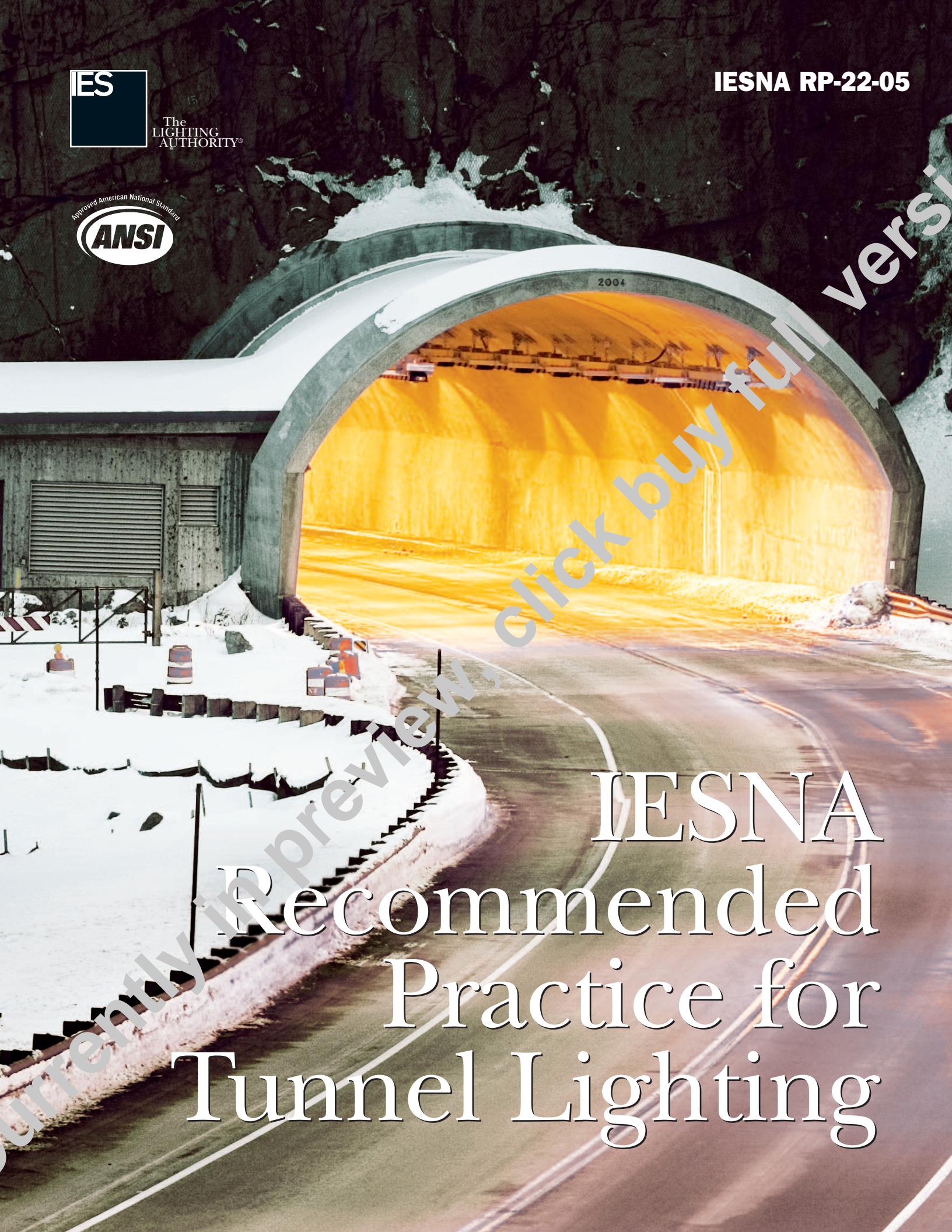




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IESNA RP-22-05



IESNA Recommended Practice for Tunnel Lighting

**American National
Standard Practice
for Tunnel Lighting**

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cover photo: Wolf Creek Tunnel, Colorado Department of Transportation

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1.0 INTRODUCTION

This Standard Practice has the objective of providing information to assist engineers and designers in determining lighting needs, recommending solutions, and evaluating resulting visibility at vehicular tunnel approaches and interiors. This Practice is intended also for use by administrators charged with the responsibility of providing a safe visual environment within a tunnel both day and night.

The Standard Practice deals entirely with lighting and associated systems and does not give advice on construction practice. It is neither intended as, nor does it establish a legal standard for tunnel lighting systems. Its purpose is to provide recommended practices for designing new tunnel lighting systems and it is not intended to be applied to existing lighting systems until such systems are redesigned. It has been prepared to advance the art, science, and practice of illumination as it pertains to tunnel lighting in North America.

Lighting is added to vehicular tunnels to enable a motorist to maintain speed and safely navigate. The basic design criteria for tunnel lighting are outlined in **Section 6.0**. Tunnels may require considerably different treatment of the threshold zone luminance values, depending on variables such as geographic orientation, geometric design, traffic volume, traffic speed, service levels, light source used, and modes of light application. The lighting designer therefore

should consider the factors which affect the visibility conditions as outlined in **Sections 3.0, 4.0, 5.0, 7.0, and 8.0**.

Treatment of tunnel portals, wall and ceiling surfaces, and selection of lighting equipment, as well as light sources, maintenance and lighting economics are also reviewed and assessed. However, special requirements for pedestrians are not addressed in this document. For pedestrian and underpass lighting refer to ANSI/IESNA RP-8, *American National Standard Practice for Roadway Lighting*.¹

2.0 PHYSICAL CHARACTERISTICS

2.1 Definition of a Tunnel

A tunnel is defined as a structure over a roadway, which restricts the normal daytime illumination of a roadway section such that the driver's visibility is substantially diminished.

2.2 Tunnel Classification

In determining whether a structure constitutes a tunnel or an underpass, two factors should be taken into account: structure length, and its geometric alignment and profile (visibility through the structure).

2.2.1 Tunnel. A tunnel is a structure covering a roadway which, by producing a shadow, limits the

Table 1: AASHTO STOPPING SIGHT DISTANCE (Wet Pavement)

Traffic Speed (estimated km/h and mph)		Estimated Safe Stopping Sight Distance (SSSD)*	
Kilometers per Hour	Miles per Hour	Meters	Feet
50	30	65	200
60	40	85	305
80	50	130	425
90	55	160	495
100	60	185	570
110	65	220	645

Refer to American Association of State Highway and Transportation Officials (AASHTO) "A Policy on Geometric Design of Highways and Streets," 2001 for accurate calculation of stopping sight distance.

The speed and distance columns only correspond to their metric or English equivalent (i.e., if determining the SSSD for a posted speed in miles per hour, use the value shown for feet, if using kilometers per hour, use the value shown for meters).

* Assumes average prevailing speeds in a straight and level tunnel approach roadway are at, or near, the posted speed limit of the facility. For other geometric conditions, refer to the AASHTO document.

ability of a driver to see objects or obstructions within the structure. It is also of sufficient length or composition to require an adaptation of the driver's eye to the lower lighting levels within the tunnel structure. A tunnel requires supplemental daytime lighting in order to compensate for this diminished visibility as well as transition lighting to lower interior lighting levels to allow for adaptation. Refer to American Association of State Highway and Transportation Officials (AASHTO) "A Policy on Geometric Design of Highways and Streets," 2001 for accurate calculation of stopping sight distance.

The speed and distance columns only correspond to their metric or English equivalent (i.e., if determining the SSSD for a posted speed in miles per hour, use the value shown for feet, if using kilometers per hour, use the value shown for meters).

2.2.2 Divided and Undivided Tunnels. A structure which consists of two separate enclosures, each designated to accommodate one direction of traffic flow, is considered to be a divided tunnel.

A structure which consists of a common enclosure to accommodate the traffic flow in both directions is considered an undivided tunnel.

2.2.3 Underpasses. Structures considered to be underpasses are those in which the length and physical configuration of the structure do not substantially limit the driver's ability to see objects within the structure. No supplemental daytime lighting is required for underpasses or structures less than 25m (80ft.) in length. The zero percent values in **Table 2** show when supplemental daytime lighting is not required.

For nighttime illumination underpasses can also be classified as short or long. Short underpasses can generally be lighted with conventional street and roadway luminaires and placements. When the lighting levels and uniformity on the roadway provided by the conventional roadway lighting system are affected by the structure, then the underpass can be classified as long and will require additional lighting. When pedestrian lanes or sidewalks are included as part of an underpass then pedestrian lighting should be considered. Lighting levels should be as recommended in ANSI/IESNA RP-2, *American National Standard Practice for Roadway Lighting*.¹

2.3 Tunnel Topology

Terms used to describe tunnel topology are as follows, see **Figure 1**.

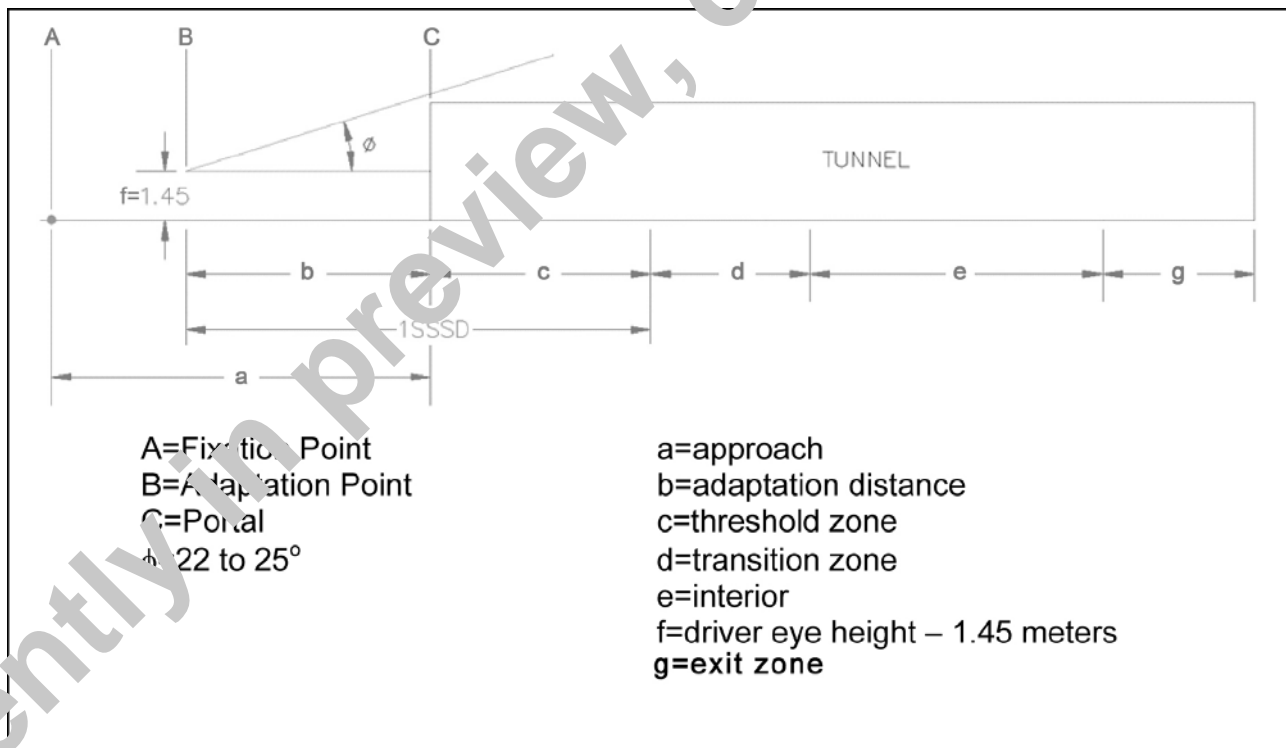


Figure 1. The primary external and internal areas associated with and affected by tunnel lighting design.