

CRITICISM OF POSSIBILITY OF TRAVELING BY BUS BY DISABLED PERSON USING WHEELCHAIR

Krzysztof Olejnik
Grzegorz Woźniak

*Motor Transport Institute
Jagiellońska Street 80, 03-301 Warsaw, Poland
e-mail: krzysztof.olejnk@its.waw.pl
e-mail: grzegorz.wozniak@its.waw.pl*

Abstract

The European Parliament and the European Council in directive 2001/85 EC of 20 November 2001 decided to reach out the necessity of disabled people using wheelchairs. Solutions that have been proposed are equitable but they exact from constructors to invent new technical devices. In this report have been assessed law regulations relating to provide structural requirements facilitating disabled people using wheelchairs to get in as well as to get out of the bus. Particularly we have assessed mentioned problem taking into consideration new-produced small busses, in which the floor is situated relatively high up off the road. The restrictions relating to comply the law recommendations being in force have been criticized. We shall among others permanently updating our national legislation in order to adapt it to requirements enclosed in appropriate directives issued by EU authorities. The life of disabled people in society is full of problems with locomotion. We have proposed the new structural solution supporting disabled people to get in and to get out of the bus. The functional tests have been made on physically prepared mechanism and positive results have been achieved. The bus with a new solution has a big chance to receive a type approval certificate as well as to be accustomed into mass production. This vehicles are the most common one in use to transport disabled people on a short distances. From economical point of view for transport operators as well as for bus owners such solutions are unfavorable.

Keywords: *disabled person on wheelchair, getting in and getting out of the bus*

1. Introduction

Everyday life of disabled people in society is full of problems with locomotion. Despite of many of law provisions there are still a lot of architecture as well as communication obstacles. Treaty establishing the European Community (OJ 2004, No. 90 item 864/31) in article 13 stipulates: „Without prejudice to the other provisions of this Treaty and within the limits of the powers conferred by it upon the Community, the Council, acting unanimously on a proposal from the Commission and after consulting the European Parliament, may take appropriate action to combat discrimination based on sex, racial or ethnic origin, religion or belief, disability, age or sexual orientation.”

The Constitution of the Republic of Poland of 2 April 1997 (OJ 1997, No. 78, item 483 with amendments) grants as follows: „Public authorities shall provide, in accordance with statute, aid to disabled person to ensure their subsistence, adaptation to work and social communication.” There is also written in the Charta Rights of Disabled People „right of disabled people to among others to live in environment free of functional obstacles, free of movements and right of wide-spread using of transport services”. In the law of 15 November 1984 the Transportation Law (OJ 2000, No. 50 item 601) article 14 section 2 stipulates: „Entrepreneurs shall take appropriate actions in order to facilitate disabled people, including people using wheelchairs, to use motor vehicles, check in points, bus stops and platforms.”

Poland is one of 27 European Union member states since 1 May 2004. It means that we shall among others permanently updating our national legislation in order to adapt it to requirements

enclosed in appropriate directives issued by EU authorities. Mentioned directives concern different areas of life including requirements relating to bus constructions. Directive 2001/85/EC of 20 November 2001 relate to procedure of issuing type approval certificates for busses in EU member states. This directive in details describes requirements that shall be fulfilled by bus in order to receive type approval certificate as well as to be licensed to traffic operation.

Requirements included in this directive are relating to different part of bus constructions such as for example:

- dimensions of passengers seats and seat spacing,
- the free space above passengers heads,
- the stability of the vehicle,
- using fireproof materials, the way of disposing fire extinguishers and first aid kits,
- the width of entrance door as well as the width of gangways between rows of seats, the height of entrance staircase,
- the number of emergency exits,
- the number and arrangements of passengers seats, handrails and handholds as well as the color of them,
- the maximum permissible floor slope, the height of disposing push-buttons,
- the strength of vehicles bodywork structure,
- devices facilitate disabled people using buses.

The most remarkable thing is passengers' space, particularly its availability for disabled people. The directive regulations concerning requirements relating to facility getting in and getting out disabled people of the bus stipulates as follows:

- „The lift platform shall not be less than 800 mm wide and not be less than 1200 mm long and shall be capable of operating when carrying a mass of at least 300 kg.”
- „The ramp shall be at least 800 mm wide. The slope of the ramp, when extended or folded out on to a kerb of 150 mm in height, should not exceed 12%. A kneeling system may be used to achieve this test. Any ramp which when ready for use exceeds 1200 mm in length shall be fitted with a device to prevent the wheelchair rolling off the sides” [1].

In busses with big categories M3 the solution that facilitates getting in and getting out of the bus for disabled people is among others a kneeling system of the vehicle. The control that initiates the lowering or raising of any part or the whole of the bodywork relative to the road surface is clearly identified and is under the direct control of the driver. Another solutions using mostly in big busses in urban services is the ramp. The ramp shall be at least 800 mm wide. The slope of the ramp, when extended or folded out on to a kerb of 150 mm in height, should not exceed 12%. If the length of the ramp exceeds 1200 mm it ought to be fitted with a device to prevent the wheelchair rolling off the sides.



Fig. 1. The lift in raised and lowered position

Above mentioned technical solutions facilitating everyday life, locomotion and functioning in society disabled people using wheelchairs do not have big influence on the bus as well as its technical exploitations. Busses category M3 are the one with big measurements and have possibility to equip them with additional devices with no influence on passengers space as well as on number of transporting people. The different situation is in small busses such as M₁ and M₂ category, particularly when its maximum total mass do not exceed 5000 kg. Each additional device makes that the number of passengers ought to be lower. The next constructive barrier is the floor situated relatively high up off the road. One of the solution that can avoid such disadvantage is using the lift. Using lift's platform has got both - its advantages and its disadvantages. On the one hand it facilitates disabled people getting in and getting out of the bus, but on the other hand the big total mass of the lift makes lower the number of transporting passengers. Additional disadvantage is multiple lift situated in the passengers space, as showed on the Fig. 1. The solution for this can be the ramp. In Directive 2001/85 there is clearly stipulated that the ramp shall be at least 800 mm wide. The slope of the ramp, when extended or folded out on to a kerb of 150 mm in height, should not exceed 12%. In order to fulfill mentioned requirements - particularly the slope of the ramp - in vehicles that for the technical reasons the floor is situated relatively high up off the road the outside ramp wings have to be enough long.

This can be some kind of impediment not only for disabled person but also for the ramp operator. So to raise and lower very long outside ramp wings can be inconvenient. What's more the ramp itself can be troublesome in safety transporting and disposing it in the vehicle. The outside ramp wings ought to be enough long and the slope of angle enough small in order to make disabled people possible to get in to the bus using only their muscles power.

2. Trying to solve the problem with transporting services for disabled people

Motor Transport Institute in cooperation with the Polish company AMZ - KUTNO (that is producer small couches buses especially for disabled people) have prepared a new technical solution. For mentioned reason the electric winch has been used, as showed on the Fig. 2.



Fig. 2. The outlook and way of using bus- bars and winch in the bus

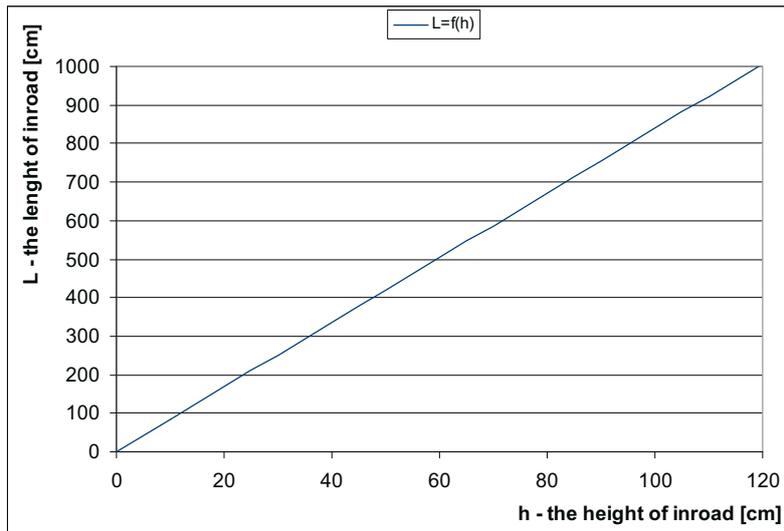


Fig. 3. The length of inroad in the function the height of vehicles floor form the ground $L=f(h)$ for the slope of ramp ($\Delta=12\%$; $\alpha=6^{\circ}51'$)

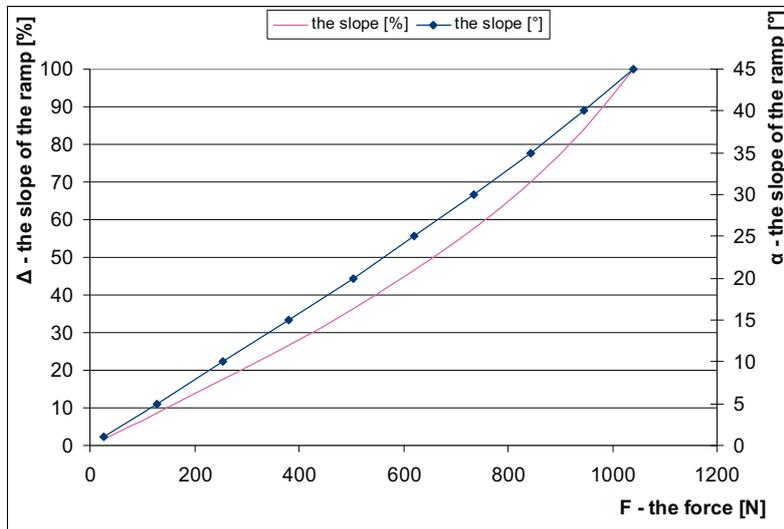


Fig. 4. The force of winch depending no the slope of the ramp for $m=150$ kg winching mass

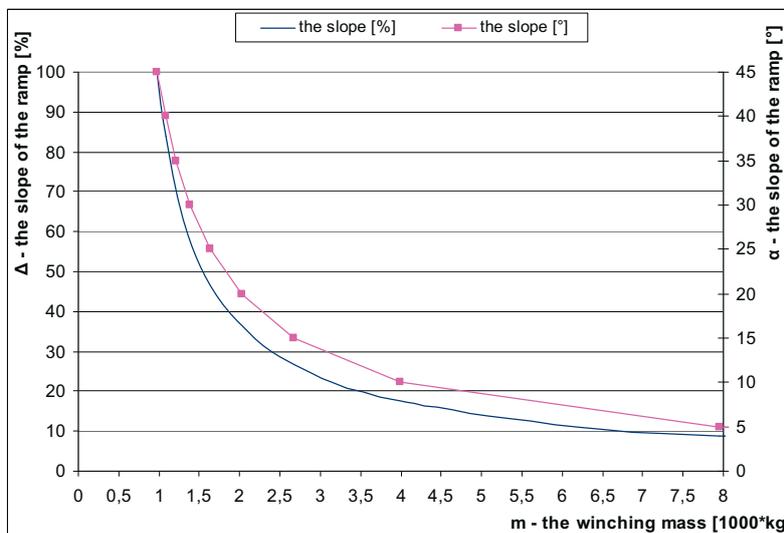


Fig. 5. The winching mass by the winch for the force $F=6800$ N in function of slope the ramp

Using the mechanism of winching of the wheelchair made increase the value of slope of the ramp. Through mentioned it was possible to use shorten inroads because to get in as well as to get out from the vehicle it is not necessary to use the power of human muscles. The short and lowered inroads can be very easy dismantled and can be put away with occupation no space in the bus. Relatively small mass of the winch, including the bus-bars for inroads, brings about tiny overloading of the bus. The winch is fixed in the ground and it makes that space in the vehicle is not reduced. The short lowered inroads can be hidden in the glove compartments under the floor. To fixing them as well as to dismantling is very easy and takes not to much time. The company named AMZ - KUTNO, particularly in mentioned case fixed the winch T1500 produced by Superwinch. The power this winch is about minimum 680 kG. The analyses concerning the selection issue of the winch as well as appropriate powers needed for transporting the wheelchair with disabled person have been showed on Fig. 3-5.

In modernized vehicle Mercedes Benz type Sprinter inroads were 3000 mm long and the floor of the vehicle was on the level 885 mm. The risen angel was 15°. The technical device facilitating getting in the vehicle has been showed on Fig. 6.

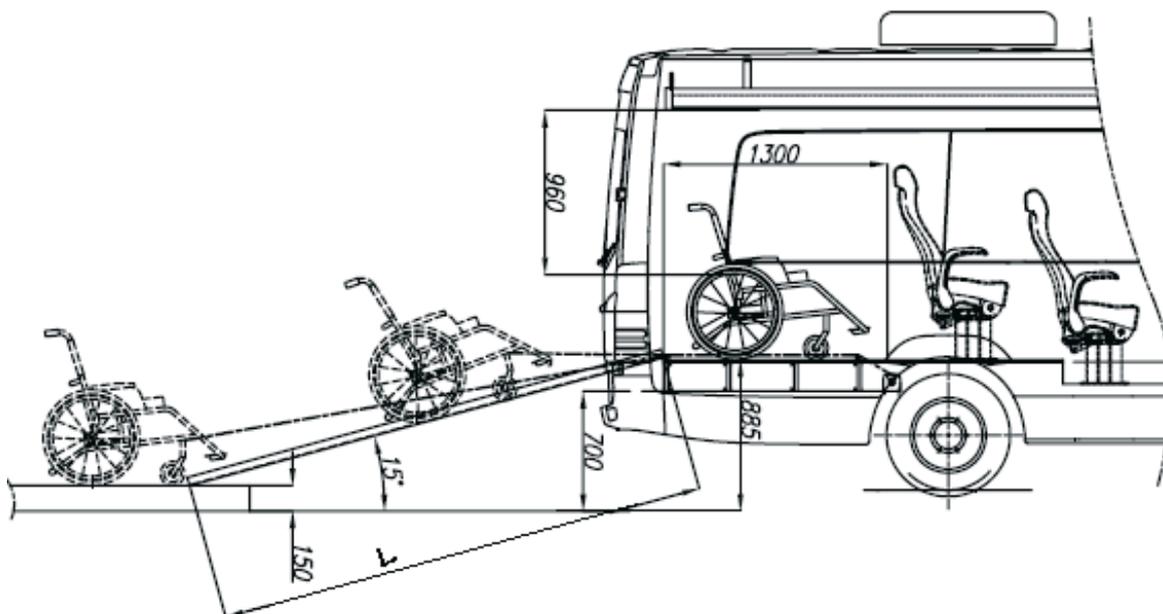


Fig. 6. The way of getting in and getting out of the bus disabled people

The maximum load of the winch is 680 kG and load that makes that its motor is about to stop is 885 kG.

Such big reserve of the power of witch is the reason that using it is completely safe taking into consideration transporting person using wheelchair.

The bus tested with the new device for getting in and getting out disabled people went through the technical examinations with positive results that had been made in The Automotive Industry Institute in Warsaw (*Przemysłowy Instytut Motoryzacji*). After preliminary analyses as well as after the inspection the construction of Mercedes Benz adopted to transporting disabled people has received positive opinion. It has a big chance to receive the type approval certificate and be useful for disabled people.

3. Resume and conclusions

The European Parliament and the European Council in directive 2001/85 EC of 20 November 2001 decided to reach out the necessity of disabled people using wheelchairs. Solutions that have been proposed are equitable but they exact from constructors to invent new technical devices. Fixing on the vehicle additional equipments that facilitating disabled people to get in and

get out of the bus makes limitation of transporting services ability. Particularly it regards to small busses with number of passengers do not exceeded 20 people. This vehicles are the most common one in use to transport disabled people on a short distances. From economical point of view for transport operators as well as for bus owners such solutions are unfavorable. This is the reason why the new technical solutions are searching with respect EU requirements as well as EU expectations. Using electrical winch is one of such solutions that fulfills mentioned. This solution facilitates getting in and getting out of the bus by means bus-bars disabled person using wheelchair and this device itself do not occupy a lot of space in the bus and do not bring needless overloading it. Taking into consideration the law regulations being in force as well as current vehicles construction it seems to be the best optimal solution.

References

- [1] *Directive 2001/85 EC of the European Parliament and of the Council of 20 November 2001 Relating to special provisions for vehicles used for the carriage of passengers comprising more than eight seats in addition to the driver's seat, and amending Directives 70/156/EEC and 97/27/EC*, 2001.
- [2] *Regulation of the Minister of Infrastructure of 31 December 2002*, On technical requirements for vehicle and its obligatory equipment (OJ No 32, item 262.) 2002.
- [3] *The Charta Rights of Disables People, The Resolution of the Polish Parliament of 1 August 1997* (as published in Monitor Polski of 13 August 1997) 1997.
- [4] *The Constitution of the Republic of Poland of 2 April 1997* (OJ 1997, No. 78, item 483 with amendments) 1997.
- [5] *The law of 15 November 1984, The Transportation Law* (OJ 2000, No. 50 item 601), the Article 14 point 2 1984.
- [6] *The law of 20 June 1997, The Law of road traffic* (OJ 2005 No 108 item 908 with amendments) 1997.
- [7] *The Treaty establishing the European Community* (OJ 2004, No. 90 item 864/31), the Article 13, 2004.

"The author's reward was sponsored by Society of Collective Management of Copyrights of Creators of Scientific and Technical Works KOPIPOL with registered office in Kielce with duties obtained on the ground of the art. 20 and art. 20¹ of law on copyrights and related rights."