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Ergonomics and visibility in tramway driving cab

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Abstract

The STRMTG, in charge of safety for ropeways and guided public transport for the French Ministry of Transport, edited in 2012 a guidebook relative to the "Ergonomics of drivers' cab in tramways". It aims to set minimums for designers of rolling stock to assure an appropriate visibility to drivers and to gather the needs of the tramway operators.

Safety of tramway systems is in particular based on line-of-sight driving principle but no regulation or standard existed on visibility requirements. Therefore, the STRMTG got into process for elaborating a frame of reference shared with concerned professionals.

These specifications concern in particular:

- Visibility: close and far-off outside fields of vision, inside field of vision, area swept by windscreen wipers, etc...;
- Location and type of controls;
- Windscreen and side windows.

The two driving positions are studied (centred and off-centre) and a specific part of the guide deals with tram trains regarding the compatibility with conventional railway standards.

Because the field of the STRMTG is exclusively safety, in 2015 the original guide was divided into two parts: the STRMTG guide concerns safety prescriptions and a second guide deals with comfort specifications. This second guide is co-edited by the UTP (union of French operators in public transport) and the GART (union of French public authorities in charge of transport policy).

This revision of the guide also enabled to associate public authorities in charge of transport policy to the process as they are decision-makers in the choice of the rolling stock design.

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1. Introduction

To elaborate a reference on driving cab's design, the STRMTG's Tramway Department (DTW) created a working group gathering operators, manufacturers and ergonomics specialist. The latter was in charge of the first step of the

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process: retrieving observations of drivers and questionnaires in 7 tramway networks. A proposition of specifications was based on these observations, on European regulations / standards regarding road vehicles (specially buses that operate in the same urban environment) and also on standards for conventional railway rolling stock (French and European standards).

After debate with the working group, specifications were defined about anthropometrics data to characterise drivers' population, visibility, commands location, driving chair, alarm signals and lighting...

The consultation with concerned professions enables to define specifications that are technically feasible.

1.1. Main objectives

In France, public authorities in charge of transport organisation tend to use tramway liveries as a visual identity for the city. Consequently aesthetics designers' requirements have great influence in defining the shape of the tram end. Unfortunately visibility is not a criterion taken into account. As no frame of reference exists on tram driving cab, operators – who are not in charge of buying rolling stock – are helpless to face aesthetics designers.

Operators share the same needs on several items as visibility or comfort problematic and they would have more influence by bringing their requirements all together. On the other hand, the DTW wanted to have precise specifications to ensure an adequate visibility to drivers, particularly in response to two severe collisions that occurred in 2010 with pedestrians that were hidden by pillars (one fatality and one serious injured).

For those reasons a guidebook on tram driving cab was created.

1.2. European requirements on outside field of vision

The method to define the requirements couldn't be based on European references as, to the best of our knowledge, they only define main objectives on visibility:

- The guide “Recommendation of type – Light Rail Vehicles” edited by VDV (German Association of Public Transport Authorities) requires that windscreens and side windows “offer good sight”;
- The “Ordinance on the Construction and Operation of Street Railways” (German federal regulation, known as BOStrab) specifies that the cab “must be so designed that the driver may carry out his duties safely. In particular he must be provided with an ample field of vision”;
- The federal Swiss office (OFT/BAV) specifies in “Measures of execution of railway regulation” that there should be “measures guaranteeing good visibility with windows sufficiently large”
- The “Guidance on Tramways” edited by the ORR (Office Railway Regulation of United Kingdom) refers to the current Road Vehicles Regulations 1996 (similar to the EC directive) as a tram operates on-street and specifies that “the design of the driver's cab should offer optimum internal and external visibility for the driver.”

Therefore we defined our specifications on collision scenarios to prevent from and on road vehicles regulations. This method enables to adapt the requirements to the operational conditions of any network. Moreover we used a large part of European references (road regulation, standards) and lots of operators might share most of our objectives, so other countries can easily use our requirements.

1.3. Drivers' opinions

To collect operators' needs, the ergonomics specialist studied seven tramway networks (Rouen, Marseille, Montpellier, Lyon, Grenoble, Strasbourg and Clermont-Ferrand) having different rolling stock types made by Alstom, Bombardier and New Translohr (tramway on tires).

The observation highlighted that most drivers were unsatisfied with the driving chair quality and that some had trouble in reaching or activating the pedals. It also showed the problem of driver's desk and screen reflections on windscreen, of mist on side windows and of sunshields not effective enough. Drivers asked an improvement on the

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