Evacuating a train in case of fire

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Abstract

Four groups of 31 subjects in total were tested on the effect of one type of message (a short and urgent one), in a mock-up of a regular Dutch train, situated in a tunnel mock-up. These groups were confronted unexpectedly with a fire alarm while completing a short questionnaire on personal data on travel habits. Generally these participants reacted fairly quickly to the urgent message to leave the train, by exiting train and tunnel within 70 seconds.

One hundred and nine participants were asked to give ratings with respect to understanding seven different messages, in case of fire to be broadcast in trains with the aim of leaving the train as quickly as possible. The participants were required to complete a questionnaire after watching and listening to various messages, in small groups. The messages could be auditory, visual or a combination; they could be short or extended. The message that was best understood was a short auditory message spoken with higher pitch that only gave the most vital information. Complementary visual information on an electronic display improved understanding in some respect, but confused other participants occasionally. Therefore, the use of an electronic display is best restricted to route guidance towards the exit.

Introduction

There is a growing concern about safety in railway tunnels, for at least two reasons. Firstly, the relatively high number of accidents that have occurred recently in tunnels throughout Europe. Secondly, in the near future more tunnels will be built, among other tunnels in the Netherlands.

Although tunnel fires are very rare, concerns about them are not unfounded. If they happen the consequences can be enormous. In a tunnel the consequences of a fire are likely to be worse than those of a fire out in the open (e.g., on the road). In a tunnel a fire can lead very quickly to life-threatening conditions. This is the result of a fast and enormous development of heat after a short period of time. In the first minutes after the onset of the fire the heat is bearable and not yet life-threatening, but depending on the type of fire, after approximately 5 to 10 minutes it may develop into a fire with heat of up to 1350 degrees Celsius. Figure 1 shows such a heat curve in a worst case scenario. The curve depicts the increase in temperature of a fire in a