PubTrans4All

Public Transportation - Accessibility for All

Deliverable 5.2

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1. Introduction

The PubTrans4All project's objective is to develop a standard boarding assistance system (BAS) that can be used on many different types of rolling stock and infrastructures. The boarding assistance system will not simply be a device, but rather include contributing elements that make it possible to effectively use the device in order to access rail vehicles. A prototype will be developed by a multi-disciplinary consortium including users, public transport operators, academic researchers and manufacturers.

As part of the process of developing a prototype boarding assistance system, the project will survey state of the art accessibility devices and make recommendations for best practices in the use and operation of these existing devices.

This newsletter gives a brief overview of the results of the evaluation of existing BAS (also confer Deliverable 2.1 and Deliverable 2.2) and the recommendations for improving BAS (confer Deliverable 3.1).

2. Types of Reduced Mobility

For equal participation in society, accessibility is an elementary precondition for disabled or in their mobility reduced persons. There are various ways or models used to define disability but the PubTrans4All project is mainly concerned with the TSI-PRM (Technical Standard for Interoperability Persons with Reduced Mobility) which distinguishes between two main groups, "People in wheelchairs" and "Other groups of people with reduced mobility".

Wheelchair-Occupants/Wheelchair users

Wheelchair-users face the greatest barriers when it comes to train accessibility. They heavily rely on their wheelchair and face tremendous difficulties when accessing or alighting the train. Therefore a boarding assistance system is highly recommended.

Other People with Reduced Mobility

- ✓ *People with limb impairments*
- ✓ *People with ambulant difficulties*
- ✓ *People with children*

- ✓ *People with heavy or bulky luggage*
- ✓ *Elderly people*
- ✓ *Visually impaired and blind people*
- ✓ *People with hearing impairments and deaf people*
- ✓ *Pregnant women*

Often multiple mobility impairments occur at the same time and these impairments can be both, permanent or temporary (for example people with walking impairments could be blind as well). These persons profit from a BAS as well as all other passengers.

3. The Role and the Importance of a Boarding Assistance System (BAS)

The role and the degree of the importance of a BAS can be described from different perspectives – user groups, operators and manufacturers. The opinions differ not only between user groups, operators and manufacturers but also amongst the groups. For example, some operators value all passengers as very important in regards to the existence and uses of a BAS, others ony value a BAS exclusively for wheelchair users. Besides these two main-trends, most operators have a variety of opinions and views regarding the importance of boarding assistance systems. In contrast manufacturers assess the role of some user groups (wheelchair users, persons with walking impairments and persons with prams) more important or slightly more important than operators do. Representatives of user groups assess the importance of many user groups (persons with luggage, children, pregnant women etc.) higher than the operators do, which is a result that one could have expected (for more details see Deliverable 2.1, page 27 pp.).

4. Boarding Assistance Systems: Vehicle based versus platform based BAS

Operators use both **vehicle based** and **platform based boarding assistance systems**, depending on the infrastructure, operational environment and task.

Vehicle bound BAS (vehicle bound ramps or vehicle bound lifts) are either permanently incorporated into the vehicle or are otherwise stored on the vehicle. Activation is performed

by train-personnel, automatically or in case of independent operation by the user himself. One main advantage of a vehicle based BAS is its independently use form the provided train station infrastructure and is safe regarding vandalism at the train station.

- Vehicle based ramps are stored in the vehicle and deployed from the vehicle when in use (conf. picture 1). Ramps are usable for all passengers and usually manually applied by the train personnel. A major disadvantage is that ramps are limited in their application due to the maximum gradient of the ramp and usable platform width.

Picture 1 – Vehicle based ramp, ÖBB

Source: Deliverable 2.2, page 21, (http://medivent-wagner.de/)

- The vehicle based lift is installed into the vehicle and deployed out of the wagon for its operation (conf. picture 2). The use of this lift is amongst all operators limited to wheelchair users and during the boarding/alighting process the entrance cannot be used by other passengers. A significant advantage of this BAS is the nearly unlimited application for all platform heights and also the possibility of an emergency evacuation in-between station.

Picture 2 – Vehicle based lift, ÖBB

Source: Deliverable 2.2, page 39, (http://www.youtube.com/watch?v=fsWQvBJx_rs)

Platform bound systems (platform bound ramps or platform bound lifts) are positioned and located at the platform and should be usable in combination with all vehicle-types using the station. Normally the platform based system is operated by the station-personnel and is not intended for the use without staff. Two types of platform based systems can be distinguished:

- Platform based ramps – here the ramp can be stored at the platform in a folded position and is carried to the applicable coach when needed. The operation of this kind of BAS is performed by the train personnel. Or a permanent ramp is directly situated on the platform, as shown in picture 3. This kind of BAS can be used by all passenger groups. It is only limited due to the gradient of the ramp and the usable platform length.

Picture 3 – Platform based ramp, USA

Source: Deliverable 2.2, page 37

- Platform based lifts – the manually (hydraulic or mechanical) operated lift is stowed at the platform and positioned in front of the vehicle entrance when needed (see picture 4). Platform based lifts can be used for all vehicle types. A great disadvantage is that during its operation the entrance and a bigger area in the station are blocked for the use of other passengers because most operators only allow wheelchair users to use this type of BAS.

Picture 4 – Platform based lift, DB

Source: Deliverable 2.2, page 51, (http://www.herkules-reha.com/index.cfm?at=Produkte&pt=DE_Herkules_Produkte_WG_300&menu_ac1t=Hebeb%C3%BChne%20WG%20300)

Table 1 summarizes the different types of BAS (vehicle based lifts, vehicle based ramps, platform based lifts and platform based ramps) with their main advantages and disadvantages and some additional information concerning usability for different user groups and purchase costs. For more detailed information, please have a look at Deliverable 2.2 (page 19 pp.) and Deliverable 3.1.

Table 1 – Different BAS and their Advantages/Disadvantages

BAS	+	-	Comments
Platform based ramps	Applicable for all vehicle entrances and usable for all customers	Limited application due to its maximum gradient and maximum platform length, personnel required on the platform	Low purchase cost, but cannot be applied on all vehicles
Platform based lifts	Limitations depending the vehicle	Personnel required, vehicle-entrance is blocked while BAS operation, not useable for all users	No limitation in terms of platform height
Vehicle based ramps	Useable for all types of vehicle entrances and by all passenger groups	Limited application options due to gradient and platform width limit	Not useable at all vehicle types, difficulties with ramp-length
Vehicle based lifts	BAS useable independently from the train-station's infrastructure and BAS has no limitations regardless the type of coach	Vehicle entrance blocked while BAS is in use, not useable for all passenger types	No limitations in reference to height difference

Source: Deliverable 3.1, page 11

5. Recommendations for specific boarding situations

For several specific boarding situations – **level boarding**, **one or two step upwards boarding and downwards alighting**, **step down boarding and upwards alighting** and **boarding/alighting in the case of height difference greater than 400mm** (also see Deliverable 3.1, page 27 pp.) – recommendations can be made:

- Level Boarding includes boarding/alighting situations where the level of the platform and the vehicle entrance floor are in the same height, or up to a height difference of ± 50mm, combined with a horizontal gap up to 75mm. In this situation, the boarding/alighting process for people with reduced mobility (PRM) can be managed without any BAS or by using gap bridging device in case of larger horizontal gaps (like in picture 5).

Picture 5 – Gap bridging device

Source: Deliverable 2.2, page 58, (Bernhard Rüger)

- One or two step upwards boarding and downwards alighting includes situations with a platform up to approximately 400mm lower than vehicle floor. This scenario allows solving the boarding/alighting for people with reduced mobility with different types of ramps, but does not exclude the possibility to use lifting devices if they are available.

  An access ramp may be either positioned manually by staff whether stored on the station platform or on board of the wagon, or deployed semi-automatically by mechanical means, operated by train-staff or by the passenger.

- Step down boarding and upwards alighting – this scenario includes the boarding/alighting situations with platform up to approximately 200mm higher than vehicle floor level and can be solved with some kind of ramps or vehicle based lifts. The known platform based lifts are not suitable for this boarding/alighting scenario.

- Boarding/alighting in the case of height difference greater than 400mm – in the case where the height difference is greater than 400mm a lift is the best solution for boarding/alighting for PRM. As already be mentioned, the lift can be platform based or integrated into the doorway of the vehicle.

6. Recommendations for a retrofit-able BAS in an UIC-wagon

Until a few years ago the UIC regulations were the only international regulations for passenger coaches in Europe. For this reason practically all wagons for international passenger traffic, decades ago, were built according to these regulations. As long living structure, this type of coaches is still and will stay in service for future decades.

Therefore the clear objective of the PubTrans4All project is being first in developing a prototype which can be retrofitted into an UIC-wagon also. Up to now, no useful BAS was found (see also results in Deliverable 2.2, page 43 pp.) for an UIC-wagon. Only SJ (Statens Järnvägar) in Sweden uses a Boarding Assistance System with a door-width of 800mm (similar to the UIC-wagon) but the door area in this case is slightly shifted out of the buffer area which allows the use of the clear space under the steps for the driving mechanism, which is not possible in UIC-wagon. Approximately 80% of all types of UIC wagons have the entrance doors immediately in the zone of the buffer. Additionally to that, the BAS used in Sweden is no longer up to standard (e.g. lifting capacity with a maximum of 125kg).

The PubTrans4All consortium agreed to find a vehicle based retrofit-able solution for the UIC-wagon. In this case the BAS is always right in time and at the right place – retrofitted in those wagons designed for wheelchair users. Therefore it cannot happen that in any station there is no BAS available for boarding or alighting of a wheelchair user.

It need to be taken into consideration that in the entrance area of the UIC-wagon there are severe constraints which makes it very difficult to find an appropriate place for the BAS in the stowed position. Moreover, possible differences in the entrance layout of UIC-wagons complicate the possibility to find a standard BAS solution that can be retrofitted in the all existing UIC (and other) vehicles.

Additionally to these constraints, a vehicle based BAS implementation only makes sense if the wagon has entrance corridor, toilette and compartment adapted for wheelchair users. In the case of existing rolling stock, the BAS implementation is normally a part of refurbishment works linked with some internal adaptations for providing additionally place for the BAS.

The BAS mechanism should have two variants – one for the left and another for the right side. With these two solutions almost all possibilities of boarding situations in other types of UIC-wagon will be covered (e.g. the BAS for wagon with central longitude corridor can also be solved with one of these mechanisms for both sides).

Some of the main technical restraints concerning a BAS retrofit-able into an UIC-wagon are summarized in the table below – for more detailed technical information please confer Deliverable 3.1.

Table 2 – Some of the technical restraints of a BAS retrofit-able in an UIC-Wagon

Characteristic	Value	Comment
Carrying capacity	300kg	Covers 99% of wheelchair users, see chapter 2.2.4.7
Minimum clear width of lift platform	720mm	Covers 96% of wheelchair users, see chapter 2.2.4.7
Minimum platform length	1200mm	
Boarding/alighting parallel to the vehicle	recommended	Alternatively, exit sideways through lay down of the side fenders (required for narrow platforms)
Integrated folding seat for categories of users other than wheelchair users	Recommended	
Overload protection of the main power electrical circuit		Fuse, an overload cut-out or similar
The lift platform surface should be smooth and must have slip-resistant surface	yes	Slip resistance according to EN ISO 14122-2
Easy removal of ice and snow must be possible	yes	Environmental influence shall not occur any fault
Visual and audible warning signals during the lift movement must be activated	yes	
A stop in overload protection should be present at overload more than	25%	
Other technical details not covered in this table preferably should be based on	TSI PRM, EN 14752, EN 1756-2, RVAR	

Source: Deliverable 3.1, page 84 pp.

If you have any more questions or remarks concerning the Project “Pubtrans4All – Public Transportation for All” please don’t hesitate to contact us by email: office@rodlauer.eu or take a look at our website www.pubtrans4all.eu.