

# **DEFINING THE METHODOLOGY STANDARDS FOR DESIGNING DRIVER CABINS FOR RAIL VEHICLES, BASED ON 10 YEARS OF PROFESSIONAL WORK EXPERIENCE WITH RAIL VEHICLES DESIGN**

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## **SUMMARY**

In the dissertation, the author used the knowledge and skills gained not only during the years of study, but mainly as a result of the ongoing deepening of his competences and experience during his professional work related to the design of rail vehicles. As part of his professional work so far, the author has designed several drivers desks and cabins for rail vehicles and co-designed or supervised the design of such positions within the work of project teams. Its modern and innovative design solutions in terms of ergonomic, functional and design solutions have gained the recognition of carriers and train drivers and are successfully used in several hundred manufactured rail vehicles of various types. As part of the implemented projects, he encountered many problems related to the limitations of creative and innovative design. These problems were not dictated by factors related to the safety conditions or the lack of production technology, but in many cases resulted only from the obligation to rely on archaic guidelines or habits that had been in force for years.

The main goal of the work is to present the design solutions implemented by the author, paying attention to the technical, legal and functional problems he encountered during his professional activity. The paper presents the design methodology taking into account the limitations resulting from the current regulations and requirements, as well as other conditions that adversely affect the design process and the final effect of design solutions in final products. The thesis of the work is to indicate the need to implement the correct methodology for designing rail vehicle control cabins by developing unified, unambiguous guidelines for the normative acts related to this design field. The basis for the development of these guidelines are the analyzes of the currently applicable normative acts and the reference of these requirements to the selected rail vehicle driver's control stations, implemented by the author of the designs. Referring to the existing standards on specific examples shows the advantages and disadvantages of the impact of current standards on the process of innovative design. Innovative ideas of functional solutions were presented, which could not be implemented, among others, precisely because of the rigid normative guidelines, and were created on the basis of existing control stations and practically prevent, in many cases, the implementation of other, more innovative and ergonomically correct solutions. As part of the analysis of normative acts, the author also indicates the irregularities which, in his opinion, affect the ambiguity of the interpretation of their key provisions, which in many cases leads to the use of erroneous functional and ergonomic solutions at control stations. Ambiguous provisions impose a rigid scheme of design solutions, often not suitable for a given type of vehicle or leave too much freedom, which leads to the creation of designs with a large number of errors. In the author's opinion, the applicable standards inhibit the development of innovation and the implementation of innovative solutions, because instead of indicating the correct design principles, they rely only on the already existing solutions in too much detail. A normative document in this field of design should be an instruction (guide) for the optimal conduct of the design process, paying particular attention to the ergonomic and functional aspects of individual components of the driver desk (e.g. the ability to select and functional configuration of subassemblies), which in effect will become the overall assumptions for the station steering. In the author's opinion, a normative document developed on the basis of such assumptions will provide the possibility of innovative design while maintaining optimal ergonomic systems based on many years of experience, research and, very importantly, also on the opinions of users, i.e. people who directly use the solutions produced. In this work, the author also refers to the advantages of using driving simulators in the process of designing rail vehicle drivers cabins and during training for drivers of these vehicles on the example of the project of the first Polish tram simulator, which he co-implemented.

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