

EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT

Improving Transport for People with Mobility Handicaps



A GUIDE TO GOOD PRACTICE

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EUROPEAN CONFERENCE OF MINISTERS OF TRANSPORT (ECMT)

The European Conference of Ministers of Transport (ECMT) is an inter-governmental organisation established by a Protocol signed in Brussels on 17 October 1953. It is a forum in which Ministers responsible for transport, and more specifically the inland transport sector, can co-operate on policy. Within this forum, Ministers can openly discuss current problems and agree upon joint approaches aimed at improving the utilisation and at ensuring the rational development of European transport systems of international importance.

At present, the ECMT's role primarily consists of:

- helping to create an integrated transport system throughout the enlarged Europe that is economically and technically efficient, meets the highest possible safety and environmental standards and takes full account of the social dimension;
- helping also to build a bridge between the European Union and the rest of the continent at a political level.

The Council of the Conference comprises the Ministers of Transport of 39 full Member countries: Albania, Austria, Azerbaijan, Belarus, Belgium, Bosnia-Herzegovina, Bulgaria, Croatia, the Czech Republic, Denmark, Estonia, Finland, France, the Former Yugoslav Republic of Macedonia (F.Y.R.O.M.), Georgia, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Moldova, Netherlands, Norway, Poland, Portugal, Romania, the Russian Federation, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine and the United Kingdom. There are five Associate member countries (Australia, Canada, Japan, New Zealand and the United States) and three Observer countries (Armenia, Liechtenstein and Morocco).

A Committee of Deputies, composed of senior civil servants representing Ministers, prepares proposals for consideration by the Council of Ministers. The Committee is assisted by working groups, each of which has a specific mandate.

The issues currently being studied – on which policy decisions by Ministers will be required – include the development and implementation of a pan-European transport policy; the integration of Central and Eastern European Countries into the European transport market; specific issues relating to transport by rail, road and waterway; combined transport; transport and the environment; the social costs of transport; trends in international transport and infrastructure needs; transport for people with mobility handicaps; road safety; traffic management; road traffic information and new communications technologies.

Statistical analyses of trends in traffic and investment are published regularly by the ECMT and provide a clear indication of the situation, on a trimestrial or annual basis, in the transport sector in different European countries.

As part of its research activities, the ECMT holds regular Symposia, Seminars and Round Tables on transport economics issues. Their conclusions are considered by the competent organs of the Conference under the authority of the Committee of Deputies and serve as a basis for formulating proposals for policy decisions to be submitted to Ministers.

The ECMT's Documentation Service has extensive information available concerning the transport sector. This information is accessible on the ECMT Internet site.

For administrative purposes the ECMT's Secretariat is attached to the Organisation for Economic Co-operation and Development (OECD).

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Guide de bonnes pratiques

Further information about the ECMT is available on Internet at the following address:
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FOREWORD

Over the last ten years or so there has been considerable progress in making transport more accessible for people with mobility handicaps. Low-floor wheelchair accessible buses are coming into service in ever increasing numbers; new light rail systems are now built to be fully accessible and many existing metro and heavy rail systems are gradually being refurbished and made more accessible. Air and maritime transport now provide much improved access for mobility handicapped passengers.

Transport infrastructure has also improved, and for example much more use is now made of tactile warning and guidance surfaces; ramps and lifts are provided where formerly there were only steps. New technology is also playing an important role in making travel easier for many disabled people, particularly in providing better, more immediate and useable information both before and during journeys.

Although a lot has been achieved, much still remains to be done to make transport services and travelling accessible to everyone. Over the last decade the European Conference of Ministers of Transport (ECMT) has played an important role in bringing together experts on the many aspects of transport for the mobility handicapped and producing reports and recommendations which provide guidance on achieving barrier-free travel. Political support for this work has been given through the adoption of several formal resolutions by the Council of Ministers. They are all available on ECMT's Internet site at the following address: <http://www.oecd.org/cem/>

The ECMT decided that, in the furtherance of accessible transport, it would be helpful to bring together current good practice in one publication. This publication is not a detailed statement of specific guidelines. It is intended to provide an overview of the subject as well as references to reports and other publications which provide further details.

ECMT would like to acknowledge the invaluable help of Philip Oxley of Cranfield University, United Kingdom, in preparing this publication. The

members of the working group (listed in Annex 2) are also warmly thanked for providing examples and illustrations of good practice from their own countries.

We hope this publication will be of help to everyone who works in the field of transport for mobility handicapped people, but particularly to those who are in places where much still remains to be done to achieve barrier-free transport.

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INTRODUCTION

Mobility handicap is a broad church. It includes people who by reason of accident, disease or a congenital condition find it difficult to move around, or to see or hear or understand. It includes people who have a temporary impairment which can encompass anything from a leg broken in a skiing accident to having a small child and/or several baskets of shopping. In fact at one time or another virtually everyone has a degree of mobility impairment, so good design of transport – in the broadest sense – has a universality of relevance.

It is worth keeping this thought in mind when reading this guide. Of course the ideas contained in it are of particular importance to people conventionally thought of as disabled – roughly 12 per cent of the population – but the guidelines are relevant to a much larger proportion than that. Two studies, one in Germany the other in France, estimated that at any one time between 20 and 30 per cent of people travelling have a mobility impairment for one reason or another.

In a recent publication by John Gill¹ the following estimates of numbers of people with various types of impairment are given. They relate to geographic Europe, which has a total population of about 800 million.

Wheelchair users	3 million
Cannot walk without aid	45 "
Cannot use fingers	1 "
Cannot use one arm	1 "
Reduced strength	22 "
Reduced co-ordination	11 "
Speech impaired	2 "
Language impaired	5 "
Dyslexia	25 "
Intellectually impaired	30 "
Deaf	1 "
Hard of hearing	80 "
Blind	1 "
Low vision	11 "

Many people, especially as they grow older, have more than one impairment: the total number of people out of the 800 million with some degree of impairment is probably of the order of 110 to 120 million.

This publication is not intended to be a very detailed and absolutely comprehensive guide to good practice: if it were that it would be several times bigger than it is. Rather, it is intended to provide a vade mecum for anyone who is concerned with transport whether as a designer, planner or operator; to give good advice and some details of the more important aspects of transport infrastructure, vehicles and information, and to provide a list of sources where more detailed and specific information can be found.

Notes

1. "Access Prohibited? Information for Designers of Public Access Terminals" published by the Royal National Institute for the Blind, London (May 1997). Note that the figures are based on 1986 data.

INFORMATION

In whatever form information is made available it should meet the four criteria:

- clear;
- concise;
- accurate;
- timely.

It makes no difference whether the information is presented on a leaflet, a sign, in response to a telephone call or in any other way, those criteria must be satisfied if it is to meet the needs of travellers.

These criteria, of course, apply to information for everyone who has to travel, but for disabled people there are aspects of these criteria that are particularly important.

1.1 CLARITY

Clear means two things: easily legible in the case of textual information whether printed or on a screen or a sign and in all cases, including spoken information, easily understood.

There are quite a lot of good guidelines developed for the presentation of text.

Generally people find it easier to comprehend text when it is written in lower case, with appropriate capitals RATHER THAN ALL IN CAPITALS. This applies to timetables and leaflets as well as signs and television displays.

Size is important. Failing eyesight is a common accompaniment to increasing age and very small print is difficult to read. Conventional timetables

and brochures should be printed in a clear type face for the benefit of everyone but should also be produced in large print, minimum 14pt, preferably 19pt: **which is this size.**

Even large print can be rendered difficult to read if the contrast between the colours used for the text and for the background paper is not good. Brown print on a beige background may be aesthetically pleasing but it is not easy to read especially if the light is not too good. Black or dark blue on a white background is fine.

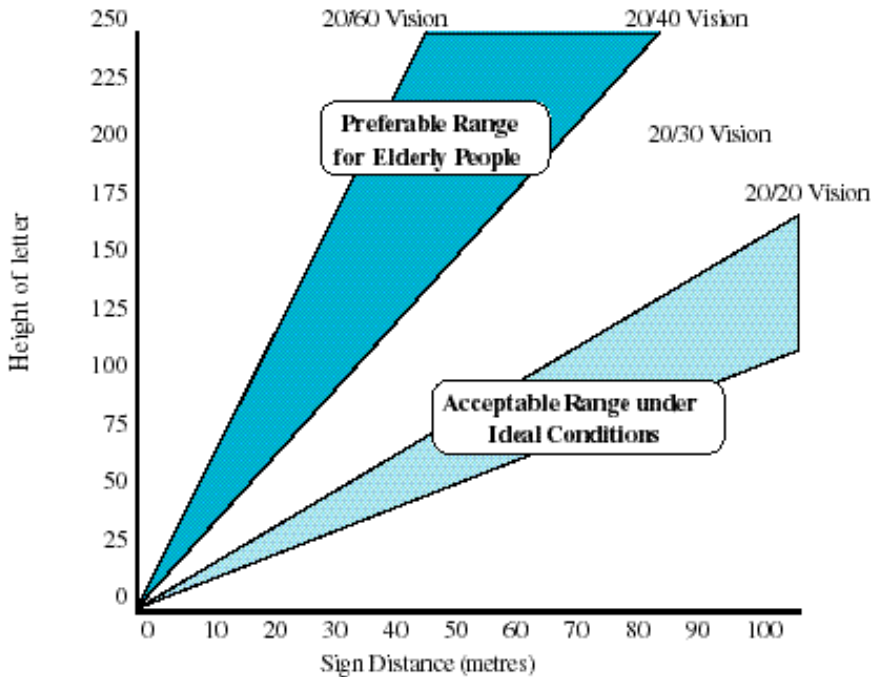
These guidelines generally also apply to signs. Lower case lettering, again, should be used and the type face should be a clear one like:

- Helvetica;
- Airport;
- Futura;
- Folio.

Part of the process of ensuring that signs are legible is the placing of them. The ideal position for seeing a sign is on a level with the eyeline of the individual but this is often not possible. Put at that level in, for example, a railway terminus would mean that unless you were right by them you would not be able to see them because of other people in the way. So they often have to be raised. The extent to which they are raised will depend on the specific location, but to avoid other people (apart from American basketball players) getting in the way they should be placed not less than 2.3m^{1,2} above ground level. Of course in large areas like a station concourse they will be a lot higher than that because people need to see them from a long way away.

There are several guidelines on the size of lettering in relation to distance varying according to the degree of visual impairment of the observer. The figure below shows the size of lettering required at a range of distances. Thus to meet the needs of elderly people and others with rather poor sight a letter height of 25 mm is required for a viewing distance of 7.5 metres. At 20 metres distance, letters should be about 75 mm. Some transport authorities have more exacting standards. For example London Transport's standard is based on 10 mm letter height for every metre of viewing distance, with no lettering less than 22 mm.

There is an increasing use of variable message signs particularly in air and rail services but also growing on bus services as well.



Source: Improving Transportation Information. Prepared for Transportation Development Centre, Transport Canada by TransVision consultants Ltd (1996).

These take a variety of forms from television screen displays, LED and fibre optics to the more old-fashioned but still much used flip disks. Following the advice given for printed texts and static signs will improve the legibility of these displays - clarity, appropriate size of letters and contrast are just as important. But, by their nature, variable message signs change by scrolling or flipping. It is most important that speed of change should not be too fast otherwise people who can read, but not well, will find it difficult to understand the message. It is recommended that a line of text should be displayed for at least ten seconds, preferably a little longer. Dynamic signs should have non-reflective glass and should be shielded from direct sunlight.

There are increasing numbers of public access information terminals and kiosks at transport terminals and on-street. The type of information they give varies. It may be related to one specific service or to a whole range of transport information including planning journeys by car. Examples include the

Photo A: Dynamic information at bus stops helps all passengers



Photo B: **ROMANSE TRIplanner** information terminal



Source: Courtesy of ROMANSE project, Southampton, United Kingdom.

TRIPlanner terminals developed as part of the European Commission's ROMANSE project in Southampton and the INFOPOLIS travel terminals in Madrid.

It seems likely that this source of information will increase in the future and it obviously has great value *if properly designed*. A recent ergonomic evaluation of the ROMANSE terminals³ produced the following guidelines:

- the operational face of the machine, which is a touch-sensitive screen, should be no more than 1 200 mm from ground level;
- the screen should be flush with the front surface of the terminal casing, not recessed into it;
- parallax can make it difficult for people to place their finger on the desired icon or symbol on the screen; this effect can be reduced by careful positioning of the screen in relation to the viewing angle;
- the cabinet in which the screen is placed should have a foot and knee recess, so that wheelchair users can get close to it;
- displays of text should follow the guidelines mentioned earlier concerning clarity, contrast and legibility.

Further information on the design requirements for new information technologies, including Internet services, can be found in reports produced by the EC project QUARTET PLUS. A contact point for obtaining this information is included in the References section of this publication.

Help Points, which people can use to get travel information or to call for emergency assistance, are becoming more common, particularly on stations which are not staffed all the time. These help points should be placed so that the maximum height of any button which the caller has to use is 1 200 mm, they should be clearly distinguishable by visually impaired people and should be fitted with an induction loop.

Lighting of static signs

Signs should be well lit. As a rule of thumb it should be possible for a person with good (20/20) vision to read a newspaper in the vicinity of the sign. Where ambient light levels are not as good as this illuminated (back-lit) signs may be preferable. In conditions where the light is good, glossy finishes to signs should be avoided as they can cause glare and disadvantage people with low or impaired vision; a matt finish is better.

1.2 CONCISE

Quite a lot of information is seen while *en route* when the observer himself is moving – perhaps walking or maybe on a bus or a train. The time available to see, read and understand the information may therefore be quite short. This then emphasises the importance of keeping information as concise as possible and emphasises the value of using symbols.

COLITRAH⁴ has produced a comprehensive set of recommendations on signage – “*chaîne signalétique*” – which makes the point that for passengers in transit signs should be designed to give an instantaneous “snap-shot” of information. Symbols can be very helpful in this process, not least because they can be understood by people with low levels of literacy, but they must be used consistently, be unambiguous and if or when new ones are introduced, they should be accompanied by a verbal explanation until the public is fully familiar with the symbol and its meaning⁵.

1.3 HEARING INFORMATION

The emphasis on the preceding paragraphs has been on visual display of information, but audible information is also important, especially for conveying any unexpected changes to services and in emergencies. However audible information is not restricted to announcements at stations and on-board public transport vehicles. Other sources include telephone information, information and ticket offices.

Many personal hearing aids incorporate a “T-coil” which provides direct inductive coupling with a second coil, for example in a telephone receiver or at a ticket office window. However, as not all hearing aid users have a T switch, it is recommended that telephones should also have user-controlled amplification of received sound. Amplification of sound is accessed via a button on the telephone that automatically reverts to the ordinary sound level once the telephone handset has been replaced.

Some telephone information services now include a Telecommunications Device for the Deaf (TDD)⁵. Text phones are available and are essential for those people who are profoundly or severely deaf.

1.4 ACCURATE AND TIMELY

Of course it is obvious that any information in whatever form should be accurate. This means more than just making sure that it is correct at the time it is **first** presented it also means a process of up-dating and checking to make sure that it continues to be accurate. A mistake in a timetable may be the cause of irritation to anyone, but to a disabled person the consequences can be much more serious.

Timing of information is also important. Thought should be given not just to the content but to the point in the journey when it is needed. To take one simple example, an audible announcement of the next stop on a metro is very helpful particularly to visually impaired people but it needs to be made in sufficient time for the passenger to get ready to leave the train; an announcement as the train draws to a halt (or the bus) is too late for people who are less than fully agile.

1.5 GENERAL INFORMATION

The preceding sections have dealt with specific aspects of the ways in which information should be presented, but there is also a need for more general information. Transport services change over time and so do the facilities that they offer. Knowledge about public transport services – where and when they operate, what the fares are and so on – is important for everyone but disabled people really need more information especially if they use a wheelchair.

A good example of this is the guide produced by SNCF⁶ which gives information on facilities and equipment (toilets for disabled people, ramps, lifts, accessible telephones, etc.) at stations and on trains, ticket booking and seat reservation and, most importantly, also gives information on accessible public transport (buses, trains, etc.) to and from the rail stations.

At a more general level, covering a range of modes of public transport, guides such as that published by the Department of the Environment, Transport and the Regions for the United Kingdom (“Door to Door”) or the French “*Guide des transports à l’usage des personnes à mobilité réduite*” can be of value to disabled people. These publications provide a summary of the range of services

available to disabled people. They are not intended to offer detailed, local information but to provide a broad overview of what is available and to give contact telephone numbers for more specific enquiries.

With a different purpose in mind, guides on good design for accessibility can be used to raise awareness of transport operators and local authorities to the needs of disabled people. In the Netherlands, for example, brochures are being prepared with specifications on accessibility in urban public transport, for information systems, and for parking and facilities on motorways. The idea is that such brochures will provide guidance to operators and authorities in a way that is easier for them to assimilate than if the same information is conveyed in a scientific report.

NOTES

1. See page 22, “Access prohibited” by John Gill, published by the Royal National Institute for the Blind, London, for more information on this and related subjects.
2. Fruin JJ, “Synthesis of Transport Practice: Passenger Information Systems for Transit Transfer Facilities”. US Transportation Board, Washington DC (1985).
3. Barham, P. and Alexander, J. “Evaluation of Interactive Information Terminals (with respect to their use by the elderly and people with disabilities) – ROMANSE Project.” CCLT, Cranfield University (1998).
4. Stevoux P, Smolar M, Thery C and Briaux-Trouverie C. “*Une conception de la ‘signalétique’ adaptée aux besoins de l’ensemble des usagers*”. COLITRAH, Conseil National des Transports (1989).
5. See ECMT Transport for People with Mobility Handicaps - Information & Communication, p 65 and pp 104-105 ECMT (Paris, 1991).
6. “*Guide du voyageur à mobilité réduite*” published by SNCF, Paris.

THE ROAD AND PEDESTRIAN ENVIRONMENT

Almost all journeys start and finish by walking or wheeling. No matter how accessible transport itself may be, if the walking environment contains barriers to movement then the usability of transport services is largely negated.

2.1 FOOTPATHS AND FOOTWAYS¹

The underlying purpose of a pavement is to provide safe, easy access for everyone walking or using a wheelchair. To achieve this the following guidelines should be followed wherever possible:

- a minimum obstacle free footway at least 1 800 mm wide – preferably 2 000-2 500 mm;
- widths should be greater at bus stops (minimum 3 000 mm) and in front of shops (3 500 mm or more);
- if possible gradients should be not more than 5 per cent (1 in 20) to cater for self-propelled wheelchairs: this should be used as a design limit in new development (The Swedish Association of Local Authorities² noted that a gradient of 2.5 per cent (1 in 40) can be managed by the majority of people, but gradients steeper than this begin to cause difficulties for some manual wheelchair users.);
- where gradients are unavoidably steeper than this, level areas (preferably 1 800 mm long) should be incorporated at intervals of 10 metres;
- crossfalls, which are needed to make sure rain water drains away quickly should not be more than 2.5 per cent (1 in 40). Anything steeper than this makes it difficult for a wheelchair user to steer in a straight line;
- where there is a drop or steep slope at the rear side of a footway (or both sides of a footpath) a 100 mm edging upstand should be provided as a safeguard for wheelchair users and as a tapping rail for long cane users;
- surfaces should be non-slip, well maintained and any joints between paving slabs should be closed and flush to avoid catching the small wheels of a wheelchair;

- covers and gratings should be non-slip and flush with the pavement surface;
- nothing should overhang the footway (signs, tree branches, etc.) to a height of less than 2 100 mm (preferably 2 500 mm);
- where it is not possible to avoid having obstacles in the pavement, such as lamp-posts, traffic signs, etc. they should have a contrasting band of colour 140 mm to 160 mm wide with the lower edge 1.5 to 1.7 metres above ground level. Trees in the footway should have a distinctive surface around them (for example grating or pebbled) to warn blind people;
- seating should be provided at regular intervals of around 100 metres.

2.2 JUNCTIONS AND ROAD CROSSINGS

These are potentially hazardous for visually impaired people and wheelchair users. Dropped kerbs are of great help to wheelchair users and should be provided at all pedestrian crossing points. At side roads where there is space to do it, dropped kerbs should be set up on the side road out of the direct line of the footway of the main road. This is to prevent blind people walking into the side road without realising it.

The dropped kerb or “kerb cut” should be flush with the carriageway, 2 metres wide (more if it is a heavily used crossing point) and the gradients associated with it should be gentle.

To help visually-impaired people, when a dropped kerb is in the direct line of travel, a tactile surface should be laid to a depth of 1 200 mm (see below) in a contrasting colour to the surrounding pavement. This will provide a warning to the pedestrian that they are approaching a road.

Busy junctions require some form of control to assist pedestrians across the road. This may be just a pedestrian crossing (“zebra”) or a controlled crossing (traffic signals with a pedestrian phase and various other forms of control such as “pelicans” and “puffins”). Again all these crossings should have dropped kerbs and tactile warning surfaces.

Further help can be given to visually-impaired pedestrians at controlled crossings by means of audible and tactile (or haptic) signals. Examples of these

include the signal popularly known as “bleep and sweep” which is designed to be used at staggered crossings across roads which have a centre reservation.

Straightforward crossings can use a standard bleep which should have two tones – one to indicate that it is safe to cross, the other to indicate that the safe period is about to come to an end. Electronic systems have been developed which will extend the safe crossing period; this can be helpful to disabled people who cannot move as quickly as an able-bodied person. The sound output of beepers can be modified by reference to the ambient (traffic) noise level to ensure that it can be heard over traffic noise but does not cause a noise nuisance at quieter times.

2.3 PEDESTRIANIZED AREAS

Areas, particularly in town centres, that are traffic free for some or all of the time can provide a pleasant and safe environment for all pedestrians, but they can also contain hazards.

The gradients mentioned earlier (in 2.1) also apply to pedestrianized areas and, where there are unavoidable changes in level, ramps should be provided as well as steps. Two level (or more) shopping precincts must have lift access to all floors.

The walking surface, like that of footways, should be non-slip and well lit; good maintenance is also essential.

There is very likely to be some encroachment onto the pedestrian areas of shop displays and goods as well as street furniture – lamp posts, bollards, waste-bins and the like. Such encroachment should be carefully controlled otherwise it can be dangerous for visually-impaired people. The aim should always be to maintain all the principal directions of movement as “pedestrian clearways”.

Large open pedestrian areas are difficult for visually-handicapped people to navigate, so tactile guidance surfaces should be incorporated in such areas (see 2.5) as well as appropriate warning for any flights of steps. In the future navigation systems may help blind people to find their way through these types of area.

2.4 ROADWORKS: HOLES AND HOW TO AVOID THEM

It is inevitable that from time to time repairs will have to be made to footways and pedestrian areas. When this happens the area should be barricaded off with a continuous rail about 1 000 mm above ground and a tapping rail below this. Audible warnings and lamps should be provided and where a diversion is necessary, the needs of wheelchair users should not be forgotten. Temporary footways should never be less than 1 200 mm wide and, wherever possible, at least 1 800 mm wide.

Where scaffolding or other temporary structures are erected on or adjacent to a pedestrian way, it is essential that their presence is made apparent to visually impaired people. There should be a minimum passage width of 1 100 mm (more if possible) where scaffolding is erected over a footway.

Corner poles must be padded and all vertical supports should have a band of contrasting colour about 150 mm in depth and with the lower edge 1.5 to 1.7 metres above ground level. Lighting and audible warning should be provided.

2.5 TACTILE SURFACES

For people who are blind or who have little residual vision, tactile surfaces are essential for the safe progress through the street environment.

Many European countries have developed tactile surfaces of various kinds. There is a strong case for Europe-wide agreement on which surface should be used in what circumstance, but this does not exist at moment and indeed there is some inconsistency even within one country, let alone between countries.

However, there are some general guidelines of good practice that can be adduced:

- tactile surfaces have to be sufficiently “rough” or “rigorous” for blind people to feel them through their shoes, bearing in mind that some medical conditions which lead to vision impairment also cause loss of feeling in the lower limbs (e.g. diabetic retinopathy);

Photo C: Road works on a pavement with protective barricade and lamps



Source: Courtesy of the Department of the Environment, Transport and the Regions (DETR), United Kingdom.

- The surface should not be so rigorous that it causes problems to other pedestrians, particularly ambulant disabled people and wheelchair users;
- because most visually-impaired people still have some vision, tactile surfaces should be readily distinguishable by colour and tone from the general pedestrian area;

Photo D: **Tactile surfaces are essential to warn blind and visually impaired people of hazards**



Source: Courtesy of the Department of the Environment, Transport and the Regions (DETR), United Kingdom.

- there are two categories of tactile surfaces; those that warn of a potential hazard and those that impart information;
warning surfaces should be used in the following circumstances *and should be readily distinguishable one from another*:
 - at pedestrian crossings (where colour may be used to differentiate between controlled and uncontrolled crossings),
 - at the edges of rail, tram and raised bus platforms,
 - to warn of other hazards: steps, level crossings, the approach to on-street light rapid transit platforms;
- information surfaces can be used to:
 - provide a guidance route through large open spaces or through complex pedestrian environments
 - indicate the presence of facilities such as bus stops, telephone kiosks, tactile or talking information services, toilets and so on.

Photo E: Tactile guidance surface



Source: Courtesy of the Ministry of Transport, Public Works and Water Management, The Hague, Netherlands.

Research³ has shown that a height of approximately 5 mm for the raised profile part of a surface is sufficient for almost all blind people to detect the surface and at this height it does not cause too much of a problem to other pedestrians. An alternative to a surface with a raised profile is one that feels different underfoot. A surface made of neoprene rubber or similar elastomeric compound feels noticeably softer than normal paving – and sounds different when walked on. This type of surface is recommended in the UK as an information surface.

Sound itself can be a guide. Hamburger Hochbahn AG has equipped some of its underground stations with ceramic tiles with raised bumps 30 mm in diameter but only 1.5 mm high⁴. The detection of these tiles depends on sound rather than feel, and thus the environment is of major importance.

The Dutch town of Gouda has introduced an extensive system of tactile surfaces including route guidance and warning of a junction, the latter based on a concrete tile coated with a layer of hard rubber.

2.6 CAR PARKING

It is usual in European countries for special car parking arrangements to be made for disabled car users.

Parking bays should be wide enough to give space for a wheelchair user to transfer from chair into the car, that is about 3.6 metres wide compared with a standard bay width of 2.5 metres. Where there are several bays together some space can be saved by having one shared extra space (1.2 metres) to two bays.

Where parking bays are on-street kerb-side they should be 6.6 m long to allow for access to the rear of the vehicle, where wheelchairs are often stored. An adjacent flush dropped kerb should be provided to give access to the pavement.

Whether on or off-street, enforcement is essential to ensure that parking bays (marked with the wheelchair symbol) are not used by other motorists.

The recommended numbers of parking spaces for disabled motorists vary according to the type and capacity of car parks. The following examples are taken from the British Institution of Highways and Transportation Guidelines:

- (i) for car parks associated with employment premises and providing for employees and visitors:
 - Up to 200 spaces : 5% of capacity (minimum two spaces)
 - Over 200 spaces : 2% of capacity plus six spaces.
- (ii) for car parks associated with shopping areas, leisure or recreational facilities and places open to the public:
 - Up to 200 spaces : 6% of capacity (minimum three spaces)
 - Over 200 spaces : 4% of capacity plus four spaces.

Other countries have different recommendations – for example the French regulation (1994) envisages one space per 50 parking spaces and a minimum of ten spaces for car parks with over 500 spaces. When deciding on the number of spaces to be allocated, it should be remembered that the number of disabled car users as a proportion of all car users is likely to increase in the future.

The reserved spaces in whatever type of car park should be placed at the closest point possible to the place they are intended to service. This is particularly important in pedestrianized town centres where, because of the distances involved, it may well be appropriate to make provision just for disabled motorists within the pedestrian area rather than on its periphery.

Increasingly, variable message signs (VMS) are being used to tell people whether there are spaces available in public car parks. It would be helpful if these signs could also show whether there are any spaces for disabled motorists available as well.

2.7 LONGER ROAD JOURNEYS

Although much emphasis is, and should be, placed on making the local road environment accessible and safe for disabled people, their needs on longer journeys should not be forgotten. The Federal Government in Germany, for example, has produced guidelines that should ensure that wheelchair users have unimpeded access to emergency telephones and that motorway service areas include parking spaces for disabled motorists and accessible facilities including toilets. Where motels are provided they should include rooms equipped for disabled people.

NOTES

1. Footpaths are defined as pedestrian ways without a contiguous road, footways (or pavements) run alongside roads. Design standards will generally apply to both.
2. “Streets for Everybody” Swedish Association of Local Authorities (1993).
3. “Tactile footway surfaces for the blind” TRL Contractor Report 257, TRL Crowthorne, UK (1991).
4. BILOS und Seine Effektivität, Report on a symposium held in Hamburg (1991).

INFRASTRUCTURE

3.1 GETTING INTO THE BUILDING

The physical location of transport infrastructure – bus station, rail stations, etc. varies enormously – ground level, below ground, above ground, one level, multi-level and so on.

The basic principles in designing access, however, remain the same whatever the specific physical characteristics of the building. Expressed in a different way, a single step at the entrance to a station or a kerb without a ramp in the road outside can make the most carefully-designed terminal inaccessible to people with certain disabilities.

Ideally, doors should be avoided at the entrance to the station but this is not always feasible, for example for reasons of climate. Where doors are needed they should be automatic, linked either to a weight sensor or sensors mounted above the door.

The clear width of the door(s) once open must be sufficient to allow easy access for anyone, including people in powered wheelchairs, walking with a helper or pushing a double-buggy. Recommendations on minimum width vary from one guideline to another but to be on the safe side a clear width of 1 200 mm should be provided. Where double doors are installed each door should be a minimum of 800 mm (or preferably a little more – 830-900 mm) wide.

Glass doors must be marked with a brightly coloured banding about 150 mm deep at a height of at least 1 500 mm from the ground. Glass should not be used below a height of 400 mm to avoid damage from pushchairs and wheelchairs.

Obviously the way into the building has to be fully accessible and step free. Where the height change between the pavement or road outside and the floor level of the station is comparatively small, a ramp (in addition to steps) will be adequate. The ramp should have a fairly shallow gradient, ideally about 1 in 20 certainly no steeper than 1 in 12. The maximum length between level landings,

Photo F: A clearly marked pedestrian way, with dropped kerbs, through a bus station



Source: Courtesy of Cranfield University, Cranfield School of Management, United Kingdom.

where a wheelchair user could rest to regain his breath, should ideally be no more than 6 metres¹ and the ramp itself should be at least 2 000 mm wide, so that two wheelchair users can pass one another. The level landings should be at least 1 200 mm long, preferably 1 800-2 000 mm.

Ramps should be built with handrails on both sides, these being set at about 850 mm above the surface of the ramp. The handrail should be circular in

Photo G: Glass or other translucent doors and panels should have clear coloured markings on them



Source: Courtesy of Cranfield University, Cranfield School of Management, United Kingdom.

cross-section and about 45 mm in diameter. If fixed to a wall there should be a clear space between rail and wall of 45 mm. A second lower handrail, set at 700 mm above the ramp surface, can be helpful for children and people of reduced stature. Where the ramp is open sided a tapping rail or kerb for long cane users should be provided along each (open) side at a height of 100 mm.

Even where a ramp is provided, there should also be stairs. Some people, often those suffering from arthritis and back pain, find it easier to climb stairs than to use a ramp. In designing any stairs, whether two steps or twenty, the same principles apply :

- all the steps in a flight should be uniform;
- the risers should be between 100 and 150 mm high; 130 mm is preferred;
- treads should be 300 mm deep and treated with a non-slip surface;
- nosings (step edges) should be slightly rounded (6 mm radius) without any overhang and colour contrasted;
- risers should be vertical;
- the minimum width between rails should be 1 200 mm;

- the maximum rise of a single flight of stairs should be 1 200 mm;
- rest areas between flights of steps should be at least 1 200 mm long, preferably 1 800 mm;
- there should be a minimum of three steps in each flight;
- handrails (dimensions similar to those mentioned above for ramps) should be provided and should extend 300 mm beyond the start and finish of the flight of steps;
- approaches to steps should have a tactile “warning surface” to alert blind and visually handicapped people.

Open tread staircases should be avoided: some people feel unsafe on them and they are more difficult for visually impaired people to use.

Photo H: Open tread stairs are a hazard for many disabled people and should not be used



Source: Courtesy of Cranfield University, Cranfield School of Management, United Kingdom.

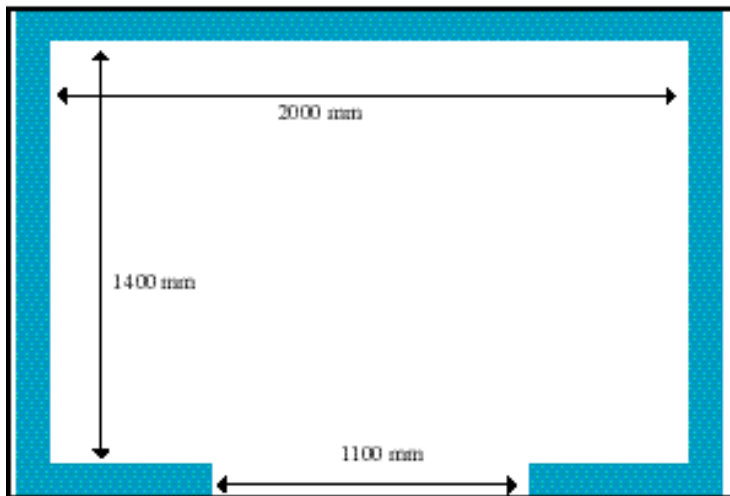
Where there is a substantial difference in height between the pavement and the interior of the station or where space is limited a ramp may not be appropriate and a lift will have to be provided.

Photo I: Interior of a wheelchair accessible lift showing control panel



Source: Courtesy of the Athens Hilton Hotel, Greece.

The size of the lift will obviously be dependant on the numbers of people expected to use it but there are minima which must apply if the lift is to be used by a wheelchair passenger. These are shown in the following diagram.



The internal height of the lift should be 2 300 mm, 2 100 mm at the entrance door.

To allow easy access into and out of the lift there should be a clear space outside the door sufficient for a turning circle of 1 700 mm (minimum 1 500 mm).

The lift call buttons on the outside of the lift should be between 900 and 1 200 mm from the floor – similar dimensions should apply to the control buttons inside the lift. The buttons themselves should be at least 19 mm across their smallest dimension and protrude from the wall. Usual convention is for the emergency buttons (call and stop) to be at the bottom of the control panel.

To help visually impaired people, buttons should be labelled with raised characters in both Braille and text and, for all users, there should be a visual acknowledgement that a call has been registered and when it has been answered. Pre-recorded announcements of direction of travel of the lift and of the floors should be provided.

Escalators

These are not popular with some disabled people, they cannot be used by people with guide dogs or, of course, wheelchair users, but others can and do use

them. To make them safer and more user friendly for ambulant disabled people the direction of travel should be clearly shown at the top and bottom of each flight using red and green signs. Lighting should be provided near to floor level with a visible change in lighting at the bottom and top of each flight and edges of the 'steps' should be clearly marked in a contrasting colour and tone.

Approaches to the top and bottom of escalators should have a change of floor texture or tactile strip to alert blind people.

Travelators

These are helpful where there are long distances to be traversed but they should not be at a gradient of more than 1 in 8. They are not suitable for wheelchair users, so a parallel passageway should be provided.

3.2 MOVING WITHIN THE BUILDING

The size and complexity of transport buildings varies enormously from small bus and rail stations to huge interchanges and international airports. Designs for the interiors of those buildings will reflect their size, complexity and the numbers of passengers using them, but there are some design guidelines that should apply whatever the size and type of terminal.

3.2.1 Pedestrian clearways

As a general principle, station furniture should be designed to minimise obstruction to the main pedestrian flows. Facilities such as telephones, vending machines, seating, litter bins, etc. should all be placed in such a way that, although easy to see and to reach, they do not obtrude into the pedestrian flow corridors.

At a minimum there should be a 2 000 mm pedestrian footway clear of all obstacles. It should include a directional tactile surface to help blind people (and appropriate warnings of any changes in level) and any station furniture or structural features such as columns supporting the roof in the vicinity must be in contrast (colour and tone) to their surroundings. If there are columns in the main pedestrian flow corridor, they should be marked with two horizontal bands 140 to

160 mm wide, preferably of alternative yellow and black stripes, with the lower band 800 mm from the ground and the upper one 1 600 mm. For secondary circulation spaces such as short passages to toilets, offices or service areas a reduced width (minimum 1 200 mm) may be acceptable.

Photo J: Badly designed interiors can be confusing for people with impaired vision



Source: Courtesy of Cranfield University, Cranfield School of Management, United Kingdom.

3.2.2 Facilities and services

Buying a ticket

Where there is a ticket office it should :

- (i) have one position suitable for wheelchair users (and people of reduced stature) with a desk height of between 75 and 85 mm;
- (ii) all positions where there is a security screen between the ticket salesman and passenger should have an induction loop;
- (iii) handrails along the queuing positions which passengers who find it difficult to stand can lean against.

These guidelines also apply to information offices and desks.

Many terminals, whether or not they have a ticket office will have ticket machines. The scope for designing these so that they are awkward to use is

Photo K: Check-in facility for wheelchair users at Oslo airport



Source: Courtesy of the Norwegian Association of the Disabled.

immense and frequently used. As with ticket offices, designers should remember that wheelchair passengers will want to use the machines so none of the operating elements of the machine – push buttons, coin/note slots, ticket dispenser should be more than 1 200 mm from the ground.

Operating buttons should be at least 19-20 mm in diameter, protrude sufficiently to enable use by people who use palm pressure and contrast in colour from the face of the machine.

Tickets and change should be easy to retrieve for people who have limited manual dexterity.

Instructions on how to use the machine, and the process of actually using it, must be kept simple and clear. Ideally this should be just a three stage process: choose ticket – tender fare – collect ticket (and change if any). The face of the ticket machine should be well lit.

Many transport systems require tickets to be validated before the journey is started. Much the same principles apply to validation machines: they must be clearly identified and within reach of passengers in wheelchairs.

Where there are ticket barriers at least one gate should be available at all times for use by wheelchair passengers, people with guide dogs and others with heavy luggage or pushchairs. Ticket slots in barriers must be clearly visible.

3.2.3 Waiting for buses, trains, etc.

A lot of disabled and elderly people find standing for any length of time uncomfortable or even impossible, so providing seating at appropriate points throughout the terminal is very important. It is worth remembering that some of the distances people have to negotiate within a terminal are considerable. At Heathrow Airport interchange passengers may have to walk as far as 1300 metres between gaterooms.

Research by Leeds University² found that only 40 per cent of wheelchair users and 20 per cent of ambulant disabled people using walking sticks could manage to walk 180 metres without a rest. Quite large proportions of the ambulant disabled could not manage more than 60 to 70 metres without a rest.

So, as a general guide seating should be located so that people don't have to walk more than about 50 to 60 metres without the opportunity to sit down and rest for a moment.

There are a lot of different types of seating, some more suitable than others for people with different kinds of disability. There are five broad types of seat:

1. Perch-type seats against which passengers can lean or “half sit” for a short period of time. They require minimal maintenance, take up very little space and are attractive to some passengers with arthritis, stiff joints or back problems who find it difficult to get up from a low seat.
2. “Flip-up” seats, which also have the advantage of saving space and do not become wet when it rains.
3. The traditional wooden bench, with end (and possible intermediate) armrests, is more comfortable for sitting on for extended periods than either the perch-type or the “flip-up” seat. Wood is a relatively “warm” and non-slip surface which dries quickly and does not encourage vandalism.
4. Wire-mesh or perforated metal seats installed in rows fulfil largely the same role as the traditional bench. A brightly-coloured coating (possibly the provider’s corporate colour scheme) helps visually-impaired passengers and makes the seats less cold and slippery. Arms help passengers to get up from the seat and also deter vagrants from sleeping on them.
5. For indoor waiting rooms where there is not a serious problem with vandals, a more expensive form of upholstered seating can be provided.

Seat heights should be about 450 mm (and not less than 420 mm) for conventional seating, about 550 to 600 mm for flip-up seats and about 700-800 mm for perch-type seats. If possible and space permits the three basic types of seating should all be provided. Whatever type of seating is provided sharp edges and corners should be avoided and for conventional seating arm rests should be provided at a height of 200 mm above the seat.

At terminals where passengers are likely to wait for quite a long time, enclosed waiting rooms should be provided. They should be heated/air conditioned, free of draughts but well ventilated and have easy access doors. Most importantly, both visual and audible information should be relayed to all waiting rooms.

3.2.4 Refreshment facilities

Many terminals have restaurants, cafés and bars but not always designed with the needs of disabled people in mind. Key design criteria include:

- gangways and spaces between tables sufficient to allow wheelchair access: 1 300 mm if possible;

- tables designed for wheelchair users with space under the table for adequate leg room – 700 mm high, 500 mm deep and 600 mm wide. This means a table-top height of about 730 mm;
- furniture, trays and crockery that contrast with their surroundings.

There seems to be an increase in refreshment rooms designed with fixed furniture – seats and tables. If designers really insist on doing this, some spaces must be left for wheelchair users to sit at a table.

3.2.5 Toilets

It is most important that terminals and stations and other transport – related buildings used by the public should have toilets for disabled people. These should be designed to accommodate people in wheelchairs. There are usually national building regulations which specify the design standards for toilets for disabled people, but there are common requirements:

- a wide, easily opened door (minimum clear width 1 000 mm);
- sufficient space for a wheelchair user to manoeuvre inside the cubicle;
- space around the lavatory to enable the wheelchair user to transfer from front or side from wheelchair to lavatory;
- hand washing and drying facilities within reach from the lavatory;
- sufficient space for a helper to assist in the transfer.

As a general rule toilets for disabled people should be no less available than ordinary toilets for able-bodied people.

3.2.6 Other infrastructure

The previous sections have dealt with relatively large and complex infrastructure, but there are other, smaller pieces of transport infrastructure that need to be designed carefully.

Bus and tram stops may be no more than a pole with a timetable board attached (sometimes not even that) but bearing in mind that people do have to wait at them, sometimes for more than just a minute or two, the following should be taken into account:

- shelters to keep the worst of the weather off waiting passengers are helpful, but they should be designed so that people inside them can see the approaching bus or tram;

- they should be lit, or if that is not possible, situated in a well-lit area;
- modern shelters make a lot of use of glazed areas which is good from the point of view of increasing ambient light in them but can make them a hazard for people with impaired vision. Where glazing is used, a bold brightly coloured band 140 to 160 mm wide should be placed on the glazing about 1 500 mm from the ground;
- seating should be provided, ideally some at the conventional height (450 mm) and some perch seating (700 to 800 mm high);
- timetable information should be provided at a height of between 1 000 and 1 700 mm from the ground – this really should be lit if at all possible.

Whether or not a shelter is provided, timetable information should be given perhaps on the pole which also has the bus or tram stop flag. The flag itself should contain the route numbers of the services using the stop in clear bold numbers on a contrasting background (black on white or dark blue on yellow). The numbers should be at least 50 mm high (the Syndicat des Transports Parisiens recommends 60 mm) and the flag itself should be a minimum of 450 mm wide by 400 mm high. The bottom of the flag should be no lower (but not much higher) than 2 500 mm from ground level. If services using the stop are fully accessible, the international wheelchair symbol can be used on the timetable information.

3.3 BOARDING THE VEHICLE

3.3.1 Bridging the gap

The previous sections have discussed ways in which it is possible to improve a journey through rail, bus stations and other termini. Before moving on to consider the vehicles themselves, there is the matter of bridging the gap between the platform or pavement and the vehicle itself.

For able-bodied people a step up or across, say from platform to train is, at worst, a mild inconvenience: a slightly greater inconvenience if encumbered with heavy luggage but still not too difficult. For a person who can only walk with difficulty or who uses a wheelchair a relatively small gap may simply be non-negotiable. For a person who is visually-impaired it may be dangerous.

Research has shown that virtually all ambulant disabled people can manage a step height of 200 mm³ but this is much too large to be negotiated by a

wheelchair user without assistance. Research for the design of the South Yorkshire Supertram⁴ showed that the maximum horizontal gap possible for wheelchair users was 45 mm and the maximum vertical gap was 20 mm.

In an ideal system the design should be such that the interface between the platform and the boarding/alighting point on the vehicle – whether bus, tram or train – meets this standard. In practice this is often not possible though there is no reason why it should not be achieved in newly-built systems.

An increasing number of bus stops are being built as raised bus boarders – raised to the height of the entrance of the bus when the (air) suspension is knelt – usually about 240-250 mm. Provided the bus is able to draw up close and parallel to the bus boarder, a wheelchair user will be able to board or alight without assistance. A common problem which prevents this is the existence of cars parked at or close to the stop. This can be overcome by using cape-type bus stops, but these are still few and far between and for other reasons, such as interference with general traffic flow, may not always be appropriate.

The alternative then is to provide a ramp to bridge the gap between bus (or tram/light rapid transit). A raised boarding platform is still an advantage when a ramp is used because it reduces the gradient. Some recent research⁵ suggests that the maximum gradient for a short ramp of this kind – about one metre in length – should not be more than 1 in 11 (9%) for self-propelling wheelchair users. Powered wheelchair users can manage steeper gradients: 1 in 6 (17%) is generally acceptable. The report prepared by COST322 recommends a gradient of 13% up to a ramp length of one metre.

There are various types of ramp, in ascending order of cost:

- manual demountable: carried on the bus and put in position when required;
- manual: usually a “book leaf” type which is folded out by the driver or attendant;
- powered: electro-mechanical.

The decision on which type should be used will depend on the amount of use expected as well as the cost. Manual ramps will only be appropriate for lightly used bus services; for those with heavier use and for rail-based vehicles powered ramps should be provided.

One consequence of the use of a ramp is that there must be sufficient space on the boarding area to allow the ramp to be fully extended and for the wheelchair

Photo L: The new metro line (Météor) in Paris is designed to enable direct train/platform access for wheelchair users



Source: Courtesy of the RATP-Audiovisuel, France.

users to manoeuvre onto or off the end of it. A minimum space (width) of 2.5 metres is recommended.

3.3.2 Heavy rail

The vertical gaps between buses, light rapid transit and their platforms are usually quite small, but this does not apply to some heavy rail systems. In the United Kingdom and Ireland railway station platforms have generally been built

Photo M: **Train mounted lift in Sweden**



to a greater height than elsewhere in Europe and it is possible to provide wheelchair access by means of a portable ramp. Use of it does, of course, require the presence of station staff and therefore of advance notification from the wheelchair traveller.

Elsewhere in Europe the vertical distance platform to rail carriage is often too great for a ramp to be used. A number of train operators now use mobile platform lifts – for example at French, Austrian and Swiss stations. Prototype train-mounted lifts have been developed and tested, notably in Holland and in the longer term this method may be preferable to station-based lifts. The Austrian lifts, for example, are hand operated and can deal with a height difference of 1.5 metres but, as the Helios⁶ report noted, the use of the lift is “a little scary for passengers with vertigo”. Further examples of provision for wheelchair access to trains are provided under the SJ Swedish State Railways programme for measures to assist handicapped people, including both platform and train-based lifts.⁷ In Germany Deutsche Bahn AG is working on the design of a train-based boarding aid and some local and regional train carriages are now fitted with these boarding aids.

Some organisations representing disabled people believe that only on-train solutions can offer satisfactory access in the long term. However, whether the access means used is a lift on the train or a mobile ramp, safety concerns require that they should be operated by railway staff.

3.3.3 Getting onto aircraft

Airports are designed with the need for easy movement by wheeled luggage trolleys and so are generally convenient for wheelchair passengers to move around, but problems can arise when it comes to boarding the aircraft.

At larger airports, with medium size or bigger aircraft, access from gaterroom to the aircraft is by jetty which will be step-free: the problem arises with smaller aircraft or where there is no jetty system. A government funded boarding lift for passengers was introduced in Kjevik, Norway in June 1996⁸. It consists of an electrically-powered platform which runs on rails at the sides of standard detachable stairs. Other lifts suitable for use with smaller aircraft have been developed and used in Finland and in the United Kingdom (e.g. the Sampson Aircraft Loader).

An alternative to this is a “bus” which raises itself to the height of the plane door; examples are at Paris Charles de Gaulle airport and at Washington Dulles.

Photo N: Aircraft boarding lift at Munich airport



Source: Courtesy of the Ministry of Transport, Building and Housing, Germany.

A further alternative for access to smaller (commuter) type aircraft is the use of a low-level loading bridge of the type developed in Canada and suitable for use with aircraft such as Dash 8s, SAAB 340s and BAe 146s. The loading bridge, which would be used by all passengers, is electrically operated, provides smooth step-free access and has contrasting lighting to assist visually impaired passengers.

3.3.4 Other features

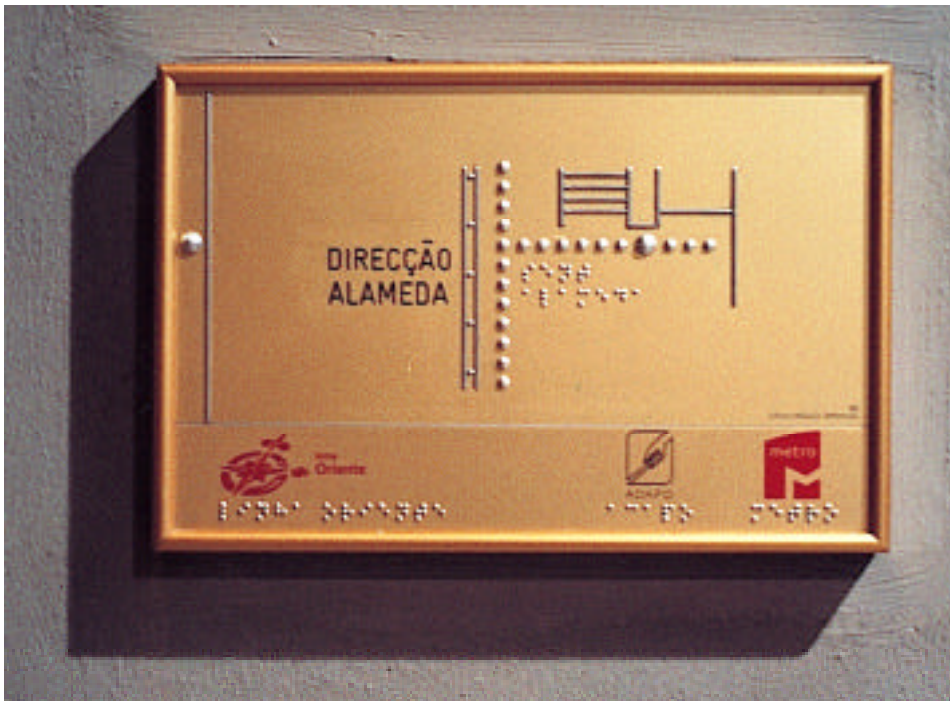
Where there is a raised bus boarder, and on all rail platforms there must be a tactile warning strip laid parallel to the edge of the platform with a width of 400 mm and set back at least 500 mm (preferably 600-700 mm) from the platform edge⁹. The edge of the platform should also be clearly marked with a contrasting colour, usually white or yellow.

The surface of the platform should be non-slip and should not have a cross-fall greater than that needed to ensure good drainage (usually 1:30 or 1:40). That slope should be away from the tram or train in order to avoid accidental rolling of wheelchairs or prams onto the rails¹⁰.

Many platforms whether for trams, trains or buses will have other furniture on them. Where this is the case, furniture such as ticket machines, litter bins, seating should be placed so as to leave an unobstructed area of two metres width along the boarding edge of the platform. If the platform is open and raised it should have railings or fencing of some kind along its rear edge and this should include a kerb or “kicking board” which can help long care users. This board should be 150 mm in depth with the top of it 200 mm above the platform surface.

Large and complex platforms should include a tactile map at their entrance (as on some stations on the Brussels metro) which blind people can use to orientate themselves.

Photo O: **Tactile information wall panel in a metro station**



Source: Courtesy of Direcção Geral de Transportes Terrestres, Ministério do Equipamento, do Planeamento e da Administração do Território, Portugal.

NOTES

1. There is some variation between countries on this distance. In France and Sweden the recommended maximum is 10 metres, in the United States it is 12 metres for a 1 in 20 gradient, 9 metres if the gradient is steeper. The Netherlands railway station standard is a maximum 1 in 16 gradient with rest places every 8 metres.
2. "Ergonomic standards for disabled people in pedestrian areas: results from Leeds observation work 1988/89". Transport Research Laboratory Working Paper, TRL, Crowthorne, United Kingdom (July 1989).
3. Flores JL, and Minaire P, "*Epidémiologie du handicap: étude fonctionnelle d'une population*" LESCO, INRETS, Lyon, 1986 and also Oxley PR, and Benwell M, "An experimental study of the use of buses by elderly and disabled people" Transport Research Report 33, TRL, Crowthorne, United Kingdom (1985).
4. Fowkes A, Gallon C and Oxley PR, "Supertram Ergonomic Study", Cranfield University (1992).
5. Research for Motability (UK) on access to vehicles by wheelchair users, to be published in 1999 (Cranfield University).
6. "The Design and Operation of Accessible Public Transport Systems" HELIOS Report (November 1996).
7. See COST 335 "Passengers' accessibility of heavy rail systems" (pp 123) Brussels (October 1997).
8. See HELIOS Report ut supra.
9. See "Guidance on the use of tactile paving surfaces", DETR, London (1997).
10. See p 79, "Principles for Travel Centre Design" Ministry of Transport and Communications, Finland (1997).

VEHICLES

4.1 BUSES AND COACHES

For many people with limited access to a private car buses are usually the most frequently used mode of public transport. Many countries have been progressively improving the design of buses for many years; initially with changes intended to help ambulant disabled people, subsequently (in some countries) with designs that enable people in wheelchairs to use them.

In Germany, for example, over 80 per cent of all buses ordered by the members of the Association of German Transport Operators are low-floor, usually with a kneeling device and a ramp. In Greece low-floor trolley buses have recently been ordered for the Athens area.

Photo P: A low floor trolley bus of the type to be used in Athens



Source: Ministry of Transport and Communications, Greece.

It is worth distinguishing between buses and coaches because the basic designs of these vehicles are rather different and therefore have implications for the methods by which full accessibility can be achieved. It is also sensible to distinguish between design guidelines that assist ambulant disabled and sensorily impaired people and those that make wheelchair access possible.

Photo Q: Increasing numbers of buses are now designed to be accessible by wheelchairs users. A low, step-free entrance helps all passengers



Source: Courtesy of the Department of the Environment, Transport and the Regions (DETR), United Kingdom.

The essential difference between buses and coaches is the floor height. Even quite old designs of buses did not have floor heights more than about three-quarters of a metre, while coaches, especially those used for holiday tours and excursions have floor levels well in excess of one metre; frequently over three metres.

Modern designs for buses used on local and some inter-urban services have become progressively lower until the point has been reached at which it is possible to board with just one step and for a substantial part of the interior then to be step free. In turn this means that it is then possible, with the use of a small ramp at a comparatively shallow gradient, for a wheelchair passenger to board the vehicle.¹

Ramped access is not practical because of the high floor of modern coaches. Access for wheelchair users has to be by lift, which has implications for both vehicle design and costs.

Ideal though it may be, it may not always be feasible to introduce low-floor wheelchair accessible buses into local services but quite a lot can be done to make non-wheelchair accessible buses easier for other disabled people to use. The first of the following sections sets out design guidelines for achieving this, the second then sets standards for wheelchair access to buses and the third section considers access to coaches.

4.1.1 Measures to assist ambulant disabled people

For people with impaired sight:

- clear marking of the edge of any steps (yellow and black sharks tooth markings are effective);
- colour contrasted hand rails and stanchions;
- colour contrasted bell pushes;
- audible announcements (of next step, terminus, etc.);
- adequate space in the priority seating for guide dog.

For ambulant disabled people:

- any interior steps to be between 120 mm and 200 mm and all of the same height (± 10 mm);
- gangway width to be a minimum of 450 mm (preferably 550 mm as recommended by COLITRAH) up to a height of 900 mm above the floor increasing to a width of 550 mm at a height of 1 400 mm above the floor;

- stanchions / handrails to be at intervals of no more than 1 050 mm apart down the length of the bus (COLITRAH recommends a minimum of 1 000 mm);
- bell pushes within reach of a seated passenger;
- priority seating with a minimum pitch of 650 mm; this gives sufficient space for people with stiff legs to get in and out and sit down easily.

For hearing impaired people:

- visual display “bus stopping”;
- where feasible display of name of next stop.

In general, all surfaces should be non-slip and all entrances and exits should be well lit and have appropriately placed hand rails.

4.1.2 Measures to assist wheelchair users

- minimum gangway width from entrance to wheelchair space of 750 mm, preferably 800 mm or more (see also 4.1.1);
- a wheelchair space, clearly marked as such, with a flat surface without obstacles and with minimum dimensions of 1 300 mm x 750 mm as well as space to manoeuvre;
- it is safer for the wheelchair passenger to sit with his back to the direction of travel; there should be a back rest (from 350 mm to 1 400 mm in height) against which the wheelchair can rest, a horizontal rail or armrest at a height of about 900 mm to one side of the space and a bell push within easy reach; a movable armrest should also be considered;
- the general consensus is that on low floor buses, there is no need for the wheelchair and occupant to be secured.

4.1.3 High floor coaches

Unlike low floor buses, where a wheelchair passenger can wheel directly in from the boarding area, access onto a high floor coach has to be by lift.

This can be integral with the coach, or a free-standing lift. The latter though a cheaper option can only really be used at major coach stations. A possible alternative to an integral lift is a stair climber though the usual step configuration at coach entrances makes this a difficult option to design in to a coach. Both the free-standing lift and the stair climber mean that the wheelchair passenger would have to transfer to a boarding chair (similar to that used on aircraft and some

Photo R: Access onto a high floor coach is possible with an on-board lift



Source: Courtesy of the Canadian Transportation Agency.

trains) to get to a seat. The integral lift can be designed so that the passenger travels in his own wheelchair which is an advantage for some who find transferring difficult or painful. The recently produced USA evaluation² of these systems shows, however, that the integral lift is the most expensive option.

4.2 TAXIS

Taxis can provide a vital link in the transport chain for the disabled traveller. The European Commission has recognised this with its recently started project on the Eurotaxi – a taxi accessible to all customers.

Various different strategies have been adopted by European countries in the development of accessible taxis but they can be broadly divided into two groups.

- (i) a proportion of the taxi fleet is made fully accessible, usually by the use of minivan-based vehicles, with the remainder of the fleet being ordinary saloon cars (e.g. in Finland), or,
- (ii) requiring that all taxis, whether purpose-built or based on minivans or multi-purpose vehicles should become, in due course, fully accessible (as in the United Kingdom).

Whichever method is adopted it should be possible to define some design standards which when applied will ensure that whatever the type of vehicle, it will meet requirements for wheelchair access and for easy use by other disabled people.

The UK Department of the Environment, Transport and the Regions has recently³ published an informal consultation document on proposals for accessible taxis and these include a number of design requirements:

- at least one doorway through which a wheelchair passenger can enter: 1 350 mm high and 780 mm wide;
- at least one doorway on the nearside of the taxi which has a height of not less than 1 700 mm from ground level and a minimum clear width of 600 mm;
- no more than three steps into the vehicle, the first one no more than 250 mm high, any subsequent ones between 120 and 200 mm, consistent to within ± 10 mm;
- a boarding device must be provided at the doorway used by wheelchair passengers. This will usually be a ramp, which must be at least 750 mm wide, no more than 1 700 mm long and when deployed, must give a gradient of not more than 25% (1 in 4). If a lift is used it must have a platform at least 750 mm wide and 1 200 mm long;
- inside the taxi, the space for the wheelchair must be sufficient to take a “reference wheelchair” (1 200 mm x 700 mm) and with headroom of at least 1 400 mm.

There are a number of other requirements including colour contrasted hand holds, provisions for passenger wishing to transfer from wheelchair to seat and guidelines for swivel seats. The latter are particularly helpful for elderly people with arthritis or similar conditions who find it difficult to get into a fixed seat.

The dimensions given above are to some extent a compromise between the ideal and the practicable. COLITRAH, for example, recommends a minimum width of doorway for a wheelchair passenger of 800 mm. In Sweden, Lund University has recently developed ergonomic standards for taxis which include:

- 900 mm preferred width for door used by wheelchair passengers;
- minimum door opening height of 1 400 mm for saloon cars, 1 650 mm for van-type taxis;
- maximum slope on access ramp of 1 in 12;
- wheelchair space inside the vehicle 800 x 1 300 mm, with minimum headroom of 1 400 mm in cars, 1 800 mm in van conversions.

In Spain the C.E.A.P.A.T. technical guidelines also include a recommended 1 350 minimum height and 800 mm width for access to a taxi and a space 1 200 mm x 700 mm (800 mm if possible) with headroom of 1 400 mm for the wheelchair space. Thus it can be seen that there is already a considerable degree of agreement between countries on minimum acceptable standards for taxis.

Passenger safety for wheelchair users must also be considered. Unlike low floor buses, where it may not be judged necessary to secure passenger and wheelchair, it is essential to do this in taxis. It is also most important that wheelchair passengers should travel facing either forwards or backwards but never sideways.

There are some good examples of accessible taxis based on conversions of small vans, for example Fiat Scudo in Spain, but in most places in most countries good examples of fully accessible taxis are few and far between.

4.3 TRAMS AND LIGHT RAIL

Trams are operated in many continental European cities. Some are still of the traditional relatively high floor design, not easily used by ambulant disabled people and completely inaccessible to wheelchair users. However, they are gradually being replaced by modern designs, for example those developed in Germany (where about half of cities and towns with trams have low-floor vehicles) and in France.

Ultra-low floor trams have been developed (e.g. in France, the Tramway Saint-Denis-Bobigny and the Tram Val-de-Seine) which provide wheelchair access without ramps or lifts, but low floor versions usually do require a boarding aid. The tram system in Grenoble, France, uses vehicles with a (minimum) floor height of 350 mm and with ramp access available at the centre door.

Light rail or light rapid transit represents a half-way house between tram and traditional heavy rail. It is normally built to the same gauge as heavy rail but with lighter vehicles and relatively much more frequent stops. The majority of these systems are comparatively recent and generally provide good levels of access for all disabled people including wheelchair users. As they are usually built with dedicated infrastructure (boarding platforms) there is no reason why they should not permit direct access for wheelchair passengers without the need to use a ramp.

Aside from the question of access, other requirements for the design of trams and light rail are really similar to those for buses: adequate gangway widths, space allocated for wheelchair passengers, colour contrasted handrails and step edges, audible and visual information and so on.

The requirement needed by some tram and light rail vehicles (and some buses) is a press-button on the outside of the vehicle, which when pressed opens the doors. This should be placed at 90 mm from platform height, raised from the surrounding area and should be illuminated. It should be big enough to be pressed by the palm (i.e. about 20 mm diameter).

As trams have a longer operational life than buses, it may be worthwhile considering modifying existing high-floor vehicles with a central low-floor section. This has been done in several places in Germany (including Nuremberg, Mülheim and Cottbus), giving vehicles a low-floor proportion of 15 to 30 per cent, so that disabled passengers can board and alight at least through one door. Another way of achieving access more quickly is to construct low-floor trams which can be coupled to non-convertible power cars, as is being done in Berlin.

4.4 HEAVY RAIL

Many of the design requirements for heavy rail are similar to those for light rail, but because some journeys made on heavy rail will be long, there are some additional requirements.

Perhaps the most important of these, aside of course from providing adequate space in carriages for wheelchair passengers, are accessible toilets.

These should be located close to the wheelchair position (and to any priority seating) and should be designed for ease of use by all disabled passengers.

Thought should be given not just to the interior layout and facilities, but also to the approach to the toilet, making sure that there is sufficient space for a wheelchair to manoeuvre to and into the toilet. The Helios report noted that the accessible toilets on Austrian inter-city trains were a little difficult for a wheelchair user to negotiate because of a narrow corridor (1 080 mm) and poorly positioned seating in the approach area to the toilet.

There are various ways of designing the layout of an accessible toilet, but the following⁴ items and standards should be followed:

- the doorway into the toilet cubicle should be at least 900 mm wide;
- there should be sufficient space inside for a wheelchair to be positioned in front of the lavatory or to one side of it so that it is possible for a disabled person to move from wheelchair to the lavatory seat from the front or the side;
- the surface of the lavatory seat when lowered should be not less than 475 mm and not more than 485 mm above floor level;
- the toilet cubicle should have facilities to enable a person in a wheelchair to wash and dry his hands without moving from the seat of the lavatory;
- there should be two control devices to enable a disabled person to communicate in an emergency with train staff, one placed no more than 450 mm above the floor, the other placed between 800 and 1 200 mm above the floor;
- there must be adequate hand holds and hand rails, including a hinged handrail at the side of the lavatory where the wheelchair space is.

Further information on access to rail services is contained in the proceedings of the COST 335 Seminar (referenced earlier) which includes a section on rail rolling stock design.

Many countries have set national standards for access to their rail services and related infrastructure. A good example of this is the Dutch Standard Station Complex Accessibility which sets out in considerable detail the design requirements that should be met to give disabled people access to rail services. The corollary to this is that disabled people need to be made aware of the improvements – see Section 1.5.

4.5 AIRCRAFT

Travel by air has increased more than any other form of public transport and seems likely to continue to do so. It is important therefore to ensure that disabled people are able to use aircraft.

The European Civil Aviation Conference (ECAC) has made recommendations concerning fittings within new-build aircraft to serve the needs of disabled people⁵:

- all aircraft with 60 seats or more must carry an on-board wheelchair;
- in aircraft with 30 or more seats, at least 50 per cent of all aisle seats have to be equipped with moveable arm rests in order to make them accessible for people with reduced mobility;
- wide-bodied aircraft with more than one aisle must be equipped with at least one spacious lavatory for the special needs of people with reduced mobility;
- aircraft with 100 or more seats must be equipped in a way that at least one foldable wheelchair can be stowed inside the passenger cabin;
- aircraft with 60 or more seats with a special lavatory for people with reduced mobility must carry one on-board wheelchair all the time;
- aircraft with 60 or more seats not yet equipped with a lavatory for people with reduced mobility have to carry an on-board wheelchair when such a passenger applies for it at least 48 hours before departure.

These requirements are very similar to those adopted under the US Air Carrier Access Act, 1989 and the regulations set out in the Canadian Code of Practice (1997).

It should also be noted that many other design requirements on aircraft are no different to those that apply to other vehicles. Thus floor surfaces should be glare-free and slip-resistant, handrails on integrated boarding stairs should be sturdy, rounded and slip-resistant as should grab rails in toilets.

The air carrier should also provide large print and Braille supplemental passenger briefing cards on an aircraft that includes a recommendation that passengers make sure they receive a personal briefing. Where a video film is used for safety or information purposes, it should include signing for passengers with impaired hearing.

Photo S: Specially designed wheelchairs can be used to assist passengers on vehicles with narrow gangways, including aircraft



Source: Courtesy of the Canadian Transportation Agency.

4.6 FERRIES AND SHIPS

Ferries and ships operating on inland waterways are an important link in the travel chain in some countries. Many vessels are large enough to have the facilities such as toilets, restaurants, etc. found at land-based transport terminals, and these facilities should be accessible to all passengers including wheelchair users. Where vessels operate in tidal waters care should be taken to ensure that slopes on access gangways do not become too steep for wheelchair users as tides ebb and flow. The gangways should wherever possible conform with the general requirements for ramps, as described in Section 3.1.

For the purpose of safety, new passenger ships should be designed in such a way that there is barrier free passage for elderly and disabled people in public areas on board and in escape routes to muster stations.

The International Maritime Organisation (IMO) has produced recommendations on the design and operation of passenger ships to meet the needs of elderly and disabled passengers. Many of the requirements are similar to those found in other transport systems, including wheelchair-accessible toilets and cabins, clear signage, slip-resistant surfaces, etc. Where vehicles are carried, the IMO recommends that there should be barrier free access from the parking area to the passenger facilities, which will often require an elevator. The IMO also recommends that at least one place per 100 passengers carried should be reserved for a wheelchair user who wishes to travel in his wheelchair, and that four per cent of the ship's passenger seats should be suitable for disabled people.

Ferries and other ships, like heavy rail rolling stock, have a long life: 30 or more years. So it is important to ensure that their design is good. A number of countries have made considerable progress in improving access to and on maritime vessels. In Germany, for example, ship operators have voluntarily taken into account the needs of disabled passengers including the provision of lifts between decks and fully accessible toilets.

Norway has been developing and improving access on its ferries for more than 20 years. Since 1975 all larger vessels (with a capacity of 75 car units or more) have been built with lifts, accessible toilets and designated car parking spaces near the lifts. It is recognised that it is not practical or economically viable to require full access on smaller ferries, but at least accessible toilets can be located close to the deck area assigned for disabled passengers.

NOTES

1. COST 322, Low Floor Buses, Brussels (1995).
2. "Evaluation of Technology and Department Alternatives for Providing Regularly Scheduled Intercity Bus Service to Mobility Impaired Travellers" Nathan Associates Inc (November 1997).
3. The Government's Proposals for Taxis, Department of the Environment, Transport and the Regions, London (1997).
4. Based on the Disabled Persons Transport Advisory Committee's Rail Working Group recommendations (1998).
5. "Access to Air Travel for People with Reduced Mobility" European Conference of Ministers of Transport, Paris, France (1995).

NEW AND INNOVATIVE TRANSPORT SERVICES

Even when all modes of public transport are fully accessible there will still be a need for special services designed specifically with the requirements of disabled people in mind. It is quite likely that as mainstream public transport becomes more accessible many of the people who at present have no option but to use special services will switch, at least for some of their trips, to mainstream services.

This is to be encouraged, both on grounds of equality of opportunity but also on cost grounds since special services are almost always much more expensive to operate per passenger carried than mainstream transport. However, for some disabled people on some occasions – and for more severely disabled people – most of the time, the extra care that can be provided by special services will remain essential.

The variety of special services is almost infinite, but they can be categorised to some extent.

5.1 DEMAND-RESPONSIVE: INDIVIDUAL TRANSPORT

This is the group of services that provide transport for an individual (plus companion) door-to-door. They fall into two categories; voluntary car schemes and accessible taxi (or “Taxicard”) schemes.

Voluntary car schemes, in which the passenger is carried in the volunteer’s own car are quite widely used for taking people to out-patient treatment at hospitals. The volunteer will usually be paid a mileage allowance to cover running costs of the vehicle, while the service is free to the user. Such services can be very useful in rural areas where conventional modes of transport, accessible or otherwise, may be thin on the ground. These services, since they rely on the cars owned by volunteers are not appropriate for wheelchair users who cannot transfer from their chair to a car seat, though quite a lot of wheelchair users can transfer and so use ordinary cars.

Some community transport services (see 5.3) also provide a car service with a vehicle adapted to carry a passenger in his wheelchair.

Accessible taxis can, of course, be used by any disabled person provided they can afford the fare. That, for many disabled people, is the problem: the fares are more than they can afford. To help overcome this problem various schemes have been introduced to make taxis available to disabled people at a heavily subsidised rate.

This type of service is frequently found in Scandinavian countries especially Sweden and in the UK, where the largest is the London Taxicard scheme. To be fully effective the service must be provided by fully accessible taxis. In the UK this is normally done with the accessible purpose built (“London”) cabs, elsewhere multi-purpose vehicles or minibus taxis are used. It doesn’t really matter much what type of vehicle is used as long as it *is* accessible and, most importantly that the taxi driver has had disability awareness training.

Providing a service of this kind can be expensive for the funding authority (local and/or central government) so it is important to try and ensure that the people using it really do need it. Some form of eligibility criteria should be used and even then it is very likely that an upper limit on the number of trips any one individual can make over a given time will have to be imposed.

Having said that, there is some evidence to suggest that an accessible taxi-based service for disabled people can be more cost-effective than a shared-ride demand-responsive minibus service (see 5.2). In planning and developing these types of service, it would be prudent to consider all the forms and systems; the most effective, in terms of both use of resources and delivery of a good level of service to the individual, may be found by a combination of services rather than just one.

5.2 DEMAND-RESPONSIVE: SHARED TRANSPORT

Often known as dial-a-ride or dial-a-bus, this service also provides door-to-door service, using minibuses which should be equipped to carry passengers in wheelchairs. They are booked in the way that taxis are – by telephone – or possibly by regular (“standing”) order and the theory is that the control office of

the service will be able to organise the requests for trips in such a way that more than one individual is carried at the same time. This shared ride concept, if it could be achieved, would reduce the cost per passenger carried, in theory to less than the cost of an equivalent taxi journey.

In practice this often does not happen, with the result that the cost per passenger trip is higher than the equivalent taxi trip. However, taxi drivers cannot be expected to exercise the level of special care and assistance needed by some disabled people. Dial-a-Ride drivers will not only assist passengers from their door to the vehicle, but may also help them to finish dressing. They may, as for example in Copenhagen, carry special equipment to enable a wheelchair passenger to negotiate a flight of stairs. It is this level of necessary extra care which, as accessible taxis become more commonplace, should be used to determine whether Dial-a-Ride is appropriate, and if so who should be eligible to use it.

5.3 COMMUNITY TRANSPORT AND SHARED TRANSPORT SERVICES

This is the category of services, again usually using lift-equipped minibuses, which provide collective transport for disabled people. They will provide a service from an individual's home to a facility such as a day centre or luncheon club or to an accessible town centre for shopping. The essential difference between these services and the ones described in Section 5.2 is that they do not cater for individual requests for a journey, but take individuals to a collective or joint activity.

Community transport services are usually funded, at least in part, by local government and are available for use by a wide range of people, not just disabled or elderly. It is their general availability which distinguishes them from the host of transport services provided by disability associations for the use of their own members.

Although these services are specific in the sense that they are provided by and for the members of a specific association, they nevertheless represent a transport resource which may not always be used in the most effective way. When considering the planning and provision of special services, it is always sensible to include these "disability association" services in the planning process.

5.4 VARIATIONS ON A THEME

Between the special services, of the types described above, and mainstream public transport services there is scope for services which, while not being exclusively designed for disabled people, nonetheless offer a level of service beyond that normally associated with conventional public transport.

Probably the most widely-known example of this is the Swedish Service Bus system, but there are other examples such as London Transport's Mobility Bus. The attributes of this class of service can be summarised as:

- use a fully accessible buses, medium or full-size;
- time tabling of the service which allows more time at stops than on a conventional service;
- routeing of the service which is planned to serve places where there will be numbers of disabled passengers – residential homes, clinics, daycentres, etc.;
- flexible pick-up / set down points – hail stop where appropriate and possibly a degree of route diversion;
- well trained drivers (and other staff).

It is possible that the role of this kind of service will diminish as more of the mainstream services become fully accessible, but it is probable that in some areas and at some times they will remain as a useful means of providing a better level of service to disabled passengers than can be achieved by conventional means. Certainly there is evidence, *vide* a recent study of six towns with Service Routes in Finland, that these services improve the mobility of many disabled people.

The other aspect of special services is their integration into mainstream transport. The Mobinet system in the Dutch town of Voorst is an example, with wheelchair accessible minivans acting as shuttles to regular public transport services. Door-to-door service is available to anyone who wants it, but people who are not disabled pay a premium fare for it.

5.5 OTHER INNOVATIVE SERVICES

There are other ways in which transport can be provided in an unconventional manner, some of which are of value to disabled people. Examples include the taxitrain service which is being operated in the Netherlands

Photo T: Swedish service bus routes provide flexible, accessible services close to people's homes



Source: Omninova Technologies AB, Sweden.

and in Sweden, and the use of taxis as a replacement for buses on the outer parts of bus routes during evenings (as in Germany). Taxi bus systems – using a minibus or multi-purpose vehicle as a shared ride taxi – may be an effective way of providing service in low density rural areas.

In the District du Pays de Saint-Brieuc, a system known as “Taxitub” has been introduced¹. Known as a “virtual” transport system, Taxitub serves 14 communes in Saint-Brieuc, with vehicles sent out in response to telephone calls for service which can be made anything from ten days to 45 minutes ahead of the required journey time. If no requests are received for a particular journey, then that journey is not made.

No doubt there are other innovative schemes in operation in Europe. The point is that when considering the development of special services, planners should be aware of, and take due account of, the range of systems that are there.

In the section on the Road and Pedestrian Environment (Section 2) the development of pedestrianized areas in town centres was mentioned. The walking distances in these areas can be substantial, certainly more than can easily be accomplished by ambulant disabled people.

The Praxitele system² which uses small self-drive or automatically controlled electric cars offers one possible solution to this problem. Another system, quite widely used in the UK, is the Shopmobility scheme, which provides powered wheelchairs or manual wheelchairs with a pusher for use by ambulant disabled people who cannot walk very far.

Yet another innovative system is the electric buggy service operated in Woking town centre by the local Community Transport department of the borough council³. This is designed to help people who can walk a reasonable distance, but who still find it difficult to walk across the whole town centre. This system is rather similar in some ways to the electric buggy service provided at some of the larger airports. The vehicles used for these services, which are either derivatives of electric golf buggies or of small industrial vehicles, are not ideal for use by disabled people, but the principle of the service is a good one.

Innovation is not limited to the services themselves but also applies to the ways in which services are used. One current development which could be of considerable benefit to disabled people is the contactless smart card used for payment of fares on public transport. In the longer term this type of card could be used for payment of car parking and road toll charges and perhaps for other purposes.

NOTES

1. See “*Taxitub: Définition, contenu, Coûts et répercussions*” by François Josse, pp 238-242, proceedings of the Conference of the International Association of Transport Regulators, Strasbourg (October 1996).
2. Parent, M. and Fouconnier, S., “Design of an electric vehicle specific for urban transport” INRIA, Le Chesney, France (1995).
3. Oxley, P.R. and Alexander, J., “Electric Buggies – Concluding Report” Cranfield University (1996).

PRIVATE CARS

Most of this guide is concerned with public transport but, no matter how much some politicians might wish it, the private car is and will remain a major element in the personal mobility of disabled people. As was said in the introduction to this paper, disability is related to age and the sector of the population that has the most rapidly growing car ownership is that of retirement age.

It is not the purpose of this publication to describe how cars can or should be adapted to meet the needs of elderly and disabled people. Important though that is, it is a subject for another and different report. From the point of view of this publication there are two aspects which should be considered: advice and guidance for disabled people who wish to travel in cars either as driver or passenger, and, sensible provision for disabled car users while travelling and at their destinations.

6.1 ADVICE AND GUIDANCE

The onset of disability whether traumatic or gradual can change the ability of an individual not just to drive a car but to even get in and out of one as a passenger. A few disabilities – epilepsy is the most obvious – will, for reasons of safety, prevent an individual from driving, but in the majority of cases a disability prevents driving a conventional car but certainly need not prevent driving a suitably adapted car. The key word is “suitably” and it means not just appropriate in the sense that the individual can use the controls to drive the vehicle but also that the controls themselves are well and safely designed.

The range of disabilities, and therefore of abilities, is wide and so too is the range of adaptations to car controls to meet the needs of people with impaired functions. The only sensible way to approach this is to make assessment and advice available to all who need it. CARAin Belgium was one of the first places to offer this type of service, to advise people whether they could drive safely and, if so, what type of adaptations they would need both to get into and out of the car

Photo U: Even small cars can be adapted for use by disabled people, including wheelchair users



Source: Courtesy of Direcção Geral de Transportes Terrestres, Ministério do Equipamento, do Planeamento e da Administração do Território, Portugal.

Photo V: Sophisticated controls now enable many people with severe levels of disability to drive safely and in comfort



Source: Courtesy of the Mobility Advice and Vehicle Information Service (MAVIS), Department of the Environment, Transport and the Regions (DETR), United Kingdom.

and to drive it. Assessment and advice centres have now been established in many European countries, most recently in Greece (the HNIOXOS services) and, with the support of Fiat, in Italy.

It is not possible to provide a blueprint for a successful driving assessment and advice centre within the confines of this publication, but some sources of information on this are included in the References section. In outline, though, a centre should:

- (i) be staffed by experienced and expert driving assessors; medical knowledge may be an advantage in some cases, but is not necessary for dealing with many disabled drivers;
- (ii) the centre should have a good range of vehicles and of adaptations for both primary and secondary controls
- (iii) it should have access to private road space, on which drivers can try out adapted vehicles at no risk to themselves or other road users
- (iv) it should provide advice not just on driving but on a wider range of mobility aids and should be able to give advice on other aspects such as grants that may be available to help with buying a car, where to obtain insurance, etc.
- (v) it should include advice on, and examples of, aids for disabled car passengers.

6.2 TRAVELLING AND ARRIVING

Much of what is needed by disabled people when travelling by car is the same as that needed by every other driver. There has been a substantial increase in recent times in the use of information technology or transport telematics, and this increase will continue. Many of these systems – route guidance, parking aids, sensor systems that detect when a driver is becoming drowsy, emergency alert systems are of particular potential benefit to disabled and elderly drivers, *provided they are properly designed*. How those design standards can be achieved is also a matter for a different report, but there is a considerable and growing body of research on these issues, much of it coming from research supported by DGXIII of the European Commission. There are references to sources for their information in Section 8 of this publication. All that can be said here is that anyone involved in the development of car-based IT systems should take full account of the needs of elderly and disabled car users. As with so much else, the design of a system that meets their needs will meet the needs of everyone else as well.

There are, aside from this issue, two more specific matters that should be taken into account: provision of parking space and access into areas from which private cars are normally excluded.

General standards for parking space were given in Section 2.6, but there is a specific issue relating to pedestrianized areas in town centres. These are growing in popularity and can provide a very pleasant environment for pedestrians, but some are very large in scale. Shopping or other journeys within these areas can involve a considerable amount of walking – some areas may be as much as two or more kilometres end to end. Obviously such distances cause problems for more severely disabled people, so in developing or extending these areas, careful thought should be given to appropriate parking spaces for disabled motorists either immediately on the edge of the pedestrian area if it is a small one, or within the area if it is large.

THE ROLES OF GOVERNMENT

Both central and local government should have responsibilities towards the development of accessible transport and infrastructure. The balance between the two will differ one country from another but in broad terms responsibilities can be apportioned as:

- *Central government:* national laws and regulations defining access in the environment – highways, pedestrian areas, public buildings, commercial and retail premises, etc. These may take the form of town planning regulations or specific laws or decrees. They provide the statutory or mandatory framework within which local and regional authorities carry out their duties and transport operators plan and provide their services.

Central government should also be the source of information and guidance on matters relating to access and mobility for disabled people which, while not considered appropriate for legislation, should be provided to a consistent standard throughout the country. An example might be the design of tactile guidance surfaces for visually impaired people. While there is no legal requirement to provide these it is obviously sensible that wherever they are provided they should be of the same design.

A new and interesting development, initiated by the Netherlands Ministry for Social Affairs, is for a company contracted by the Ministry to organise longer distance (city to city) journeys for disabled people, including ensuring that assistance is provided for the traveller wherever it is needed. The traveller will pay his own fare, but the cost of organising the trip and making assistance available will be borne by the government. This service is intended to help overcome travel problems until such time as public transport services become fully accessible and can be used by disabled people without the need for assistance.

- *Local and regional government:* carry out duties laid on them by central government, where appropriate to enact local regulations and bye laws concerning access and mobility. To monitor the provision of accessible infrastructure and transport services and to ensure that they meet appropriate legal requirements and standards.

In many countries, local authorities have direct control over local public transport services and should therefore be able to influence their

development to the benefit of disabled people. In some countries, most of the local public transport is in private ownership and therefore beyond direct control of local government, but there may be scope for the local authority and local transport operators to enter into “quality partnerships”. In these the two parties jointly undertake to improve the quality of local services – and better access for mobility handicapped people should be an important part of this. An example would be a local authority agreeing to provide raised bus boarders and covered seating at bus stops and the bus operator matching this by introducing low-floor wheelchair accessible buses.

The European Commission also has a role to play. In some areas it has a direct responsibility for matters of concern to disabled people. An example of this is the Directive on special provisions for vehicles used for the carriage of passengers containing more than eight passenger seats. In other areas, even though it may have no regulatory responsibilities the EC can lead by example in the sense of sponsoring research and information exchange (e.g. through COST actions on access to buses and to rail services.)

7.1 TRAINING

Training all staff who come into contact with members of the public in disability awareness is essential. Without this, the best of technical aids to accessibility may fail to fulfil its potential value. Unfortunately, to quote the HELIOS report¹, “the adequacy of training rarely meets the needs of passengers in most Member States and whilst this situation is improving, it urgently needs to be addressed.”

That said, there are some good examples of training. In the Netherlands a project on the improvement of knowledge and perception of staff of public transport companies has been started. A training programme of 3.5 hours has been developed to show the staff what it means to travel with a handicap. Staff members can experience for themselves how disabled people can best be helped. This is done actively, including use of a video and discussions and getting the trainees to go through a course set out with obstacles which they have to negotiate in a wheelchair or as a blind person. The training is given by disabled people with travelling experience.

7.2 SEAMLESS TRAVEL

There is a third and continuing role for government. Much of the advice and information contained in this publication is specific to various aspects of the travel process or to particular modes, but one thing which is very important is to bring all these examples of good practice together. Hardly any journeys just involve using one mode of transport; at the very least a journey is likely to include walking (or wheeling) and a vehicular trip. Longer journeys will probably involve more than one mode of vehicular transport, or at least changes within the same mode: bus to bus or train to train.

Obvious though it may seem, it is worthwhile stressing that any journey is only as good as its weakest link. There should, therefore, be a conscious effort on the part of government, local and central, to ensure that accessible transport services link together. The physical process of making a journey should mirror the “*chaîne signalétique*” approach advocated by COLITRAH² for information; a carefully planned sequence without breaks or interruptions.

Until comparatively recently such an approach would have seemed unrealistic, even irrelevant, because so much needed to be done to make any single link in the transport chain accessible. This is changing, rapidly so in some countries, but the full value of accessible links will not be realised unless journeys are considered as a whole, rather than as a series of discrete movements.

To achieve this continuous accessible transport will require the continued collaboration of government (central and local), vehicle manufacturers, operators and disability organisations. In other words the physical chain of accessible transport has to be paralleled by an administrative chain.

In further developing their policies for improving access to all modes of transport, government should not lose sight of the over-arching need to provide seamless transport for disabled travellers, and to achieve it by a combination of appropriate regulations and encouragement for collaboration between all the organisations concerned.

NOTES

1. “The Design and Operation of Accessible Public Transport Systems” (p 74).
2. See Section 1.2.

ANNEX 1

Action plan agreed at conclusion of the seminar “All aboard: making the case for accessible buses” held in Liverpool, May 1998

A seminar on this subject, organised by the ECMT and the UK Department of the Environment, Transport and the Regions, was held in Liverpool in May 1998.

At the conclusion of the seminar, the following Action Plan was agreed:

- (a) vehicles and the associated infrastructure must be considered at the same time – the concept of “accessible bus/coach systems”. Mandatory requirements for the infrastructure might be considered. But much can be achieved where operators and local authorities work together to realise the full benefits of accessible transport.
- (b) traffic management systems, giving priority to buses, will help to realise both the access benefits and the return on investments. Such systems also fit with the environmental concerns of Member States and the EC.
- (c) strict enforcement of no parking rules at bus stops and on pavements is crucial. Stronger punishments are required, supported by education of other road users, to raise awareness of these anti-social practices.
- (d) the question of which boarding aids are most effective is not yet resolved. Practical operating experiences need to be exchanged and, where necessary, further research carried out to identify practicable and workable solutions.
- (e) more effort needs to be made to tackle the accessibility of small buses and high floor coaches; to find solutions which are both technically and economically viable.
- (f) targeting existing subsidies both for vehicles and for transport infrastructure to reflect the need to take account of disabled people can contribute to solving the financing problems.
- (g) taking forward the concept of the “accessible transport chain” by developing new forms of mixed services – combining mainstream

bus/coach services with door to door and other innovative services, including taxis and paratransit services.

- (h) consideration needs to be given not only to urban areas, but also to rural areas which are generally more poorly served by public transport.
- (i) accessibility should be seen as part of agreed “quality charters” for public transport. Recognising that making public transport more attractive is likely to increase patronage.

In addition, new partnerships are needed between the main players – Governments (European and national), the bus industry – operators and manufacturers and disabled people.

Such partnerships need not have a statutory basis. They simply require a willingness on the part of all concerned to work together towards a common goal of accessibility which reflects the aspirations of disabled people – both those who are physically disabled and sensory impaired, the operational requirements of industry and the political objectives of Governments.

This could usefully include the development of travel training packages for disabled people, as well as disability awareness training for all levels of personal within transport companies, but particularly for drivers and “front line” customer care staff.

Partnerships could also facilitate the provision of information to disabled people about new vehicles and systems. Knowledge of new developments is essential if disabled people are to have the confidence to use them. All information provided must be accessible to all disabled people including those with sensory impairments.

In this respect:

- the EC Directive on construction standards for buses and coaches, in pursuing a common goal of accessibility, needs to offer flexibility which recognises the different starting points across member states whilst clearly legislating for what is practical and achievable.
- the UITP should be invited to review their existing formal position on accessibility with a view to bringing it more into line with current thinking and policies on social inclusion.
- the EC should target their support for Central and Eastern European transport projects which reflect the needs of disabled people for improved accessibility.

ANNEX 2

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REFERENCES AND FURTHER READING

1. Information

“Cahiers des charges pour la mise en place d’une information multimodale des voyageurs en région Ile-de-France”, Syndicat des Transports Parisiens (STP), Paris, France (1991).

“Transport for people with mobility handicaps: information and communication” European Conference of Ministers of Transport, Paris, France (1991).

“Signage for pedestrians using public transport interchanges and terminals: a review of existing research and guidelines”. Philip Barham and Philip Oxley. Report for the South Yorkshire Passenger Transport Executive. Available from Cranfield Centre for Logistics and Transportation, Cranfield University, Bedford MK43 0AL, UK (January 1992).

“The Development of Ergonomic Guidelines for Electronic Customer Information Systems”. Prepared by Katherine Hunter-Zaworski and Dean Watts, Transportation Research Institute, Oregon State University, for the Federal Transit Administration, US Department of Transportation, Washington, DC, USA. Available from NTIS, 5285 Port Royal Road, Springfield, VA 22161, USA (December 1994).

“Improving Transportation Information: Design Guidelines for Making Travel More Accessible” Tom Geehan, TransVision Consultants Ltd, for Transportation Development Centre, 800 René Lévesque Boulevard West, Montreal, Quebec H3B 1X9 Canada (October 1996).

“Draft Ergonomic Guidelines for Accessible Information Systems” Transportation Research Institute, Oregon State University, Corvallis, Oregon, 97331-4303, USA (February 1997).

“Access Prohibited? Information for Designers of Public Access Terminals” John Gill, Royal National Institute for the Blind, 224 Great Portland Street, London, UK (May 1997).

Information on design guidelines for new information technologies, including use of the Internet, can be obtained from the QUARTET PLUS project. Contact point, Mats Börjesson, Transportidé, Kålkvägen 10, 756 47 Uppsala, Sweden.

2. Road and Pedestrian Environment

- “*Aménagements de voirie en faveur des personnes à mobilité réduite*”. Fiche Technique 08, Ministère de l’urbanisme du logement et des transports (October 1985).
- “Audible and tactile signals at pelican crossings” Traffic Advisory Leaflet 4/91, Department of the Environment, Transport and the Regions, Great Minster House, 76 Marsham Street, London, SW1P 4DR, UK (November 1991).
- “Audible and tactile signals at signal controlled junctions” Traffic Advisory Leaflet 5/91, (available as above) (December 1991).
- “Guidance on the use of tactile paving surfaces” Department of the Environment, Transport and the Regions and The Scottish Office (available as above) (September 1997).
- “Revised Guidelines for: Reducing Mobility Handicaps, Towards a Barrier-Free Environment”. The Institution of Highways and Transportation, 3 Lygon Place, Ebury Street, London SW1W 0JS, UK (1991).
- “Accessibility of the built environment: The way ahead” Thematic Group No 2, Helios 11 Programme (Danish Building Research Institute, PO Box 119, DK-2970, Hørsholm, Denmark) (1996).

3. Transport Infrastructure

- “Manual-traffic provisions for people with a handicap” Ministry of Transport and Public Works, The Hague, The Netherlands (1986).
- “Streets for Everybody” Swedish Association of Local Authorities, S-118 82 Stockholm (1993).
- “Design guidelines for public transport infrastructure - Technical Report “ Philip Barham, Philip Oxley, Tony Shaw and Christine Gallon, TRL project Report 83, Transport Research Laboratory, Crowthorne, Berks, RG45 6AU, UK (1994).
- “Automatic service machines. Service for everybody?” The National Swedish Board for Consumer Policies and The Swedish Handicap Institute, Vällingby, Sweden (1995).
- “Building Sight” A handbook of building and interior design solutions to include the needs of visually impaired people. Royal National Institute for the Blind, 224 Great Portland Street, London W1N 6AA, UK (1995).

- “Cahiers de reference ; pour l’implantation d’un point d’arrêt bus en Ile-de-France”*. Syndicat des Transports Parisiens, (STP), Paris, France (1996).
- “Making railway stations accessible” Philip Oxley, Christine Gallon and Andrew Fowkes, TRL Report 199, Transport Research Laboratory, Crowthorne, Berks, RG45 6AU, UK (1996).
- “Des bâtiments publics pour tous”*. Ministère de l’Equipeement, du Logement, des Transport et du Tourisme, La Grand Arche, Paroi Sud, 92055 La Defence Cedex, France (April 1997).
- “Passenger’s accessibility of heavy rail systems.” Proceedings of the Seminar, COST 335, Brussels (October 1997).
- “Principles for travel centre design.” Ministry of Transport and Communications Finland, Helsinki, Finland (1997).
- “Bus Stops A Design Guide for Improved Quality.” Prepared by The Bus Priority Working Group, Translink and the Department of the Environment for Northern Ireland, Belfast (1997).
- “NS-norm Toegankelijkheid Stationscomplex”* NS Railinfrabeheer Utrecht, Netherlands (1997).

4. Vehicle Design Guidelines

a) Air

- “Access to Air Travel for People with Reduced Mobility” European Conference of Ministers of Transport, Paris, France (1995).
- “Code of Practice Air Accessibility for Persons with Disabilities” Canadian Transportation Agency, Ottawa, Canada K1A 0N9 (January 1997).
- “Communication Barriers” (Barriers to Communication Facing Persons with Disabilities Who Travel by Air) Canadian Transportation Agency, Ottawa, Canada K1A 0N9 (1997).

b) Buses and coaches

- “Access to Coaches” European Conference of Ministers of Transport, Paris, France (1990).
- COST 322: Low floor buses, Final report of the action. Directorate-General for Transport, European Commission, Brussels, Belgium (1995).

“Disability Discrimination Act: The Government’s Proposals for Buses and Coaches”. Department of the Environment, Transport and the Regions, Great Minster House, 76 Marsham Street, London, SW1P 4DR, UK (December 1997).

“Recommended specification for higher floor vehicles used on longer distance scheduled services features to help disabled and elderly passengers” Disabled Persons Transport Advisory Committee, London (draft, 1998).

c) Taxis

“Access to Taxis” European Conference of Ministers of Transport, Paris, France (1992).

“Accessible Taxi for People with Reduced Mobility, Technical Requirements” C.E.A.P.A.T., Spain.

“Disability Discrimination Act: The Government’s Proposals for Taxis.” Department of the Environment, Transport and the Regions, Great Minster House, 76 Marsham Street, London, SW1P 4DR, UK (July 1997).

d) Rail

“Passengers’ accessibility of heavy rail systems” Proceedings of the Seminar, COST 335, Brussels October (1997).

“The Rail Vehicle Accessibility Regulations 1998” Department of the Environment, Transport and the Regions, London (1998).

6. Private Cars

“*Richtlinien für Rastanlagen an Straßen*” Forschungsgesellschaft für Straßen und Verkehrswesen e.V., Konrad Adenauer-St 13, D 50996, Köln, Germany (1981).

“Transport for disabled people: disabled people and cars” European Conference of Ministers of Transport, Paris, France (1989).

“*Empfehlungen zur flächenhaften Verkehrsberutigung städtischer Teilgebiete in den neuen Bundesländern*” Bundesministerium für Verkehr, Referat A22, Robert Schuman Platz 1, D-53175, Bonn, Germany (1994).

“Setting the Pace”. Proceedings of the 8th International Conference on Transport and Mobility for Elderly and Disabled People, Perth, W. Australia (1998). The proceedings include a number of papers dealing with different aspects of driving and car use by disabled people.

“Mobility for Everybody” Autonomy Mobility Program, Fiat S.p.a.,
Via Nizza 250, 10126 Torino, Italy (1998).

7. Policy Framework

“International Coordination and Standardisation of Measures and Policies to promote Mobility.” European Conference of Ministers of Transport, Paris, France (1987).

“Transport for People with Mobility Handicaps: Policy and Achievements in Europe” European Conference of Ministers of Transport, Paris, France (1991).

And if all else fails:

“Accessibility Complaint Guide” Canadian Transportation Agency Ottawa, ON K1A 0N9, Canada (July 1996).

8. General and Multi-modal

“Transport for people with mobility handicaps: policy and achievements in Europe” European Conference of Ministers of Transport, Paris, France (1991).

“*Bergerfreundliche und behindertengerechte Gestaltung des Strassenraums*” Bundesministerium für Verkehr, Referat A22, Robert Schuman Platz 1, D-53175 Bonn, Germany (1992).

“Construction adaptée aux personnes handicapées” Norm SN 521 500, Office Fédéral des Transports, 3003 Berne, Switzerland (1993).

“The Design and Operation of Accessible Public Transport Systems” Thematic Group 8, Helios 11 programme (November 1996).

“Technological Developments to meet the Needs and Requirements of Sensory and Cognitively Impaired Travellers” Goss Gilroy Inc. for Transportation Development Centre, 800 René Lévesque Boulevard West, Montreal, Quebec H3B 1X9 Canada (1997).

“*oud <=> nieuw*” *ouderen als uitgangspunt voor innovatief ontwerpen* (the elderly as a starting point for innovative designs). Netherlands Design Institute, Amsterdam, Netherlands (March 1998).

“Mobility for All, Accessible Transportation Around the World” Access Exchange International, San Francisco, USA (1998).

“TELSCAN” European Commission supported project, co-ordinated by A Naniopoulos, University of Thessaloniki, Greece. Has produced a number of reports on different aspects of travel and travel information for disabled and elderly people. Information on the project and the design guidelines it has produced is available on <http://hermes.civil.auth.gr/telscan/telsc.html>.

“Making Transportation Accessible” Transportation Development Centre, 800 René Lévesque Boulevard West, Montreal, Quebec H3B 1X9 Canada (1998).

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