview of the kitchen elements.

Other disabilities have been addressed such as a shallow sink is used to allow the user to work while seated or using a wheelchair, consideration was given to the shape and optimal positioning of handles, a handrail is featured also, as an aid for better standing and to facilitate motion with a wheelchair.

These kitchens designed by ISD and Symphony are not universal in that they address the needs of all user groups simultaneously. They are universal solutions because different tenents can adjust it to suit themselves. The ISD programme is designed basically so as that anybody of any ability and size can find a range of cabinets and worktops that shall suit their personal needs. The smaller ranges that would suit elderly people would also cater for the number of people below average in stature. What this system has also done is to integrate all adaptions of a kitchen into one programme. In a situation where there are two different main users such as a wheelchair user and an able-bodied person, a combination of suitable worktops are available. The lowest worktops would suit heavy manual work of the able-bodied and also the wheelchair user. Because of this 100% of kitchen users are more catered for in one adaptable kitchen range. Once installed it is adjustable for the lifetime requirements of that user. Furthermore the relevations of optimal worktop heights and optimal arrangement of worktop units make this programme a more comfortable and safe kitchen to work in.





fig. 27. OPTIMAL ARRANGEMENT OF KITCHEN UNITS



## 3.5 PROBLEMS FACED BY UNIVERSAL DESIGN AND ITS PRODUCTS

The programme produced by Ewe-Kuche in Austria stopped producing such a wide range of unitsafter the first three years. The programmes geared towards the disabled, elderly and wheelchair users were not selling well. These ranges are still available but have to be ordered directly from EWE. Institutions, such as rehabilitation and lodging centres are their main customers rather than individuals themselves. The reasons for this was that Ewe-Kuchen, did not realise that he needed a different 'marketing strategy' to stress the versatility and benefits of this programme. The sales person would also need to be trained in the needs of handicapped. There is more time involved in consultation, advice, cooperation and planning a kitchen for disabled users than compared to the average kitchen.

Another problem facing the selling of programmes to handicapped people is that they all receive different financial support. In Austria it depends on what social security authority they belong to (workers/employees/farmers etc.), why they are disabled (birth, diesease, work, accident, etc.) or what county they belong to. Many receive insufficient financial support to justify investing in this programme.

The concept of adaptable housing is highly advantageous however problems such as incorrect marketing of the products and insufficient financial support for the user restrict the progress of this design towards success and acceptance.

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### CONCLUSION

Chapter I discussed the difference between design for the able bodied, design for the disabled and universal design. It concludes design for 5 -95 percentile market does not require specialised ergonomic applications. It suits the majority of the population, can be mass produced and is therefore within the price range of most customers. Design for those with special needs requires more intensive ergonomics. These products have a small market and are quite expensive. Universal designers aim at closing the gap between both able bodied and disabled design. Many products only require better ergonomic design to facilitate needs of the disabled. These products integrate the able-bodied and the disabled. Their ergonomic qualities make them easier to use and so lessen wear and tear on the body as it ages. These products are less expensive than products specially made for the disabled but more expensive than their less well designed counterparts.

Chapter II discusses why universal design is progressing more rapidly in Sweden compared to England and Ireland. The conclusion is that Sweden's good attitude towards the disabled resulted in them being integrated in social services from the very beginning. In Ireland and England the disabled were looked after by more charity based services, consequently there had been less legislation on their behalf. Legislation for disabled in Sweden is not in the form of a special acts but is integrative in that, extra paragraphs ensuring equal opportunities for the disabled, are inserted into all relevant acts. One result of this legislation is that there is a variety of aids including household products available for the handicapped. Sweden has the resources to provide all required aids free and also to fund research and development to promote a high standard of these aids. All products are tested with a view for handicapped users and then a list of high standard products is published. This educates the public on what constitutes a well designed product. It also encourages manufacturers to produce good designs that facilitate needs of the disabled as well as the able bodied. This has resulted in a natural development of universally designed products. Products that are designed for disabilities in Britain are specifically for handicapped people. Therse products are not as aesthically designed as those for able bodied.



The universal design of houses is discussed in Chapter III giving examples outside Sweden. This chapter concludes that initially segregative design strengthened negative attitudes towards the disabled. More recent trends are interested in integrated society. The universal design of houses, adaptable housing is a new recurring theme. Factors in favour of this approach are (1) changing needs of families as they progress to old age, (2) the importance of independence for elderly and disabled people because it combats depression (3) minimises later refurbishment of homes and therefore (4) lessens need for institutional living. This is becoming more feasible as the number of aged and disabled increases. The English 'Symphony' design does contribute to integration, but the Austrian ISD kitchen is a more universally designed program. By considering the needs of four different user groups, one hundred % of kitchen users have been catered for in an integrated range of products. Optimal heights of work tops and an optimal arrangement of units ensure a more comfortable and safe kitchen, for the lifetime of the user.

From the conclusions of the former chapters universal design is the most viable form of design because of the following advantages:-

- (a) contributes to integration, able bodied and disabled people can use the same products
- (b) ergonomically correct products reduce wear and tear on the ageing human body
- (c) increases the independence of disadvantaged
- (d) minimises later refurbishment of dwelling and therefore lessens the need for institutional living
- (e) psychologically helps in combating depression and inferiority complexes due to loneliness and uselessness
- (f) caters for increase in numbers of elderly and disabled.

The problems that challenge universal design are of a different magnitude in each country. In Chapter II, it was seen how Sweden Has developed so that these problems have been minimised which has resulted in rapid progression of universal design.

In other countries such as Ireland, England and Austria, different problems now constitute a threat to the development of universal design. The main reasons for these problems are:

- (a) ATTITUDE TOWARDS THE DISABLED, in a recent film "Fisherking" a disabled war veteran begging, sums up modern public reaction when he says "they give us money so as they don't have to look". This unfavourable attitude is the attitude of the majority of people.
- (b) LEGISLATION, there is a lack of integrative legislation regarding disabled.
- (c) FINANCIAL RESOURCES, many handicapped people do not receive enough financial support. Money received from central and local governments and from charities often support more segregated work, education, and living institutions.
- (d) OTHER RESOURCES, funding is not always available for research and development of products. Modern technology is not used appropriately.

(e) NON-STANDARD REQUIREMENTS, testing programmes of products have not until now, been testing goods with the

handicap in mind. Manufacturers have not been under any pressure to include facilities for non-standard users in products.

Universal design will continue to progress in the future because of

- (a) the growing awareness in every country for the necessity of good design
- (b) the increase in number of those requiring integrated design i.e. the aged and the disabled
- (c) advances in technology reducing the cost of more sophisticated design/products.



Each country governments have to realise long term benefits and invest in the necessary foundations to implement good design. The only way to an integrative society is that the basic solution to solving these problems is to educate the public, and make them aware of the disabled people and the handicaps facing them. Those in authority should realise that legislation for the disabled is about rights, not about caring, it is fundamently to do with citizenship and above all is nothing to do with charity.

Society's designers, manufacturers, archeticts, town planners and so on should act upon legislation and provide good solutions. It is unacceptable to build inaccessible buildings and systems such as transport.

Resources are important and therefore must be wisely used, to provide integrative rather than segregative solutions.

Product testing should include the standards required for handicapped users. The results of this product testing should be published to educate consumers and manufacturers about standards required in products. The marketing of such products should then stress the benefits to both able bodied and disabled users. Only by taking these measures can universal design become the design of the present and not always be the design of the future.

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- 3. Dual Purpose Cutlery by EDG
- 4. Drinking Goblet, Plate and Beaker by EDG
- 5. Victor Papanek
- 6. Kitchen Board and Cutting Board
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Appendix 1.

Ergonomic data of the average person (kitchen activities)





Appendix 2. Ergonomic data for the wheelchair user (kitchen activities)



Sockelhöhen 21,5 - 26,5 cm



Appendix 3.





Appendix 4. Ergonomic data for ambulant disabled (kitchen activities



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#### 1.1 AMBULANT DISABLED

- Hemiplegia full use of only arm and leg on same side of the body. Balance unsteady, walking impeded and a walking aid is usually required. May present with confusion.
- Rheumatoid Arthritis multi-joint disorder with painful mobility of upper and lower limbs. Poor reaching and grasping capacity.
- Osteo-Arthrosis usually affects weight-bearing joints of one or both lower limbs.

Lower Limb Amputees – problems with balance and walking.

- Neurological Conditions e.g. Multiple Sclerosis, Cerebral Palsyproblems with balance, walking and co-ordination.
- Geriatric Disabilities many in the older age group have problems with balance, orthopaedic conditions including abnormalities of the feet and sensory disorders.
- Sensory Disorders -e.g. Deaf or Hearing Impaired isolation through communication problems.

-e.g. Blind or Partially Sighted - general mobility problems.

## 1.2. WHEELCHAIR USERS

1.2.1

Some common disabilities which result in the use of a wheelchair. Spinal Injuries

- Paraplegia loss of power and sensation in lower limbs. Full use of upper limbs. Paraplegics can be totally independent in the wheel-chair providing the environment is accessible.
- Quadraplegia loss of power and sensation in upper and lower limbs. There may be some degree of power in upper limbs, but independence is very limited and considerable assistance is usually required. 1.2.2

Other disabilities which may result in the use of a wheelchair.

Spina Bifida – in some cases results in paraplegia of varying degree.

Cerebral Palsy — inability to co-ordinate and control movements of the body. May involve upper and lower limbs.

Hemiplegia – use of only one arm for propulsion of chair.

Double Lower Limb Amputee — may have to resort to wheelchair for part of the time.

Severe Arthritis – gross stiffness in joints and often with severe pain.

Progressive Neurological and Muscular Disorders e.g.

Multiple Sclerosis — power is weakened and inco-ordination may be evident.

Muscular Dystrophy - wasting of muscles with associated weakness.



# Appendix 6.

National Rehabilitation Board.



600

760

800

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where arm rests can be positioned beneath the work top.

FIGURE 10. Dimensions of shelves and worktops.

KNEE RECESS AT WORK TOP where arm rests are stopped

where arm rests are stopped by the work top facia.

