NEW RELEASE

HUMAN FACTORS AND ROAD TUNNEL SAFETY REGARDING USERS

2008R17

Tunnels are a key element in transportation systems. Tunnel safety has received significant attention in recent years as a result of major accidents that have led to fatalities, casualties and considerable economic damage. Due to the enclosed nature of a tunnel, the occurrence of a relatively minor incident has the potential to develop into a catastrophe as well as cause significant damage to tunnel infrastructure.

This report, prepared by the World Road Association (PIARC) Technical Committee 3.3 – Road Tunnel Operations, reviews the effect that existing tunnel safety measures have on driver behaviour. It also discusses and recommends important safety measures which should be considered in road tunnel design, in addition to those prescribed in the "Directive of the European Parliament and Council on minimum safety requirements for tunnels in the Trans-European Road Network". The report aims to provide a better understanding of road-user behaviour in tunnels in both normal and critical situations and to provide recommendations for tunnel design and operation based on this understanding.

The work commenced with an overview of existing literature concerning the general aspects of human factors that affect behaviour including the different ways in which humans process information. The ways in which human behaviour influences the perception of external stimulus, such as signs and signals was also investigated.

Road tunnel user behaviour was analysed using results of previous psychological studies commissioned by various road authorities and the European Union. The report looks at the ways in which human factors affect tunnel driving behaviour in normal situations. All aspects of the tunnel driving experience were reviewed: entering a tunnel (sight conditions, design of tunnel portals, narrowing of paved area, consideration for specific weather conditions); driving inside a tunnel (tunnel driving fear, estimating travelled distance, sign perception, consideration for specific weather conditions); and exiting a tunnel.

Studies on human behaviour in tunnels during critical situations, such as traffic congestion, vehicle breakdowns, incidents involving injuries/vehicle damage and fires suggest that human factors play a significant role in responses, and potential escalation of emergencies.

The group then compared the minimum safety measures of the EU Directive with the results of the human factors study and with the guidelines for tunnel design and operation of various countries. The report recommends and discusses a range of additional safety measures for tunnels in normal conditions. These recommendations focus on important issues including:

Education and information of drivers approaching tunnels and inside tunnels;
Traffic guidance, direction signage and warning signals;
Design of tunnel portals;
Geometric cross-section design; and
Interior design.

The report further discusses a range of improved safety measures to prevent the escalation of critical traffic events. These measures focus on educating tunnel users in appropriate behaviour during a tunnel incident. When a tunnel incident escalates further, the focus then shifts towards providing timely and accurate information to tunnel users, clearly identifying emergency exit routes and alerting users of the necessary action to take for their personal safety. Future ITS developments are also discussed, considering the future potential they may add to tunnel safety.

This report can be accessed through PIARC's Virtual Library at:
http://publications.piarc.org/en/search/detail.htm?publication=3247

WORLD ROAD ASSOCIATION MONDIALE DE LA ROUTE 1909-2009 AIPCR PIARC