

Wheelchairs

for children & adults with muscular dystrophy & allied neuromuscular conditions

A guide to the issues involved in the assessment, choice and manufacture of wheelchairs and the provision of suitable wheelchair access to a house

To be used in conjunction with:

Chapter 18 *Addresses: Manufacturers/Suppliers/Sources of Advice.*

The information is written for:

- **people with muscular dystrophy** and allied conditions and their carers;
- **therapists and other professionals** who do not have experience in wheelchair and seating assessments;
- **Wheelchair Services staff** who are experts in wheelchair assessment, but may have limited experience in the provision of indoor/outdoor powered wheelchairs and/or the specific needs of people within this disability group;
- **specialist staff of voluntary disability organisations** who may have particular expertise in advising people with specific disabilities and whom Wheelchair Services are encouraged to use or consult, in accordance with section 15 of the *NHS guidelines, HSG(96)34, Powered indoor/outdoor wheelchairs for severely disabled people (May 1996)*. See Appendix 2;
- **wheelchair manufacturers**, in order to highlight the features that need to be considered;
- **architectural designers** who want to understand more about the mobility equipment around which they are adapting the environment.

Guidance is presented under the following headings:

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What is a good seating position?

There are three aims, and prioritising these will depend upon the individual person. The importance of each is likely to vary according to such factors as time of day or the need to carry out an activity. These aims are to:

- ⇒ achieve a good postural position;
- ⇒ maintain functional ability;
- ⇒ ensure comfort.

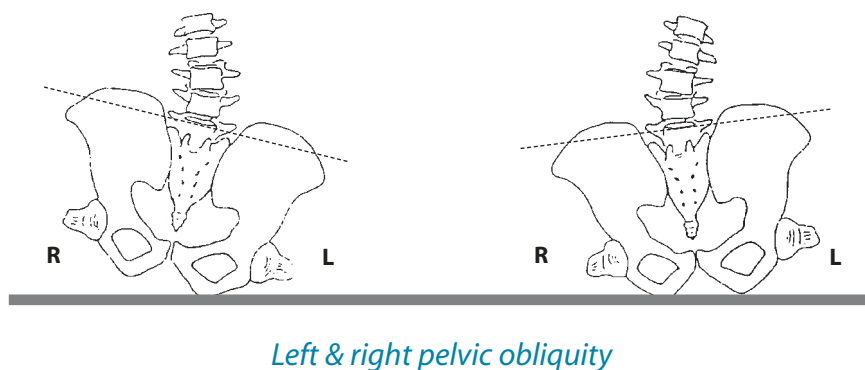
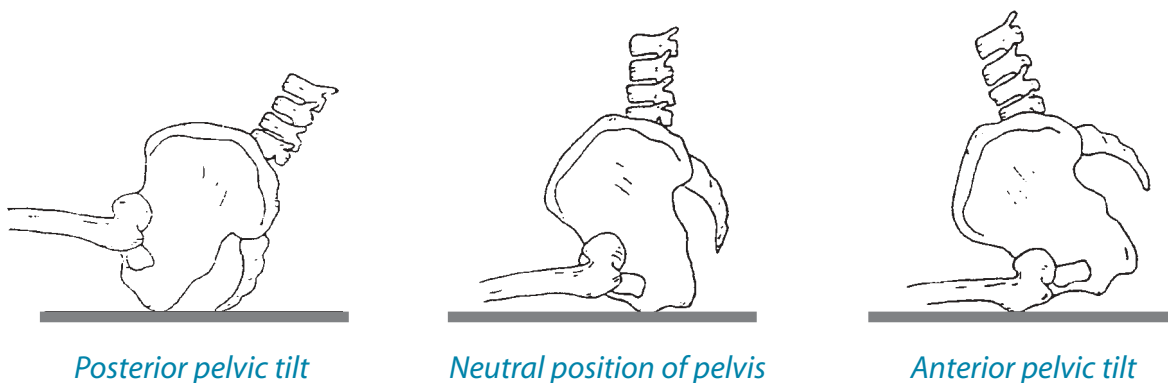
Achieve a good postural position

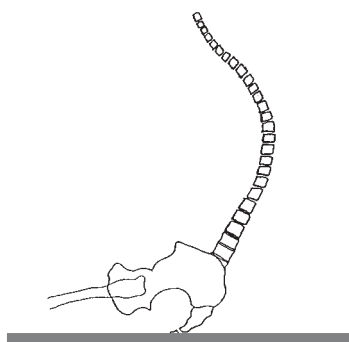
A good postural position may minimise or delay the development and severity of deformity and/or provide support and trunk control. In a progressive disability there is an ongoing need to review the seating position and advice should be sought from the person who carried out the wheelchair assessment. There are two aspects to a good postural position:

- ⇒ maintenance of the correct position of the pelvic girdle;
- ⇒ correct support for the whole body.

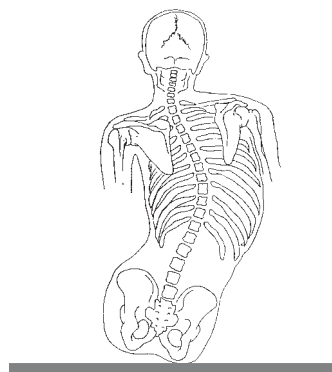
Maintenance of the correct position of the pelvic girdle

The pelvic girdle must remain in the upright, neutral position, without either a posterior tilt that results in 'sacral sitting' or an anterior tilt that throws the spine forwards, (although a degree of anterior tilt can be helpful and accepted as balanced posture). The iliac crests must be level, with no pelvic obliquity either to the left or right with associated scoliosis (side curvature of the spine) and no rotation of the pelvis.





'Sacral sitting' – showing the accentuated spinal curvature



Pelvic obliquity with associated spinal deformity

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Correct support for the whole body

This depends upon the correct size of chair (see Appendix 1: *Wheelchair Standards & Guidelines*) in relation to the following features:

- ⇒ seat width;
- ⇒ seat depth;
- ⇒ seat surface;
- ⇒ seat height in relation to the footrests;
- ⇒ position and angle of the footrests;
- ⇒ armrest height;
- ⇒ backrest height/angle;
- ⇒ headrest;
- ⇒ position of the wheels on a self-propelled wheelchair or the joystick control of a powered wheelchair.

In contrast to the other chapters in the manual, imperial measurements have been used as this is normal practice for wheelchairs in the UK.

Seat width

This must be wide enough for comfort and yet a 'neat' enough fit to ensure that the pelvis is stabilised. This ensures that the armrests are near enough to the person to eliminate leaning sideways to gain support from the armpads (which must also be at the correct height) and (unless the chair is powered) that the propelling wheels are as close to the body as possible.

N.B. *If side pads are used to reduce the width of the seat, the armpads of the armrests should be extended inwards over the side pads.* This ensures that the person's elbows and forearms are supported without the need to lean sideways.

Seat depth

The seat depth is crucial to ensure that the spine is supported, while at the same time maintaining the pelvis in a neutral position. With the hips at the back of the chair there must be **1" – 2"** between the front of the seat upholstery and the back of the knee (which is at an angle of **90°**).

Seat surface

The surface must be firm enough to provide support for the pelvis to keep it level. Good support should be identified initially as it influences comfort.

Seat height in relation to the footrests

The user's thighs must remain parallel to the floor with the ankle joint at a right-angle. This is particularly important to prevent plantar flexion (pointing the foot), which will result in long-term foot deformities and make it very difficult or impossible to wear shoes.

Position and angle of the footrests

Unless reclining in order to relax, most people with neuromuscular conditions need to sit upright to enable them to use their limited ability to reach forward and to maintain head control. To provide stability and to maintain this position, the knee joint should be kept at a right-angle. Therefore, the footrests should be parallel to the floor or tipped marginally backwards, ensuring that the ankle joint is also kept at a right-angle. However, when a wheelchair has large front wheels, the footrest hanger has to be angled to avoid obstruction; the footrests nevertheless, can be tipped up to achieve the 90° angle at the ankle joint. Although the angle at the knee joint will have to be increased, this should be kept to a minimum.

Armrest height

The armrests should be at the correct height to ensure that the user's arms are well supported with the shoulders level and not hunched. When the elbows are at the back of the armrests, the elbow joint should be at a right-angle.

Backrest height/angle

The backrest should extend to just below the shoulders for a powered chair, and 2" below the axilla for a self-propelled chair. The backrest angle may be critical to ensure balance and maximum arm function, for example for eating meals. There should be a lumbar pad to ensure good support of the spine and to encourage spinal extension.

Headrest

A headrest should be supplied for anyone with poor head control. In addition, it is essential for anyone travelling in a wheelchair in a van or minibus to use a head support to guard against whiplash injury. A backrest extension may not lie close enough to the back of the person's head and an adjustable headrest, possibly shaped with side wings, may be preferred.

Position of the wheels on a self-propelled wheelchair or the joystick control of a powered wheelchair

The position must be considered carefully to ensure that the person is able to maintain an upright position and does not need to lean either towards or away from the wheels or control, to gain the correct leverage.

Maintain functional ability

This relates to:

- ⇒ the ability to lean forward;
- ⇒ height-adjustable seats.

Ability to lean forward

The postural support provided by a seating system must not prevent the ability to lean forward, or reduce function in any way.

Height-adjustable seats

The importance of this feature is discussed later, in the context of the special features needed by some adults with neuromuscular conditions.

Ensure comfort

In addition to postural support and cushions, there are two issues involved in providing comfort in a wheelchair:

- ⇒ the ability to change the seating position;
- ⇒ cost.

The ability to change the seating position

Backache and pain associated with deformity make it essential to be able to alter the pressure on the body, and therefore chairs need:

- reclining backrests;
- seats with 'seat and backrest tilt-in-space' that tilt back from the horizontal;
- legrests that can be raised and lowered independently of each other.

These three functions should be available with the option of being controlled electrically, to allow users complete independence to move within their chairs.

Cost

Wheelchairs are used by most people with neuromuscular conditions for all or part of the day. Although comfort is, therefore, of great importance, often this is compromised because of lack of funds to buy the most comfortable chair.

It is hoped that the scheme to provide indoor/outdoor powered chairs, with assessment related to individual needs, will ensure that chairs with these important features can be obtained.

The need for specialist seating systems

The following must be considered:

- ⇒ the features of a good seating system;
- ⇒ commercial systems;
- ⇒ adaptable seating systems;
- ⇒ prophylactic provision;
- ⇒ supply/review.

The features of a good seating system

These relate to the following:

- ⇒ seat/cushion;
- ⇒ backrest/head support;
- ⇒ foot support.

Seat/cushion

It is important that:

- there is a firm base under the upholstery or cushion to keep the pelvis level;
- the cushion should be capable of being modified, if necessary, to compensate for a pelvic tilt, and other postural problems;
- the cushion is shaped or deep enough to prevent pressure under the ischial tuberosities and subsequent, associated 'sacral sitting' (posterior pelvic tilt);
- the type of cushion provides comfort and pressure relief, but not at the expense of stability;
- the cushion has not 'bottomed out' either because it was not set up correctly or because of a breakdown in the cushion material;
- side pads of varying size can be inserted, if necessary, in powered chairs to keep the knees together (but not rubbing on each other). These prevent or control abduction (moving out) and rotation of the thighs, which in turn causes inversion of the feet.

Backrest/head support

From a very early age, children with neuromuscular conditions, particularly boys with Duchenne muscular dystrophy (DMD) tend to lean on one elbow. This posture should be discouraged with the use of side pads, positioned symmetrically on the backrest, to encourage and remind them to sit erect or to relax in a supportive position. If at a later stage the spine develops a lateral curve, the position of the pads can be altered to provide support where it is needed and to help to control the curve.

- A system that includes a lumbar support is needed to encourage extension of the spine and a forward curvature of the lumbar region (lordosis), as this discourages a sideways curvature (scoliosis).
- Many boys with DMD need to sit upright to balance their head – and others use their forearms on a tray for support.
- An effective backrest and head support is essential following spinal surgery.

Foot support

This is highlighted because of the influence it has on balance, and to draw attention to the specific neuromuscular need to prevent plantar flexion ('foot drop') and equinovarus deformity (rolling out of the feet).

Commercial systems

There are a number of commercially available modular cushions and seating systems (e.g. Jay, Roho and Vicair) and some Wheelchair Services have developed their own. The advantage of a commercial system is that usually it can be built according to the needs of the user and assessed before purchase. Purpose-built systems cannot be assessed until manufactured and cannot always be adapted so readily.

Adaptable seating systems

Adaptability is recommended because of the progressive nature of many of the conditions (particularly for a boy with DMD), as it is often difficult for him to accept a change of seating at a later stage.

Prophylactic provision

When a child first needs a wheelchair – or at least a powered chair – greater attention should be given to a good seating system as a prophylactic measure, because at this age there is no rejection on the part of the child.

Supply/review

In addition to a quick response in supply, a regular review is needed to ensure that the system is being used to its best advantage and to re-assess in relation to any postural changes. This review should be carried out by Wheelchair Services if the seating was supplied by them – or by the person who carried out the previous assessment.

Specialist seating is not provided as frequently as it should be, because there has often been a struggle to find the funding to buy the chair and additional money is not available. Also, Wheelchair Services may wait until poor posture has developed before prescribing specialised seating – as the funding of preventative measures may not be seen as a priority.

Range of specifications and wheelchair features

Most of the features are relevant to anyone using a wheelchair, but those that are particular (although not exclusive) to people with neuromuscular conditions are highlighted in the text with an asterisk*.

The importance of the following are discussed:

- ⇒ seat size;
- ⇒ powered seat/backrest adjustability;
- ⇒ upholstery;
- ⇒ shoulder/head support;
- ⇒ frame;
- ⇒ armrests;
- ⇒ armpads;
- ⇒ leg/footrests;
- ⇒ kerb climber;
- ⇒ control;
- ⇒ battery;
- ⇒ tray;
- ⇒ price.

Seat size

■ **Range of seat width**

The sizes offered should extend from **10"** for the smallest child to **24"** for the largest adult.

■ ***Adjustable seat width**

Although this feature appears to be difficult to incorporate into wheelchair design, it ensures that a chair fits correctly both in the summer when thin clothes are worn and during the winter when extra clothing is needed. Additional width to the chair also helps when a hoist sling is positioned – and allows for growth.

■ ***Adjustable seat depth**

This is necessary to provide good support to the spine to discourage a posterior pelvic tilt and ‘sacral sitting’ – and to allow for growth. Although the use of a back support/cushion may help to stabilise the back, the consequential reduction in the seat depth may be contraindicated in relation to such factors as the armrest length and the position of the control. Also, it is important to ensure support is maintained under the whole length of the femora.

■ **Seat height**

The height is important to accommodate the leg length and to provide the optimum level for transfers in and out of the chair. In addition, for those who travel in their wheelchairs, the seat height must allow sufficient headroom to enter vehicles.

Powered seat/backrest adjustability

■ ***Seat height elevating to approximately 34"**

This should be an optional module to allow adults with muscular dystrophy to stand up from the chair or to reach objects at a height. The importance of this feature is discussed in greater detail on page 14.

■ ***Powered seat and backrest tilt-in-space**

This facility is essential for a wheelchair user who has severe arm weakness and cannot press down with their arms to raise their bottom and relieve the pressure - and will help in the management of pain. It also allows anyone with hip contractures (which prevent them from reclining) to lie back with their head supported. The position is recommended for boys in the later stages of DMD, including after spinal surgery - and to prevent flexion contractures of the neck in anyone unable to hold up their head.

■ ***Powered backrest recline**

In addition to providing the facility to relax, this will reduce the risk of increasing hip contractures and in conjunction with the seat-tilt facility, will ease the insertion of a male or female urinal. See also elevating legrests on page 11.

Upholstery

■ **Choice of firm, but comfortable upholstery**

This is for both seat and backrest, to provide stability, or there should be the option of a hard base for use with a seating system.

- **An attractive appearance and choice of colour**

Aesthetic features are important. This helps both children and adults to accept the chairs and aids the great psychological adjustment that is needed in deteriorating conditions, not only for the child and adult, but also for their relatives and carers.

- ***Seat belt supplied as standard**

This is essential to ensure safety from the time that the chair is delivered.

Shoulder/head support

- **Choice of height of backrest extension**

A high backrest is more often required to cover the needs of tall people and provide shoulder, rather than head, support.

- ***Optional adjustable headrest**

Ideally, the headrest should have height, forward/backward and sideways adjustment, in addition to optional wings. This type of headrest is essential to prevent whiplash injury, in anyone who travels in a wheelchair in a vehicle. A headrest extension which follows the angle of the backrest may be too far back to make contact with the person's head. This is particularly true when the person either sits bolt upright or has a forward curvature of the spine.

Frame

- **Easy to fold or dismantle into small pieces**

The chair, either in its entirety, or as separate parts should be light enough to lift into a car with ease.

- **Backrest folds in half**

This will allow carers to lift the person back into the chair, while the base of the spine remains supported. This feature is not always needed, but may be essential where a backrest has been raised – or a backrest extension supplied – to allow for the user's height. It may be an essential feature where a chair is transported in the boot of a car.

- **Choice of chromium-plated or coloured**

Aesthetically, this may be as important to a young person as the colour of the upholstery.

- **Suitable for the attachment of an appropriate seating system**

Ideally, without the need to modify either the frame or the seating system.

- **Provides fixing points**

These are essential for clamping a wheelchair into a vehicle. It is usually more satisfactory if the points are part of the frame, rather than accessories bolted or welded on to the chair.

- **Suitable seat height to allow the headroom needed to access vehicles**

It may be difficult or impossible for the disabled person to bend the head forward to enter the van. Also, it is essential that the user has a headrest extension or head support when travelling in a wheelchair and it is easier if this can be in position before the chair is in the van.

- **Easy-to-grip and height-adjustable pushing handles**

These are for the use of a carer when the gears are disengaged.

■ **Sturdy, durable and tamper-proof**

The frame has to withstand heavy use and this should be reflected in the manufacture.

Armrests

■ ***Height-adjustable within 6" range**

This is particularly important following spinal surgery when the person is sitting more upright in the wheelchair.

■ ***In/out adjustability**

See adjustable seat width, page 8.

■ **Supplied with side panels**

These will protect the user from draughts, help with balancing and contain essential items (such as a wallet) within the chair.

■ **Easy to remove**

Armrests that are difficult to remove cause a great deal of frustration.

Armpads

■ ***Width: choice of standard – or wide (possibly with side flange)**

The latter option will prevent the user's arm from falling off the armpad, which is particularly important for those unable to lift their arms on to the pad again, independently.

■ ***Length: standard or extra-long**

It is important to provide full-length support which extends under the wrists, in order to control the joystick.

■ ***Optional support behind the elbow**

This may be important to a minority of disabled people, to prevent their arms from slipping backwards when maintenance of pressure is needed to power the chair up a pavement kerb.

Leg/footrests

■ ***Standard flip-up**

It is important for the footrests to be moved out of the way to allow access for a carer and/or to enable the disabled person to stand up from the chair.

■ ***Height-adjustability within 6" range**

This is essential to allow various depths of cushions to be used and to enable adjustment of the footrest for the individual leg lengths – and at the same time to ensure that the user's thighs are horizontal.

■ ***Forward/backward adjustability**

This is not a standard feature, although some wheelchairs are available with a choice of footrests. However, trunk stability depends on optimum contact of the feet on the footrest. Therefore it is important to ensure that each ankle is maintained either at a right-angle or at the most suitable angle to allow for any existing foot deformities.

- ***Adjustable angle to footrest**

As above, this is necessary to maintain the ankle joint at a right-angle or to allow for plantar flexion foot deformities.

- ***Powered elevating leg/footrest**

This is essential if the backrest reclines and the person has hip contractures. For maximum user independence, the legrests should operate electrically and independently of each other.

- ***Electrically retractable footrests**

This is a sophisticated feature that at present is available by special modification only. However, it is a facility that is often needed because bending down to lift up or swing the footrests to the side may be impossible – yet essential – to allow a person access within restricted spaces and/or to stand up from the chair.

- **Optional heel and calf straps**

These may help to keep the feet on the footrest. However, there are occasions when the straps should be removed to allow the optimum position of the feet to be maintained.

Kerb climber

- **Advice on the kerb height that the chair will climb comfortably**

The chair's performance needs to be suitable for the surroundings in which it is to be used. Therefore, it is essential that a demonstration and assessment, with good supervision, is carried out at the user's home. Kerb climbers may be difficult to use if the user's balance is poor.

- **Large kerb-climbing wheels – or a choice of central or side climbers**

It is unlikely that a choice will be available for any particular model of wheelchair, but many users find that, if the wheels do not climb the kerbs, the choice between central or side climbers will depend upon their line of vision.

Control

- ***Choice of side or centre control – or the opportunity to fit the alternative – if the condition deteriorates**

This may be important when considering the user's optimum seating position. However, it must be balanced against their independence in moving their wheelchair and their ability to gain access under a surface without help to remove or reposition the control, or the tray on which the control is fitted. A central tray control is likely to cause problems in school as it restricts the space for books and laptop computers. Individual assessment is crucial.

- ***Ability to swing/slide the control out of the way**

An essential feature to gain access under desks, tables and working surfaces.

- ***Forward/backward and in/out adjustability**

This will ensure that the disabled person does not have to lean either towards or away from the control to gain optimum leverage.

- ***Height-adjustability that is independent of the armrest height**

This is a feature that should be available, but is usually a modification. It is needed for the same reasons as above.

- ***Sensitive control**
Many people with neuromuscular conditions have severe weakness in their arms and hands, and therefore the sensitivity of the control is important.
- ***Sensitive on/off switch/speed controls that are accessible**
These should be on the top surface of the control unit, near the joystick. Controls on a sloping raised console may be difficult to reach.
- **Battery charge indicator**
Essential for 'peace of mind', particularly when undertaking long journeys.
- **'High tech' shape of remote-control box**
The value of a 'smart' wheelchair, particularly to young people, cannot be over-stated.
- ***Optional, small remote-control box**
This should be available set flush into a tray with no projection below. This option may be necessary for users who need to lean on a tray.
- ***Optional lap-held switches for the control box**
These may be necessary for people who need to keep their hands positioned in their lap.

Battery

- **Easy to lift off**
A battery which is heavy and difficult to lift off will make it more difficult to fold the chair.
- **Choice of wet or dry battery**
This choice will be necessary to cater for the conflicting priorities of superior performance versus ease of maintenance.
- **Charging point must be accessible**
Ease of reaching the charging point will be very important to anyone living on their own who needs to charge the battery independently.
- **Battery range adequate**
This will, of course, depend on the distances likely to be travelled; it may be useful to have a battery charging point in their vehicle.
- **Option of more powerful (24V) battery**

Tray

- ***Standard/rectangular or with 'cut out' front**
To ensure optimum support for the user's arms.
- ***Optional availability in perspex**
To allow the user to see the kerb climber, when positioning the chair at the edge of the kerb.
- **High tech**
Not 'tea tray' type. Vital for 'street cred'.

■ Option of lift-off tray or tray which swings, to store at the side of the chair

The latter may be a practical feature to ensure that the tray is easy to remove and readily available when needed; however, it will increase the chair width.

■ *Forward/backward adjustability

The severe muscle weakness in the arms of many people with neuromuscular conditions makes it important that any working surface is placed in the optimum position to ensure maximum hand function; different activities may require different positions. Also, it may be useful for the tray to be moved marginally forwards for a helper to gain access, or to allow for the thickness of outdoor clothes.

Price

■ Good value for money and as competitive as possible

Unless a chair is tailored to suit an individual client, it may be possible to obtain a significant discount by shopping around - or negotiating with the supplier.

■ Inexpensive spare parts that are readily available

This is essential for those totally dependent on their chairs and will ensure a 48-hour standard service or a 24-hour emergency repair service – in accordance with *Section 17* of the guidelines, *HSG(96)34* (likely to change in 2004) which states that NHS maintenance contracts should cover modification, repair and maintenance services, including emergency call-outs.

Specialist types of chairs needed

There are two types of specialist chairs that are particularly relevant to people with neuromuscular conditions:

- ⇒ active-user/lightweight, self-propelled wheelchairs;
- ⇒ wheelchairs with height-adjustable seats.

Active-user/lightweight, self-propelled wheelchairs

It will be necessary to:

- ⇒ justify the need;
- ⇒ decide when to supply and the features needed.

Justify the need

- Active-user wheelchairs have become associated with sport and consequently their *value for people with muscle weakness is not always fully appreciated*. In fact, the advantages gained by disabled athletes are shared by people with restricted power in their arms.
- There is no doubt that all active-user wheelchairs are *easier to propel* than the standard range of chairs supplied by Wheelchair Services in the past, which were designed for stability. Active-user chairs are *more manoeuvrable* owing to their larger wheels and through adjustment of the wheels to the best position for each user. The advantageous camber of the wheels and the lightweight materials from which the chairs are made, are also beneficial.
- In addition to greater ease in propelling and manoeuvring (which enables those

with muscular dystrophy to travel faster), because less strength is needed, they will be *able to sustain the effort for much longer*.

- The supply of an active-user wheelchair may *delay the need for a powered wheelchair* and provides additional grounds to justify its selection.
- A further justification can be made by comparing the time taken, both on a straight run and when manoeuvring around obstacles, between a lightweight wheelchair and a 'standard' NHS chair – and recording the difference in functional ability, which is likely to be significant.
- A lightweight active-user wheelchair will be *easier* for parents and carers to *push up and down kerbs and to lift and stow into a car*. However, it is important to consider whether a folding frame will fit better than a box frame into a small car.
- A sleek, well-designed chair does wonders for a young person's *image and self esteem*, both of which are particularly important considerations.
- The *appearance* of an active-user wheelchair makes the first wheelchair more acceptable to both a child and his parents, and to an adult who is struggling to remain independent – which is very important psychologically.

Decide when to supply and the features needed

- For children with spinal muscular atrophy (SMA) Type II, a lightweight chair should be supplied from an early age – often before the child is 2 years old.
- There is a critical period when an active-user wheelchair is ideal for boys with DMD. They are usually *still able to walk*, with or without callipers, *but need a wheelchair* when in the school playground, playing outside with friends or shopping. The key aim is to create independent movement, giving *exercise to arms and providing an active way of playing safely*.
- At the initial time of supply, children or adults may not need armrests, but the *seat canvas must provide a firm base. The backrest should extend to just below shoulder height*, which may mean using a small backrest extension.
- Consideration should be given to the likelihood that *increasing support* in the chair will be needed in the future and to the advisability of choosing a model that can have an *extended backrest and armrests* fitted later.
- Some active-user wheelchairs have a fixed sports-bar footrest, but this is a hazard for a user who is able to stand up from the chair. It is also likely to be in the way when the user is being assisted in/out by a carer. In most cases, standard footrests which flip up are more suitable.

Wheelchairs with height-adjustable seats

These chairs are particularly important to two groups of people:

- ⇒ children with spinal muscular atrophy;
- ⇒ adults with muscular dystrophy.

Children with spinal muscular atrophy

Seat elevation from floor level to wheelchair seat height or higher

This makes a chair very versatile for *pre-school play activities*, and for all children who need the opportunity to *'explore'* in their wheelchair, or to reach different heights.

Adults with muscular dystrophy

Help to stand up

Chairs with elevating seats are *essential* for those adults with neuromuscular conditions who cannot stand up from a chair but who *are able to walk or to take the weight on their feet to transfer*. In the latter case, the chair might be the vital link between the powered stand-up/recliner easy chair, powered toilet riser and height-adjustable electric bed.

Maintain independence

This chair is often the only means by which disabled people can retain the independence *to live on their own*.

Increase reach

The seat elevation will allow the user to reach up to a higher level, which is an invaluable facility *where muscle weakness limits arm function*.

Reduce need for adaptations in the home

The opportunity to reach surfaces of different heights may reduce the need for major adaptations, particularly *in the kitchen*.

Architectural planning issues

The size and turning circle of a wheelchair

- **Manoeuvring a self-propelled wheelchair in tight spaces usually requires more upper-arm strength than anyone with a neuromuscular condition is likely to possess**

Where possible, a full turning circle will be needed for both self-propelled wheelchairs and for powered chairs. However, there may be situations where the footplates of the chair can turn under a surface, e.g. in a bedroom where there are wheelchair-accessible working surfaces, or in a bathroom where there is an inset basin in a large wall-mounted vanity top.

- **Although the sizes of wheelchairs vary, it is important that there is sufficient space for any model that may be used in the future**

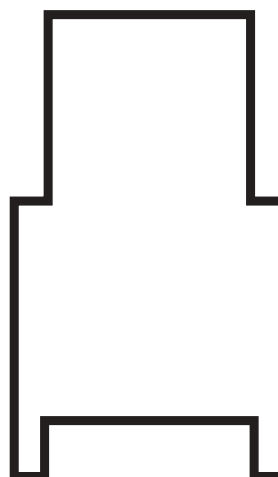
Wheelchairs have become more sophisticated in recent years with an increasing number of chairs being imported from Europe and particularly the Scandinavian countries. Many of these chairs are larger than the standard chairs widely used in the UK. It is important that no options are excluded in the future because of a lack of space. The size of the template reflects the trend towards larger chairs.

Wheelchair templates

Length: 1250mm Width: 750mm



Scale 1:50



Scale 1:20

Access into a house

■ Ramp gradient

A gradient of **1:20** is recommended for a self-propelled wheelchair, but **1:15** is adequate for a powered wheelchair. If there is insufficient space for a ramp, a short-rise lift or Steplift is an alternative.

■ The platform at the top of the ramp

This must extend forwards **1200mm** from the face of the door to allow the wheelchair to be positioned on a level surface and, if necessary, turned through **90°** before moving down the slope.

■ Ramp surface

This must be non-slip and have a side upstand of approximately **100mm** for safety.

■ A compression threshold

This has a gently curved metal threshold incorporating a central rubber projection that is depressed by a wheelchair and is very satisfactory for both manual and powered chairs. Raised threshold sills (including steel – uPVC weather bars) will prevent access in a powered wheelchair, as the front castors cannot rise over a vertical obstruction.

■ The need for wide doors

The width of the doors is influenced by narrow hallways and difficult access problems for a wheelchair, but in most houses a clear opening (i.e. from the face of the door to the door jamb the other side) of between **850** and **900mm** will be satisfactory. If new building is involved, **926mm** doors are recommended.

■ Double-swing doors (either single leaf or double leaf)

These are recommended internally to enable a person to open the door independently with the weight of the powered wheelchair. The bottom of the door should be protected with kicking plates.

■ Environmental control

The NHS provides environmental controls (see Chapter 8a *Equipment for Adaptations*) to increase independence and these units, in addition to less sophisticated equipment from Social Services, enable a person with arm weakness to *unlock* the door. However the control will not *open* the door, unless linked to an automatic door opener

■ Automatic door opener

The importance of an automatic door opener for those who cannot lift their arms and are unable to reach is becoming increasingly appreciated and provision for this should be made by the time that children are using a powered chair without parental supervision. If adaptations are carried out at a very early age, it is prudent to install the fused spur outlet in preparation for installation of the opener, when required.

Charging a powered wheelchair

■ Care of batteries

It is important to follow the manufacturer's instructions for the care of batteries and for the charge to be topped-up regularly. When the battery has completed the charging cycle and the charger is switched off at the mains, it is essential to unplug the charger from the chair to avoid draining the battery.

■ A room in which ‘wet batteries’ are to be charged should have good ventilation

For additional safety, a window can be opened when charging is taking place.

■ Designated area for charging chairs

It is useful to install a shelf for the charger, adjacent to the **13amp** socket, to eliminate the need to bend down, (see Chapter 14 *Scales & Templates*).

■ A shed in which to charge the batteries is not necessary

The only time that special provision needs to be made is where a number of wheelchairs are being charged in the same room, for example in some homes for those who are elderly or disabled. In these cases, it is recommended that the room should be force ventilated, if possible with the ventilation equipment interlocked with the chargers. However, if gel batteries are used, this provision would not be necessary.

■ Gel batteries

The performance of gel batteries has improved greatly in the last few years and to avoid the problem of leaving windows open during the winter, it is recommended that this type of battery should be used. Not only does the use of a gel battery avoid the production of significant quantities of hydrogen, but also they have the advantage of no maintenance.

■ The need for storage space

Adequate space is very important for the storage of wheelchairs which, although not acknowledged in the *Disabled Facilities Grant* legislation, cannot be stressed strongly enough. Both the Scottish and Bradford eligibility criteria (mentioned in the guidelines, *HSG(96)34*), refer to the need for adequate storage space. Many people with a neuromuscular condition have three wheelchairs:

- a transit chair or self-propelled model;
- an indoor powered chair;
- either an indoor/outdoor or an outdoor powered model.

Appendix 1: Wheelchair standards and guidelines

There are four standards or guidelines that are relevant to wheelchair users, in the context of this publication, as follows:

- ⇒ Medical Devices Regulations 2002 – *CE Marking*;
- ⇒ Medical Devices Agency. *Guidance on the Safe Transportation of Wheelchairs*;
- ⇒ Measurement of seating and wheelchair dimensions;
- ⇒ *BS 8300:2001 The Design of Buildings and their Approaches to Meet the Needs of Disabled People – Code of Practice*.

Medical Devices Regulations 2002 - CE Marking

The purpose of CE marking is to introduce uniform and statutory-based controls to regulate the safety and marketing of products throughout the European Community. The European Directive on medical devices, which includes CE marking, is brought into UK legislation under the Medical Devices Regulations. These were updated in 2002 and are aimed at manufacturers who must meet the ‘Essential Requirements’ of the Regulations, including risk analysis and risk management. CE marking means that the manufacturer claims that the product satisfies the ‘Essential Requirements’ for it to be considered safe and fit for the intended purpose.

For wheelchairs, the manufacturers do not need to seek approval of their products by a third party before they are placed on the market, but the Medical Devices Agency (MDA) monitors all aspects of the Regulations as the ‘Competent Authority’ in the UK.

Therapists must ensure that they have read the manufacturers information on a product as a part of their thorough and competent assessment of an individual’s needs. It is the responsibility of the therapist, or client, to complete an adverse incident report on the MDA website or by contacting the MDA (see below) if:

- the manufacturers information is found to be inadequate or inaccurate;
- the equipment fails to perform as stated;
- there is an injury caused by the use of the equipment;
- you think that there may be the potential for an injury to be caused.

The main aim of occupational therapy and rehabilitation is to minimise both the effects and the risks of disability and the risks associated with the use of wheeled mobility or seating equipment while attempting to maximise the individual’s potential. The client must be involved in every stage of the assessment and (where necessary, with advice) enabled to take responsibility for the decision making.

Where modifications are carried out or products are custom made, the responsibility to complete a thorough individual risk assessment lies with the prescriber and will need to take into account the manufacturers information.

Medical Devices Agency. *Guidance on the Safe Transportation of Wheelchairs*

Manufacturers should provide information on the transportability of their products within their pre-sales and user information. Most wheelchair manufacturers arrange for their new wheelchairs to be crash tested to give them basic details that they then use to support their transportability statements. Although the results of testing are important, in the event of an accident, there are many other factors that may be (equally or more) significant. These include:

- the speed at which the vehicle is travelling;
- the importance of not sitting sideways or at an angle to the direction of travel;
- the posture and symmetry of the user seated in the wheelchair;
- the appropriateness of the fixing points on both the chair and the vehicle floor.

Hence, the results of crash testing are not the primary information that a user or transport provider needs. The manufacturer should state whether their wheelchair could be transported occupied in a vehicle, or as a piece of luggage. They should give information on any specific procedures or additional equipment that may be required.

It will be important for readers to be aware of the two points of fixture when travelling in a wheelchair in a vehicle. These are as follows:

- an appropriate form of ‘tie-down’ to hold the chair in the vehicle. (N.B. There are many different types on the market now, but you should remember that clamps are generally only suitable for non-powered wheelchairs);

- a separate strap that goes across the upper body of the person in the chair and also across their lap, which is fixed to the vehicle structure. The upper part should be secured to a structure above the shoulder height. The lower ends of the lap belt should be fixed to the vehicle floor. The disabled person (or their carer, if necessary) must take every form of precaution and weigh up the advantages of travel in relation to the risks involved in any mode of transport.

N.B. The majority of pelvic straps (with a plastic buckle) secured to the wheelchair or seating are not normally suitable to be used as an occupant restraint in a vehicle. Also, many modern, large, low-floor buses have a designated space for wheelchair users with a padded back support that removes the need for separate straps or 'tie-downs'.

As part of their overall function, the MDA provides advice and guidance to users, carers, healthcare professionals and manufacturers etc. on all safety-related aspects of wheelchairs and seating. Please see the bibliography below. Bulletins are free to health and social care providers.

Measurement of seating and wheelchair dimensions

For several years there was an attempt to standardise the measurement of seating and wheelchair dimensions. Although this was not taken up by the vast majority of UK wheelchair manufacturers, it is important to consider seat sizes, when assessing a wheelchair and before ordering. In the UK, imperial measurements are usually used for wheelchairs and most manufacturers base their sizes on the size of the seat base or seat canvas. However, users should allow for:

- any additional width between the edge of the seat and the armrests:
- any extra length, from the front of the seat to the front of the backrest, if there is a gap at the rear of the seat and/or any sag in the backrest.

BS 8300:2001 The Design of Buildings and their Approaches to Meet the Needs of Disabled People – Code of Practice

This covers many items that will be of interest to wheelchair users and to those who are designing buildings and/or who are involved in access issues - and is recommended reading. However, the document is very expensive and the alternative to purchase would be to obtain a copy through your library - or to visit a library that includes British Standards information in the reference section.

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Wheeled Mobility & Seating Centre, 241, Bristol Avenue, Bispham, Blackpool. FY2 0BR.
Tel: 01253 596 000. Fax: 01253 596 177. E-mail: mb-mdav@doh.gsi.gov.uk
Web: www.medical-devices.gov.uk

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Available from:

Department for Transport, Mobility & Inclusion Unit, Great Minster House, 76, Marsham Street, London. SW1P 4DR

Tel: 020 7944 4923. Fax: 020 7944 6102. E-mail: miu@dft.gsi.gov.uk

Web: www.mobility-unit.dft.gov.uk

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Available from:

Stationary Office Ltd (formally called HMSO)

The Stationary Office bookshops or accredited agents - or

The Stationary Office Ltd, PO Box 29, Norwich NR3 1G.

Tel: 0870 600 5522. Fax: 0870 600 5533. Textphone: 0870 240 3701.

E-mail: book.orders@tso.co.uk. Web: www.tso.co.uk

BS 8300:2001, *The design of buildings and their approaches to meet the needs of disabled people – Code of Practice*.

Available from:

BSI Customer Services, 389 Chiswick High Road, London W4 4AL. Tel: 020 8996 9001.

Appendix 2: Which chair and why?

This covers:

- ⇒ NHS provision;
- ⇒ NHS voucher scheme for lightweight/active user chairs;
- ⇒ NHS voucher scheme for indoor/outdoor powered chairs;
- ⇒ Wheelchair choice.

NHS provision

This section is particularly important in view of the NHS guidelines concerning the provision of wheelchairs. The information included is as follows:

- ⇒ details of the scheme;
- ⇒ referral for NHS wheelchairs;
- ⇒ assessment.

Details of the scheme

These are discussed in this chapter in relation to the two broad groups of chairs mentioned overleaf. Copies of the guidelines are available from:

Department of Health
PO Box 410
Wetherby LS23 7LN
tel: 01937 840 250
fax: 01937 845 381

The NHS Department to contact, if necessary, is:

NHS Community Care Branch
Room 330
Wellington House
London, SE1 8UG
tel: 020 7972 4119 (Pauline Thomas)

However, it is worth noting that in accordance with section 29 of the above guidelines, *"Anyone who is dissatisfied with the service provided under the new arrangements should use the normal NHS complaints procedure"*.

Referral for NHS wheelchairs

The procedure varies between different areas: although, in most cases, a referral from a physiotherapist or an occupational therapist is accepted, in others the GP must make the referral. The local Wheelchair Services will know which is applicable; the telephone number can be obtained from the GP or local Social Services Department.

Assessment

These procedures also vary. Accredited therapists usually assess for basic chairs, whereas an appointment can be made with Wheelchair Services for non-standard or more complex needs. Anyone with postural problems may be referred to a specialist team, in which case it might be a help to be accompanied by an MDC Family Care Officer, a therapist or another professional who is familiar with the wheelchair user's needs.

NHS Voucher Scheme for lightweight/active user chairs

Guidance for the scheme was issued to Health Authorities, NHS Trusts and Wheelchair Service Managers by the NHS Executive in December 1996 (*Wheelchair voucher scheme, HSG(96)53*). The guidance stated that the scheme's primary purpose was to *"give wheelchair users more choice"*, although, at present, with the exception of a few areas, this extends to self-propelled chairs only. All Wheelchair Services were expected to be operating the scheme or to have firm plans for doing so in 1999. The Muscular Dystrophy Campaign is keen to see the benefits of the scheme extended to all users of electrically powered indoor/outdoor chairs (EPIOCs) as soon as possible.

N.B. Section 10 of Health Service guidelines, *Wheelchair Voucher Scheme (HSG(96)53)*, states that *"It is not intended that vouchers should, to begin with, be issued for powered wheelchairs"*. This should, however, be revised locally once the voucher scheme has become established.

The scheme offers three options, the second and third of which are designed to enhance the choice of the individual user:

1. **To accept the wheelchair prescribed**, as at present.
2. **The Partnership Option**, where the users contribute to the cost of a more expensive wheelchair of their choice from a range selected by the local Wheelchair Service. The NHS will own the chair and be responsible for its maintenance and repair.
3. **The Independent Option**, where users contribute to the cost of a more expensive wheelchair of their choice, which they then own and are responsible for maintaining.

The Wheelchair Service may include chairs from the range on the next page which can also be considered by a disabled person buying their own chair with (or without) a wheelchair voucher.

NHS Voucher Scheme for indoor/outdoor powered chairs

As previously stated, the voucher scheme is not available for powered wheelchairs in all areas; however, it is hoped that this type of chair will be included by all Wheelchair Services in the near future. In the meantime, the choice of chairs provided is left to each Health Trust/Wheelchair Services. It is hoped that some of the chairs included on the following pages will be supplied in their range to meet the needs of the individual person and the very specific needs of people with neuromuscular conditions – and to provide the very important element of choice. The Muscular Dystrophy Campaign would be happy to discuss with Wheelchair Services, options for chair ownership and maintenance of more expensive models. It is recommended that the advantages of the person waiving ownership are considered if the chair is maintained free of charge.

Wheelchair choice

This includes both types of wheelchairs:

- ⇒ lightweight/active user chairs;
- ⇒ indoor/outdoor power chairs.

Lightweight/active user chairs

The chairs offered by a Wheelchair Service may include chairs within the range below. All these models are prescription chairs with a choice of modules built around the individual users and their own specific needs. It is important that the assessment includes the input of the trained personnel from the different firms, where appropriate, in conjunction with Wheelchair Services.

- **Cyclone range** from *Cyclone Mobility & Fitness Ltd*
- **Handivipp** from *Dan Medica Ltd*
- **Etac and Cirrus ranges** from *Gerald Simonds Healthcare Ltd*
- **Kuschall, Action and REA Comfort ranges** from *Invacare Ltd*
- **Marshall Mark IV** from *Marshall Sports Chairs Ltd*
- **RGK range** from *RGK Wheelchairs*
- **Quickie range** from *Sunrise Medical Ltd*

Indoor/outdoor powered chairs

It is impossible to mention every chair that may be the most suitable for any particular individual. However, there are a number of chairs that are used regularly for *children and adults with neuromuscular conditions, and the recurring main reasons for their choice are listed.*

Lox

- Excellent introduction to powered mobility for younger children with SMA;
- excellent appearance;
- three sizes of seat – infant to average size of 5-year-old;
- particularly suitable for young children because seat elevation makes it versatile for pre-school play activities, early mobility and independence;
- quick release into modular pieces for ease of transportation.

Gerald Simonds Healthcare Ltd

Skwirrel

- Well-trying-and-tested chair for children with SMA;
- excellent features including seat-height adjustability;
- available with special switch-control option;
- three sizes of fully adjustable supportive seating;
- seating interchangeable with other systems;
- allows full extension of the child's legs in the 'floor-level' model;
- size needs to be assessed in user's surroundings;
- excellent appearance with 'fun' qualities; friends can travel at the rear of the chair;
- often used in conjunction with the Newton Badger Cub;
- video available.

DCS Joncare Ltd

Skwirrel Maks

- Same pedigree as Skwirrel;
- for larger children, up to approx **10 stone (65kg)**;
- various powered options e.g. height-adjustable backrest/adjustable tilt-in-space seat and backrest, electric-adjustable leg/footrest;
- can fit alternative seating systems;
- special switch-control option;
- Maks can also be 'created' by upgrading the Skwirrel, when child grows;
- video available.

DCS Joncare Ltd

Bobcat DX

- A suitable choice for small children with SMA;
- 'fun' mobility equipment which is aesthetically pleasing;
- height-adjustable seat from floor level;
- various options of supportive special seating and interchangeable standing frame;
- adaptable for growth;
- special switch-control options.

Smile Rehab Ltd

Kid Power

- Multi-adaptable design to achieve a good seating position and allow the chair to be altered as the child grows;
- based on the Vitesse range, but with colourful choices for the frame and upholstery;
- suitable to accommodate most seating systems;
- wide range of control options;
- optional powered backrest recline, and seat and backrest tilt-in-space.

Lomax Mobility Ltd

Vitesse III

- 'No-nonsense,' well-established chair;
- easy to fold for transportation;
- also available in heavy-duty options – dependent upon the weight of the user.

Lomax Mobility Ltd

Vitesse 2000/Vitesse 2000 Recliner

- As above, but also available in a model with an electric reclining backrest.

Lomax Mobility Ltd

ABC Therapy chair

- Age range approx. 2-15 years;
- front- or mid-wheel drive for indoor use;
- small turning circle and manoeuvrability;
- two seat sizes with adjustable seat depth and backrest height;
- powered seat raise, and seat and backrest tilt-in-space;
- supportive seating system and tray option;
- special control options.

Rainbow Rehab

Wizard

- Front-wheel drive for indoor/outdoor use;
- powered seat raise, seat and backrest tilt-in-space and backrest recline;
- two seat sizes with adjustable seat depth and backrest height;
- supportive seating system and tray option;
- low seat height;
- special control options;
- appealing and fun to drive.

Rainbow Rehab

Compact

- Front-wheel drive for indoor/outdoor use;
- low seat height with powered seat raise;
- postural seating options;
- comfort seat with powered seat raise;
- optional seat and backrest tilt-in-space, backrest recline and elevating legrests.

Rainbow Rehab

Miniflex

- Specifically designed for indoor use (limited outdoor);
- manoeuvrable and compact;
- powered seat raise;
- optional powered seat and backrest tilt-in-space and backrest recline;
- optional Comfort seat.

Rainbow Rehab

Flexmobil

- Specifically designed for indoor use (limited outdoor);
- mid-wheel drive for minimum turning circle and manoeuvrability;
- powered seat raise;
- optional Comfort seat with optional powered, seat and backrest tilt-in-space and backrest recline.

Rainbow Rehab

Spectra Plus/Harrier Plus

- Multi-adaptable, which is ideal for achieving a good seating position and allows the chair to be altered as a child grows;
- ability to alter the seat width and depth, features which are available infrequently;
- good upholstery, which provides a firm base;
- wide range of colours;
- easy to dismantle, which makes chair easy to transport;
- frame construction suitable to accommodate other types of special seating;
- good range of accessories;
- optional electric backrest adjustment.

Invacare Ltd

Cruiser 4E

- Front-wheel drive option, which is highly manoeuvrable indoors;
- fitting of specialised seating systems recommended;
- easy to fold for transportation;
- electric backrest adjustment and elevating legrest option.

Invacare Ltd

Storm 3

- Popular with young people because of the high-tech styling;
- various options available, e.g. electric seat and backrest tilt-in-space, electric adjustable backrest, electric elevating legrests;
- optional powered elevating seat (rises up and forwards);
- easy-to-fit modular seating systems;
- wide range of controls;
- up to 6mph option.

Invacare Ltd

Twister

- Option of front- or rear-wheel drive for indoor/outdoor use;
- front-wheel drive exceptionally manoeuvrable in confined spaces;
- silent-running motor and range of user-friendly controls;
- powered options include seat elevation, reclining backrest, seat and backrest tilt-in-space, and elevating legrests;
- armrest fully adjustable forward, backward and in/out;
- choice of four seating systems;
- optional clamping bracket.

Invacare Ltd

Newton Vixen Cub

- Normally considered to be an indoor chair, but can be used on a good, even, outdoor surface;
- well-trying-and-tested chair, particularly suitable for small children;
- compact chair with narrow turning circle which makes it excellent for indoor use and in confined spaces;
- replacement seating on existing base as child grows;
- also available in outdoor, long-base model;
- usually readily available from Wheelchair Services.

Newton Products Ltd

Newton Tilt-in-Space Vixen

- Indoor chair with excellent manoeuvrability;
- can be supplied with basic upholstery or frame only, to accommodate variety of specialist seating systems;
- powered seat and backrest tilt-in-space;
- available through some Wheelchair Services or funded privately.

Newton Products Ltd

Powertec 40

- Indoor/outdoor chair;
- custom-built, specified using F45 form;
- wide range of seat sizes and backrests;
- easy-to-transport, folding frame;
- equally suitable for children and adults.

Sunrise Medical Ltd

Quickie F45

- Indoor/outdoor chair;
- multi-adaptable which is ideal for achieving a good seating position and allows the chair to be altered as a child grows;
- range of backrests;
- manual or electric backrest recline;
- easy-to-transport, foldable frame.

Sunrise Medical Ltd

Powertec 50s

- Indoor/outdoor chair;
- a trendy, heavy-duty, robust chair able to travel over any terrain and with a good battery range;
- range of backrests and seating;
- manual or electric backrest adjustment;
- manual or electric seat and backrest tilt-in-space;
- colour range appealing to young people;
- easy to transport.

Sunrise Medical Ltd

Quickie F55

- Indoor/outdoor chair;
- 14" - 20" seat width;
- stylish, robust, rigid powerchair with suspension;
- range of backrests and seating;
- manual or electric backrest adjustment (retrofit);
- manual and power seating options (retrofit);
- optional **300mm** seat elevation;
- various speed settings available;
- maximum **21 stone (132kg)** user weight;
- exciting frame colour range.

Sunrise Medical Ltd

Quickie F16

- A quality lightweight clip-on power pack for use on Quickie 2, Quickie 2 Millenium and Quickie RXS manual wheelchairs;
- versatile, but in power mode may not perform as well as a standard electric wheelchair;
- good colour range.

Sunrise Medical Ltd

Jazzy

- Seat frame allows seat growth from **14" x 14" - 20" x 20"** and use of variety of seating frames;
- mid-wheel drive for increased manoeuvrability;
- option of powered seat raise or powered seat tilt;
- on-board charger;
- multiple control options using variety of switches with interface to environmental controls etc. using the Omni Plus.

Pride Mobility Products Ltd

Mangar Freestyle

- Seat-height adjustability, which is vital for adults who can walk or stand to transfer, but have difficulty standing up from a chair and reaching;
- small turning circle;
- retractable hand control;
- range of seating options including specialist support seating;
- seat-size modification (or replacement) from small child up to adult;
- manual or electric backrest adjustment;
- leg support adjustment;
- optional 'tie-down' points;
- individual choice of colours for upholstery.

Mangar International Ltd

Booster Calypso

- Fun mobility prior to need of indoor/outdoor wheelchair;
- seat position adjustable;
- for access, seat swivels and arm lifts up without altering position of tiller;
- angle of tiller adjustable to maintain support for arms on armrests;
- anti-tip wheels, but not recommended for gradients of more than **10%**;
- with battery removed, chassis divides for transportation;
- mechanically simple;
- three- or four-wheeled versions.

Movingpeople.net

Booster Beetle

- Front-wheel drive indoor/outdoor chair with excellent manoeuvrability;
- adjustable alternative made-to-measure seating options with forward adjustment of armrest;
- powered backrest, seat-height adjustability, seat and backrest tilt-in-space;
- powered elevating legrest with powered length adjustability.

Movingpeople.net

Booster Puma

- Robust rear-wheel drive for indoor/outdoor use with excellent comfort suspension for rough terrain;
- separate seat chassis allows infinitely-variable seat width and depth to accommodate growth;
- other features as Booster Beetle;
- range of controls to suit user;
- particularly suitable for bigger/heavier user up to **19 stone (120kg)**;
- speeds up to **6.5mph**.

Movingpeople.net

Adaptachair

- Rear-wheel drive, indoor/outdoor chair built to individual needs;
- Recaro seat with adjustable lumbar support;
- powered seat height adjustability, fully-reclining backrest and optional elevating footrests;
- adjustable armrest tilt (but not height);
- minimum seat height suitable for driving and restricted vehicle headroom;
- optional swing-away controller and tray.

