

Association
mondiale
de la Route



World Road
Association

Part 3 : Future directions !

Where are we ?

What do we need now ?



Where are we ?

25 Technical reports over a 15 years period !

1. 1995 : The First Road Tunnel
2. 1995 : Classification of Tunnels
3. 1996 : Road Tunnels: Emissions, Environment, Ventilation
4. 1996 : Road Safety in Tunnels
5. 1999 : Road Tunnels: reduction of Operating Costs
6. 1999 : Fire and Smoke Control in Road Tunnels
7. 2000 : Pollution by Nitrogen Dioxide in Road Tunnels
8. 2002 : Cross Section Geometry in Uni-directional Tunnels
9. 2003 : Traffic Incident Management Systems used in Road Tunnels
10. 2004 : Road Tunnels: Vehicle Emissions and Air Demand for Ventilation
11. 2004 : Good Practice for the Operation and Maintenance of Road Tunnels
12. 2004 : Cross Section Design for Bidirectional Road Tunnels
13. 2007 : Systems and equipment for fire and smoke control in road tunnels
14. 2007 : Guide for organising, recruiting and training road tunnels operating staff
15. 2007 : Integrated approach to road tunnel safety
16. 2007 : Risk analysis for road tunnels
17. 2007 : Human factors and tunnel safety regarding users
18. 2007 : Direction Signing on a Route incorporating Tunnels
19. 2007 : A Guide To Optimising The Air Quality Impact Upon The Environment
20. 2007 : An assessment of fixed fire fighting systems
21. 2007 : Recommendations to owners and operators of urban tunnels
22. 2007 : Tools for tunnel safety management
23. 2007 : Management of the operator-emergency teams interface in road tunnels
24. 2007 : Lay-bys and emergency stations in road tunnels
25. 2007 : Road tunnels : Operational strategies for ventilation

Some problems with these technical reports !

How to deal with information disseminated in 25 different technical reports, ...

When you need information concerning a specific topic, you have to read many of these 25 technical reports in order to extract the different elements concerning this topic.

You are never sure that you « discovered » all the relevant information available in all these reports ...

except if you have time enough to read all of these 1500 pages in English or French carefully !

Some problems with these technical reports !

..., some references are different, ...

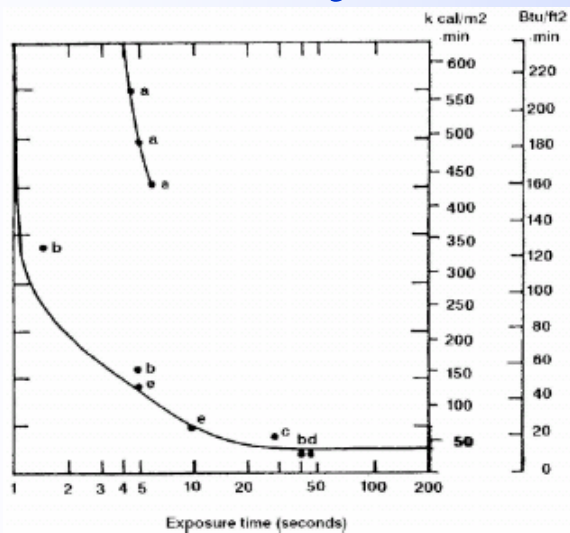


Figure 1.4.24 - Time to severe skin pain for exposure to radiant heat

Figure 1.4.24 - Résistance à la douleur après exposition à une chaleur rayonnante

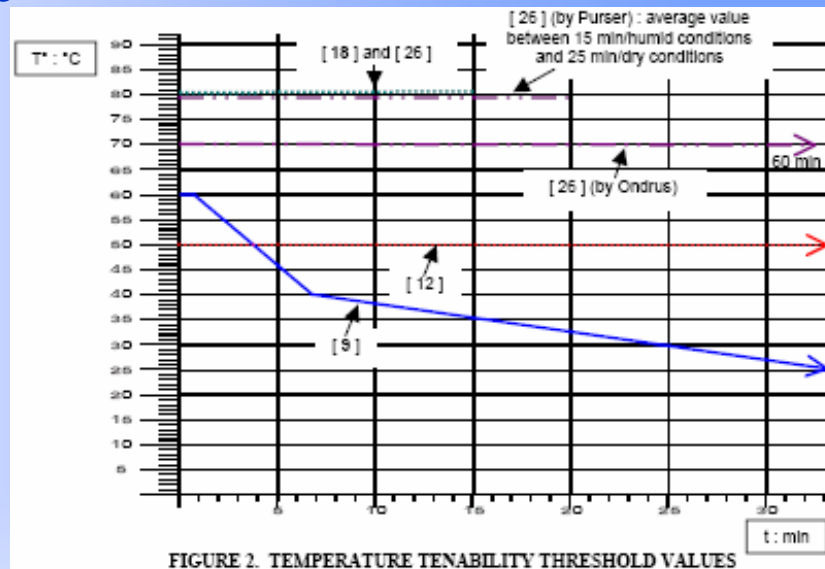


FIGURE 2. TEMPERATURE TENABILITY THRESHOLD VALUES

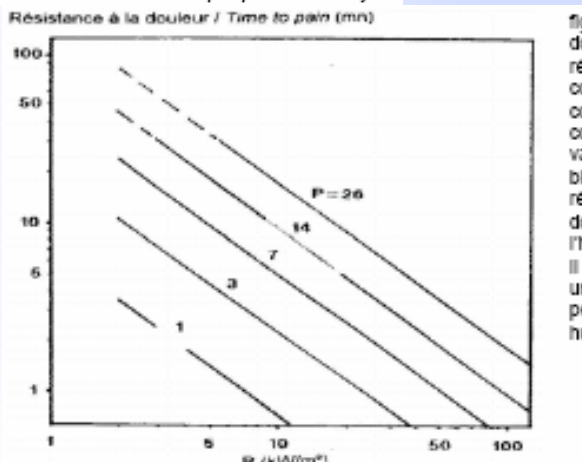


Figure 1.4.25 - Résistance à la douleur pour différents niveaux de radiation et différents facteurs de sécurité

Figure 1.4.25 - Time to pain for different radiation levels and safety factors

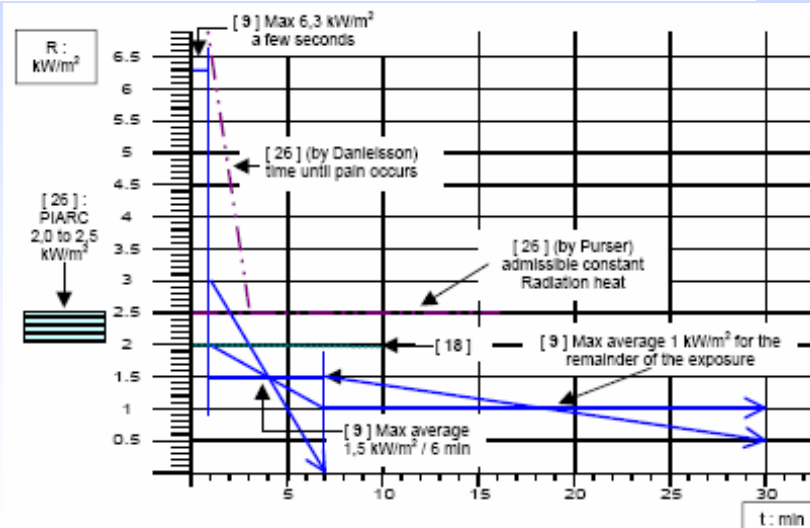


FIGURE 4. RADIATION TENABILITY THRESHOLD VALUES

Some problems with these technical reports !

..., some comments are no more relevant today, ...

V.4 - Cause of fires

Regarding the LV, the most frequent cause is from electric origin.

Regarding the HV, a large proportion (60 to 70%) of the fires comes from overheating brakes.

The 'fire after accident' phenomenon is very rare. To our knowledge only 2 cases have been recorded of a fire starting after an accident. They happened:

- in Germany, in the Elb Tunnel (1 fire following an accident over 16 years of operation representing 63 fires)
- in Italy in the Serra Ripoli Tunnel.

Extract of the Technical report Road Safety in Tunnels (1996)

Some problems with these technical reports !

..., some "horizontal" reports are not fully integrated in the other "vertical" reports, ...

It is the case of the Technical reports

- **Human factors and tunnel safety regarding users (2007)**
- **Integrated approach to road tunnel safety (2007)**

and other reports !

Some problems with these technical reports !

..., the problems with the maintenance point of view, ...

Even if the name of the C3.3 technical committee is

ROAD TUNNEL OPERATION

many technical reports on Operation and Maintenance were written after the publication of the technical reports on equipments.

That means that you need to integrate by yourself many of these Operation and Maintenance recommendations in the technical reports dealing with equipments !

How to solve these problems !

..., the problems with the maintenance point of view, ...

A solution could be :

- **to update the oldest reports**
- **to integrate the different reports and their recommendations**
- **to standardize the source data**
- **to suppress the duplications**
- **to identify and to fill in the gaps**
- **to present the integrated results in a single coherent document**

during the next PIARC 4 years cycle.

How to present these integrated results !

Four main solutions with their pros and cons !

1. BOOK

- Easiest way for consultation, see ITS Handbook
- More expensive, B/W, one shot

2. CD-ROM

- Less expensive, colours, programs, videos
- Less easy for consultation, one shot

3. BOOK + CD-ROM

- See example PIARC Road safety manual

4. WEBSITE

- The less expensive, colours, programs, videos, dissemination, evolving solution
- Less easy than a book, never finished

How to present these integrated results !

The "BOOK" solution : faisability (1)

Vol 1 : Conception - Safety - Geometry (+- 500 pages)

- **Conception : $20 + 30 = 50$ pages**
 1. 1995 : The First Road Tunnel
 2. 1995 : Classification of Tunnels
- **Safety : $30 + 80 + 60 + 95 + 15 = 280$ pages**
 1. 1996 : Road Safety in Tunnels
 2. 2007 : Integrated approach to road tunnel safety
 3. 2007 : Risk analysis for road tunnels
 4. 2007 : Human factors and tunnel safety regarding users
 5. 2006 : R/R 329 and R/R 330 articles
- **Geometry : $35 + 35 + 10 + 30 + 15 = 125$ pages**
 1. 2002 : Cross Section Geometry in Uni-directionnal Tunnels
 2. 2004 : Cross Section Design for Bidirectional Road Tunnels
 3. 2007 : Lay-bys and emergency stations in road tunnels
 4. 2007 : Direction Signing on a Route incorporating Tunnels
 5. 1995 : R/R 288 article

How to present these integrated results !

The "BOOK" solution : faisability (2)

Vol 2 : Fire and smoke control - Ventilation - Air quality

(+- 500 pages)

- **Fire and smoke control : $140 + 100 + 40 + 25 + 5 = 310$ pages**
 1. 1999 : Fire and Smoke Control in Road Tunnels
 2. 2007 : Systems and equipment for fire and smoke control in road tunnels
 3. 2007 : An assessment of fixed fire fighting systems
 4. 2004 : R/R 324 : Fire safety in
 5. 2007 : R/R 334 : Effects of pavement on fires in road tunnels
- **Ventilation : $25 + 30 + 30 = 85$ pages**
 1. 1996 : Road Tunnels: Emissions, Environment, Ventilation
 2. 2004 : Road Tunnels: Vehicle Emissions and Air Demand for Ventilation
 3. 2007 : Road tunnels : Operational strategies for ventilation
- **Air quality : $20 + 60 = 80$ pages**
 1. 2000 : Pollution by Nitrogen Dioxide in Road Tunnels
 2. 2007 : A Guide To Optimising The Air Quality Impact Upon The Environment



How to present these integrated results !

The "BOOK" solution : faisability (3)

Vol 3 : Equipments - Maintenance and Operation - Rescue services (+- 450 pages)

- **Equipments : 60 pages**
 1. 2007 : Systems and equipment for fire and smoke control in road tunnels
- **Maintenance and Operation : $70+25+80+35+25+50=285$ p**
 1. 1999 : Road Tunnels: reduction of Operating Costs
 2. 2003 : Traffic Incident Management Systems used in Road Tunnels
 3. 2004 : Good Practice for the Operation and Maintenance of Road Tunnels
 4. 2007 : Guide for organising, recruiting and training road tunnels operating staff
 5. 2007 : Recommendations to owners and operators of urban tunnels
 6. 2007 : Tools for tunnel safety management
- **Rescue services : $20 + 60 = 80$ pages**
 1. 2007 : Management of the operator-emergency teams interface in road tunnels

What do we need now ?

Issue 4 : Evaluate, systematize and communicate knowledge on tunnel operation and safety

Activities

- Identify needed information and scrutinize contents of existing PIARC and other reports
- Establish the document(s) specified after the first output (e.g. tunnel manual for practitioners or guide for non-specialists)

Outputs

- General table of contents, links to relevant documents, needs for future work
- Document presenting in a systematic way e.g. available knowledge for specialists or practical information for non-specialists

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DISCUSSION !

