3.7. Tunnels

3.7.1. Tunnels shall be provided with smoke control systems in accordance with **Table 10.25.**

Table 10.25.: Tunnel Smoke Management System Requirements

LOCATION	SYSTEM REQUIREMENTS
1. ROAD TUNNEL	**1. GENERAL** i. Ventilation is necessary in most road tunnels to limit the concentrations of contaminants to acceptable levels within the traveled roadway. ii. Ventilation systems can also be used to control smoke and heated gases that are generated during a tunnel fire emergency. iii. The intent of the Tunnel Smoke control shall be to provide an evacuation path for motorists who are exiting from the tunnel and to facilitate fire-fighting operations. iv. Smoke management Systems, other than using jet fan systems, shall be installed through a fire engineering analysis, demonstrating the efficiency and fulfillment of the above mentioned intent. **1.1. TUNNELS WITH BIDIRECTIONAL TRAFFIC** i. In tunnels with bidirectional traffic, where motorists can be on both sides of the fire site, the following objectives shall be met. a. Smoke stratification shall not be disturbed. b. The longitudinal air velocity shall be kept at low magnitudes. c. Smoke extraction through ceiling openings or high openings along the tunnel wall (s) is effective and shall be considered. **1.2. TUNNELS WITH UNIDIRECTIONAL TRAFFIC** i. In tunnels with unidirectional traffic, where motorists are likely to be located upstream of the fire site, the following objectives shall be met. a. Prevent a backlayering by producing a longitudinal air velocity that is greater than the critical velocity in the direction of the traffic flow. b. Avoid disruption of the smoke layer initially by not operating jet fans that are located near the fire site. Operate fans that are farthest away from the site first. c. Maximize the exhaust rate in the ventilation zone that contains the fire and minimize the amount of outside air that is introduced by a transverse system. d. Create a longitudinal airflow in the direction of traffic flow by operating the upstream ventilation zone(s) in maximum supply and the downstream ventilation zone (s) in maximum exhaust. **2. ROAD TUNNELS HAVING TOTAL LENGTH OF LESS THAN 90 m.** i. Natural ventilation in accordance with either **Section 2.11.** OR **Section 2.15.** shall be acceptable. ii. Natural ventilation utilizing the tunnel openings shall be acceptable. iii. A jet fan system shall not be mandatory. **3. ROAD TUNNELS HAVING TOTAL LENGTH OF MORE THAN 90 m.** i. A jet fan system, in accordance with **Section 2.14.** shall be provided for the entire tunnel. ii. Other systems or combinations of systems shall be permitted, where justified by an engineering analysis and CFD modeling.