

8. ENVIRONMENT

The construction of urban tunnels is driven in most cases by the need to keep road traffic at a certain level of service. However, as portals are often situated in built up areas with a high population density, environmental issues play an important role. These concern in most cases airborne emissions as well as emissions of noise.

8.1. EXTERNAL AIR QUALITY

For external air quality, threshold values are given in various national and international air quality acts or defined by the WHO (World Health Organisation). Contrary to the in-tunnel threshold values, air quality standards are set in order to prevent human beings from the harmful effects of long term exposure to urban air pollution. The issue of air pollution due to tunnels has already been examined in detail in PIARC 2008 [3].

8.1.1. Portal emissions

In order to achieve this conformity with environmental standards, it might be necessary to manage portal emissions. This can be done as follows:

- by extracting the polluted air in the portal region and dispersing it at a different location (*illustration 31*);
- by adjusting the portal air flow in order to enhance dilution of the portal emission,
- or in certain cases by applying cleaning technologies for the exhaust tunnel air.



*Illustration 31 - Stockholm Northern Link –
Shaft for the polluted air exhaust, located upstream tunnel portal*

Which method is used and to which extent the airborne emissions from the tunnel have to be dispersed should be determined during the environmental impact study, and hence is site dependent. Nevertheless it has to be mentioned that any additional effort for management of portal emissions will result in an increase of installation costs, energy consumption for running the ventilation and will therefore also impact operation costs.

8.1.2. Tunnel air filtration

PIARC 2008 [3] and CETU 2010 [7] deal in detail with the topic of tunnel air filtration. It can be summarized that a certain number of tunnels are installed with filtration systems for particles, a few ones with filtration/conversion systems for nitrogen oxides, but most of them are not in operation due to various reasons.

8.2. NOISE ISSUES

Ventilation equipment in tunnels acts as an acoustic source with a potential to cause noise pollution. This includes jet fans and extraction or blowing fans placed in ventilation plants. This problem can be especially sensitive in urban areas. In both cases, this involves axial fans that can be fitted with silencers or sound attenuators at the flow input and/or output of the fans but also sound reduction panels in particular cases.

In the investigation questionnaire there was no topic concerning the noise issues.

8.3. REFERENCE TO MONOGRAPHS

Most of the tunnels investigated do not have provisions for managing portal emissions, although being partly in heavily built up areas.

Some tunnels and tunnel projects like the Blanka and Mrazovka tunnel in Prague (CZ) but also Northern and Southern Links in Stockholm (S) account for this issue. Portal emissions management is popular in various tunnels in Australia.

Many existing urban tunnels are designed with portal air extraction systems (e.g. Australia, Switzerland, etc.). However, it should be mentioned that due to the fact that the impact of portal emissions is in most cases acceptable, tunnel portal air extraction systems are often not in operation.

The air cleaning equipment and NO_x treatment plants that had been installed in several tunnels in Oslo (N) are no longer in operation, essentially due the low efficiency of the systems, their maintenance costs and also the reduction of the emissions by vehicles.

In the case of M30 tunnels (E), the cleaning system is automatically switched on when the corresponding exhaust fans are in operation. However, these operate very rarely due to a limited level of pollution which is largely lower than the one expected during the design phase.

In Chiyoda and Yamate tunnels in Tokyo (J), air cleaning features have also been installed in the ventilation plants. They are still under operation but the operating time varies depending on the traffic volume and the location of the plants.

Regarding noise issue, no information has been provided in the answers of the questionnaire.