

# Soft Flooring for More Standing Comfort in Trains

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**Abstract** Standing is a reality in trains worldwide, and at the same time the least preferred travel option for passengers. Swiss Federal Railways undertook initial field research using three types of flooring with different levels of softness. The aim was to identify the potential to increase customer satisfaction when standing. The results clearly indicate that soft flooring can play a key role to improve standing areas on trains. The paper details the findings and puts them into the wider context of ways that aim to increase comfort in standing areas in trains.

**Keywords:** Standing comfort, soft flooring, public transport, railway.

## 1 Introduction

During rush hours space on trains becomes scarce. This is particularly true for regional traffic. In spite of reinforcements and expansion of services, standing room cannot always be avoided. The question therefore arises as to how standing space can be made more attractive.

### **More standing comfort thanks to improved ergonomics.**

The awareness for ergonomic workplace design has risen in recent years. Swiss law [1] obliges employers to design and furnish workplaces according to ergonomic criteria. In [2], the Swiss national insurance cover against accidents and occupational diseases *Suva* illustrates that standing work over a longer period of time is easier on the joints and less tiring if the surface is soft. SBB has taken up this idea and implemented it on a trial basis in a regional train.

## 2 Approach

In a four-carriage FLIRT train of the SBB (RABe 523 068) three existing standing areas were equipped with identical layout as follows:

1. "Normal flooring" marked with a red and white band (control group)
2. "Medium soft mat" (8 mm thick)
3. "Soft mat" (14 mm thick)

From mid-June 2018, the vehicle was in regular service on lines S1 and S3 of the *Regio-S-Bahn Basel* (Switzerland) for around one month. The choice of these two lines ensured that the test took place both in the French and German-speaking regions and that the entire range of possible load factors was mapped.

The selected standing areas are not within sight of each other. As a result, passengers participating in the test were highly likely to have seen only one of the three standing areas.

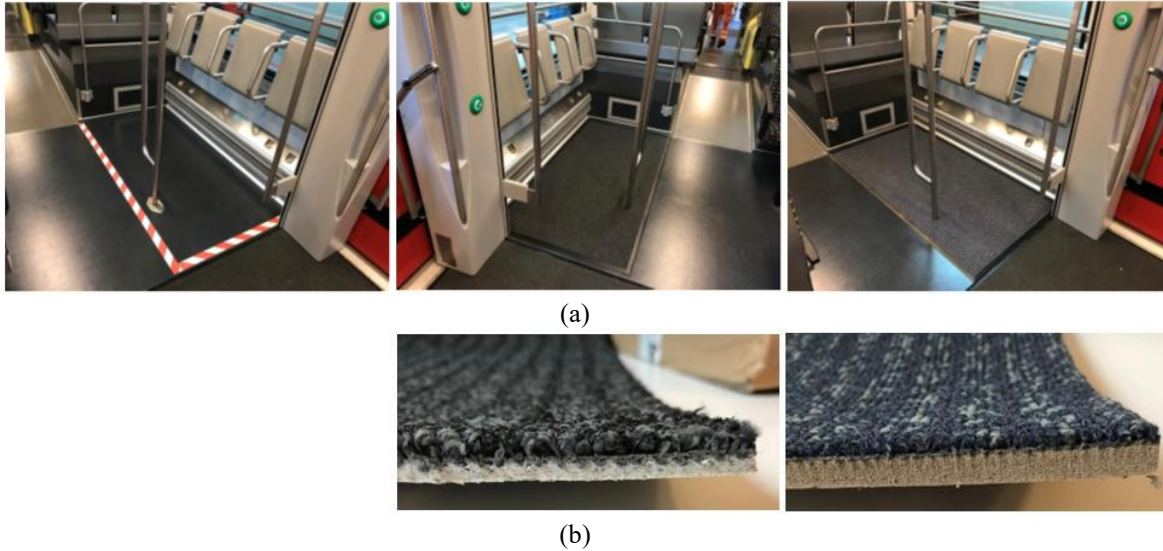


Fig.1. (a) Control group with «normal flooring» (b) Areas with built-in mats "medium soft" (8 mm, left) and "soft" (14 mm)

### 3 Evaluation

Feedback was obtained in three ways: (1) passenger survey, (2) expert inspection, (3) observation of passenger behaviour in trains.

The "passenger survey" was carried out via an online survey of the entire standing area, in which participants could participate via the QR code or link displayed on the train. The equipment of the three standing areas with different QR codes allowed a simple assignment of the answers. Only one question specifically related to the satisfaction with the standing area. A total of exactly 50 persons took part. Although the results are not representative, they can form a component of the SBB's core question: Does a further deepening of the topic appear to be appropriate?

The "expert inspection" took place as part of a ride in a test vehicle with SBB rolling stock specialists. The "observation of passenger behaviour in the train" was carried out onboard the test train during several hours over the entire test period.

### 4 Results

#### **The softer, the longer satisfied.**

The topic of "soft standing surfaces" is clearly worth further investigation. All three feedback channels have provided this answer.

The "passenger survey" showed the expected effect in its results to be interpreted as impact direction: the softer the standing surface, the higher the satisfaction. The increase between the normal floor and the soft standing surface is impressively above 40% (from 4.79 to 6.78 points, see figure on the left). Since no passenger comments were received on the vehicle floor, it is reasonable to assume that the soft floors were perceived rather unconsciously. The next step would be to find out at which mat thickness the highest satisfaction is achieved. The comfort should stagnate or decrease at a certain point.

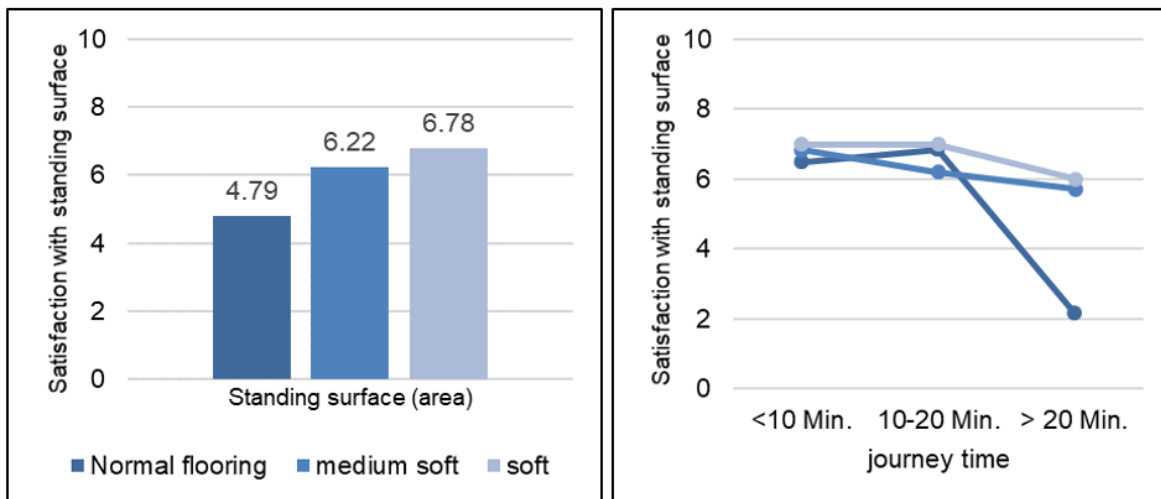


Fig. 2

A second result of the "passenger survey": The comfort gain seems to be most obvious with a standing time of 20 minutes or longer (cf. right figure). Due to the small number of cases, this tendency must be intensified in following studies.

The "expert inspection" revealed further positive aspects. Standing in the direction of travel and leaning back, the soft floor supports the necessary power movement during braking and improves stability. The increase in comfort is noticeable even on short distances.

The "observation of passenger behaviour in trains" showed that a certain number of passengers use the standing areas for shorter distances despite free seats. Other features of the standing area, such as the spatial design, the holding options or the perceived personal safety, also appear to be just as relevant from the customer's point of view. The feedback from the "passenger survey", in which the desire for comfortable leaning aids for all body sizes and more space between clearly defined standing areas was expressed, is related to this.

## 5 Discussion

### If so, then with soft standing surfaces.

The results show that a deepening of the impact direction "soft standing surfaces" makes sense in the overall context of a more attractive design of standing areas in new vehicles.

In addition to the floor condition, further components need to be optimised. Strict user orientation is required as a conceptual approach for the design of "standing landscapes" in trains. As a consequence, for example, reclining options need to be made even more ergonomic or further support options need to be specified for all body sizes. Small storage facilities or a power supply could create additional benefits.

How and when comprehensive innovations will be implemented will be decided in due course. SBB's goal remains unchanged: to offer the highest possible number of high-quality seats. Where standing room is unavoidable, it should also be of high quality.

**Acknowledgments** The author gratefully acknowledges the work of Nick Erb who contributed significantly to the research discussed in this paper during his graduate internship at SBB CFF FFS. More acknowledgements go to Joost van der Made from *Nederlandse Spoorwegen* for sharing his inspiring ideas on standing comfort, which led to this research. Furthermore, the author would like to thank Stadler Rail AG, Tisca Tischhauser AG and Texat Decor AG for their valuable support in the planning and implementation of this market test/research.

## References

1. Verordnung 3 zum Arbeitsgesetz (Gesundheitsvorsorge, ArGV 3) vom 18. August 1993 (Stand 1. Oktober 2015). 822.113.
2. Suva Pro (2014). Sitzen oder stehen? Ergonomische Gestaltung von Arbeitsplätze. Informationen für Fachleute und Interessierte. Downloaded on: [http://www.sohf.ch/Themes/Ergo/44075\\_D.pdf](http://www.sohf.ch/Themes/Ergo/44075_D.pdf).