

# ENTRANCE SITUATION OF PASSENGER CARS – EFFICIENCY, ATTRACTIVNESS AND OPERATING PROBLEMS

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## **Summary:**

Because of a large number of passengers using long distance trains on main travel days time needed for train stops increases. That's the reason, why many trains run late on those days and also cause delay of other trains. This article shows the main influences on the needed changing time of passengers and some solutions how to reduce the time needed for stops and make trains run on time.

## **1. Introduction**

Because of a larger number of passengers using trains on main travel days the time needed for a train stop rises and trains often run late. A large investigation done by the Institute for Railway Engineering of the Vienna University of Technology shows main influences on the needed time for a train stop and what can be done to improve the situation. For studying the reasons a large number of video analyses were done.

## **2. Influences of changing time for passengers**

**Main influences** of the time needed to enter or exit a train for single passengers are:

**In the sphere of influence by the passenger:**

- Age
- Luggage
- Several kinds of handicaps

**In the sphere of influence by the wagon construction:**

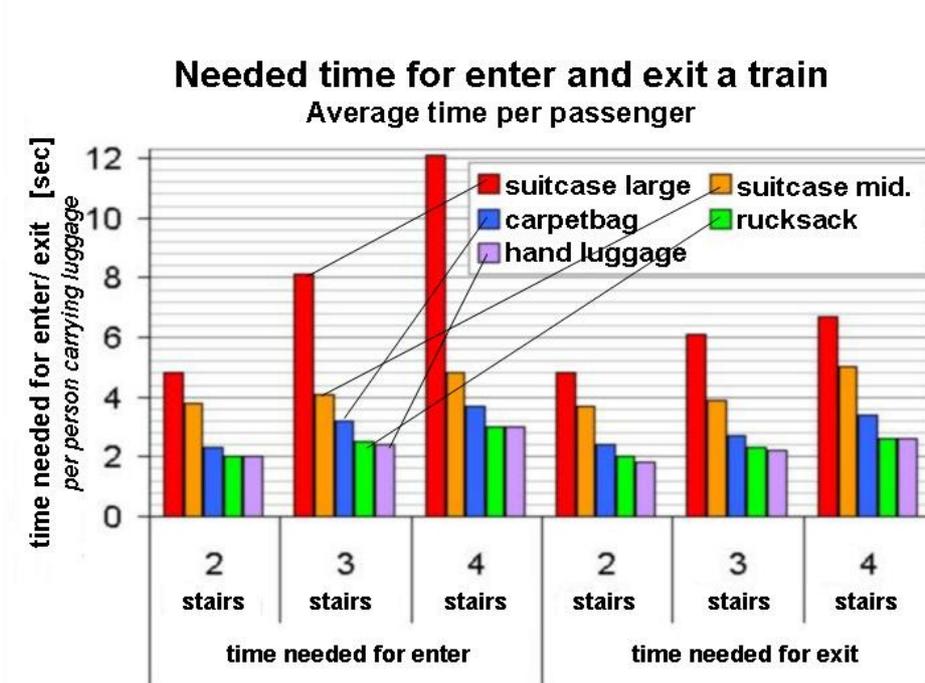
- Entrance situation
  - Number of stairs
  - Width of the door

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- Space in the entrance area
- Passenger saloon
  - Width of the aisle
  - Possibilities of luggage depositing

One main influence is **luggage**. The needed time rises by the weight, the size and the number of luggage items. Another main influence is the number of stairs a passenger has to take when he enters the train. Especially the combination of both must be considered! (see fig. 1)



**fig 1:** Average of time needed for enter or exit a train subject to the carried luggage and the number of stairs.

Passengers who take along large luggage items need twice the time in the average than passengers with small luggage like rucksacks or hand baggage. Passengers who take along heavy suitcases will even need four times longer!

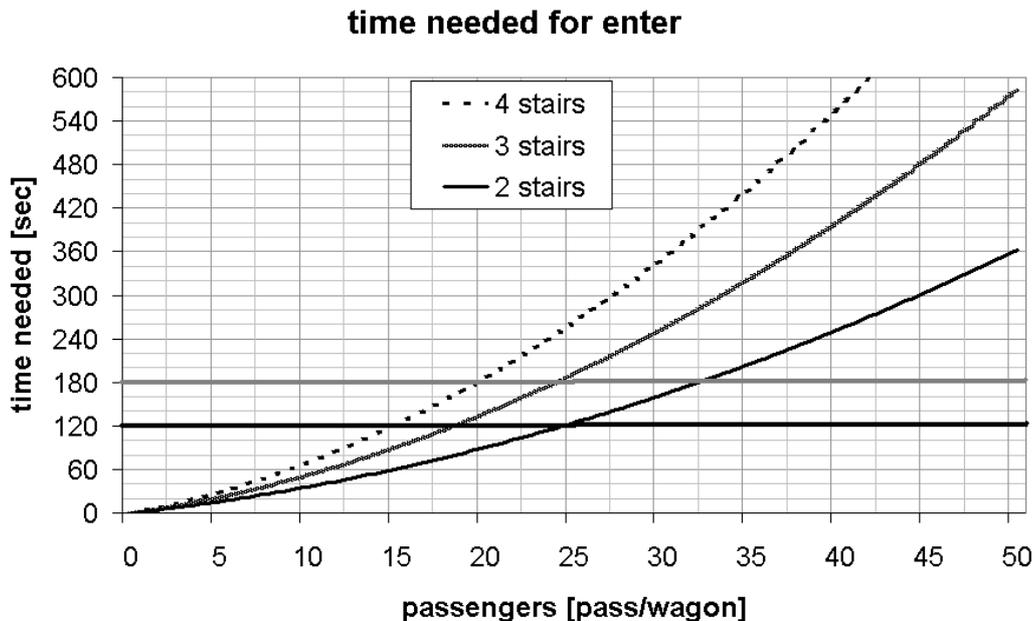
Another problem is the **entrance** area design and the railway **interiors**. After a few travellers a holdup of passengers can be watched because of a wrong design. One reason is passengers have to search for free seats and they must store their luggage. If the aisle width in the saloon is too small, passengers who have to carry luggage do have many problems when moving along. If the aisle is smaller than 60 cm passengers with large luggage items will need much longer compared to wagons with a wider aisles because of the troubles when caring the luggage.

Other problems are missing luggage storage possibilities. On the one hand passengers want to avoid lifting their luggage and therefore they want to store it at or near ground level. If there exist too few or no such storing possibilities many passengers put down their luggage on the floor and also in the aisle. This is an additional reason why travellers who enter the train and search for a free seat have got many troubles and need longer for moving along.

On the other hand they need much longer if they have to lift their own luggage in order to store it. The third problems are passengers who want to cross.

Those three reasons lead to a **holdup**. Therefore the time for a train stop does not increase linear by the number of passengers but above average.

In fig. 2 you can see increase of time needed by the number of passengers. This situation is significant for holiday makers with much luggage.



**fig. 2:** Needed time for all passengers passing one door in subject to the number of stairs.

Do passengers have to pass 2 stairs because of the difference between the platform level and the wagon floor level, in the average 25 passengers need 2 min. in order to get into one wagon (with 2 doors). Do the same passengers have to take 4 stairs in order to get into one wagon, they will need more than double the time (more than 4 min.).

In order to limit the stop time by 2 min in average 15 travellers can get into one wagon. These are about 40 % less compared to situations where only two stairs have to be taken.

### **Split-up of the number of passengers along the platform:**

The time needed for entering the train grows above average by the number of passengers as shown in fig 2. Under these circumstances an irregular split-up of the number of passengers along the platform is very problematical because some doors are frequented by too many travellers while other entrances are unused.

There are many different reasons why some entrances are much more frequented than others. For example some passengers want to be near the entrance of the platform, others want to be near the restaurant car.

On main travel days, at least in Austria, but it can be accepted in other countries too, a wrong used reservation system causes similar troubles. This problem is visualised in fig.3 where the number of reservations per wagon and station in a typical Austrian holiday train is shown. The main problem is in each station seats are reserved only in a view wagons and not evenly distributed in all. This situation leads to the fact all passengers who get into the train use only a small part of all available doors.

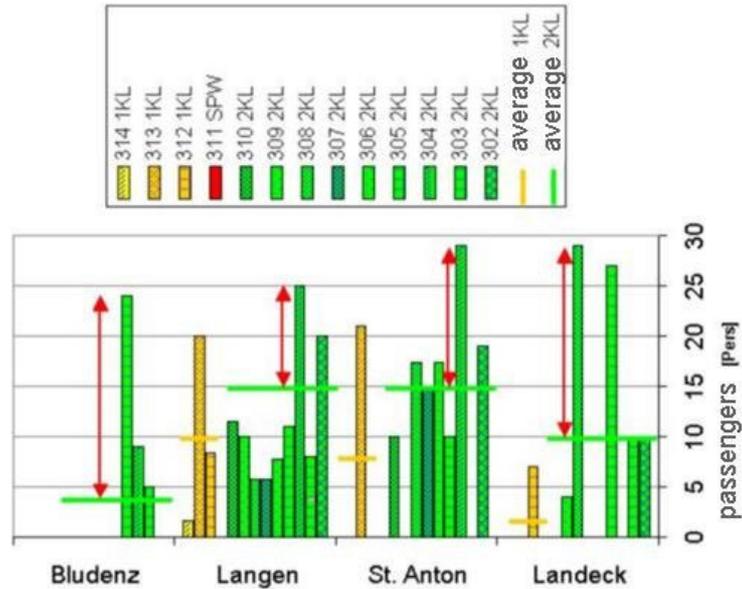


fig. 3: Number of passengers who get into the train in each station (split to all wagons)<sup>2</sup>.

By following the basics in fig. 2 only 10 up to 18 passengers can get into the train to realise the planned stop time of two minutes (with consideration to passengers who leave the train). In this example in each station the average number of passengers is about 15 per wagon. But on the other hand it can be shown, in each station nearly 30 passengers get into one wagon in order to take their reserved seats. So the departure of the train needs as long as passengers need to get into the most frequented wagon.

At the special analysed travel day the exemplarily shown train has been delayed for 25 min. between the stations Feldkirch and Innsbruck. Calculations have shown, that the train could have been running in time already if the seats would have been reserved in every station evenly distributed on the whole train.

#### 4. Improvement opportunities

All influences by passengers' sphere (age, luggage or handicaps) cannot be changed. Only influences by the railway company's sphere can be improved in order to change situation to better.

In order to reduce the time needed for train stops two basic aspects must be considered. First **short-term improvements** can be set:

*Split-up of the number of passengers:*

The reservation system must be changed that way the number of passengers can be evenly distributed the whole train as well as possible.

<sup>2</sup> Each number symbolises one wagon of the ÖBB-EC 163 (Basel-Wien) on Feb. 12<sup>th</sup>, 2005.

On the other hand **long-term improvements** must be set:

If new wagons will be designed following basics of advanced entrance interiors situation must be recognised:

*Number of stairs:*

The best situation would be a low-floor entrance. In this case passengers' difficulties and thus also the time needed for enter the train will be minimised. Two stairs is the limit in order to keep the stop time in acceptable borders.

*Comfortable entrance situation (Entrance width, dimensions of the stairs):*

Compared to classic wagon types passengers need about 20 % less time if the door width is about 90 cm and the gradient of the stairs is lower.

*Luggage storages:*

On the one hand enough luggage storage possibilities on ground level are essential comfort criteria for passengers, on the other this situation is important to reduce difficulties for moving along passengers in order to reduce the time needed for storing luggage. Theses situations will help to reduce holdups!

*Aisle width:*

The aisle width should be at least 60 cm. In this case passengers' troubles when moving along can be minimised and so the risk for hold-ups!

*Location of the entrance door:*

Doors should not be located at both ends of a wagon but in the quarter areas. So the crossing passenger-flow while entering the train can be reduced. This leads to the fact of reduced hold-ups and a shorter time needed for a train stop.

*If both the entrance situation, the interiors (with special aspect on luggage storage possibilities) and the reservation system on main travel days will be improved that way it has been shown in this article, the planned time needed for a train stop can be holed even on main travel days. In many times it can even be reduced! This is important to gain a time reserve.*

#### **4. Literature**

Rüger, B.; Reisegepäck im Eisenbahnverkehr, Dissertation at the TU-Wien

Schöbel, A.; Rüger, B.; Qualitätsmanagement im Personenverkehr am Beispiel der Arlbergbahn; ETR 11/2005; Eurailpress

Rüger, B.; Einfluss von Reisegepäck auf die Fahrgastwechselzeit, Arbeiten des Institutes für Eisenbahnwesen, TU-Wien; Institutsheft Nr. 32