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## Standard Guide to Properties of High Visibility Materials Used to Improve Individual Safety<sup>1</sup>

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### INTRODUCTION

For many years the problem of pedestrian–motor vehicle collisions has been a major one in the United States and the rest of the world. In the U.S., in the last three years for which data are available (1988–1990), there have been on the average about 8200 pedestrian fatalities per year, of which about 54 % occurred at night **(1)**.<sup>2</sup> In addition, over 100 000 pedestrians were injured by motor vehicles each year **(2)**.

Lack of adequate visibility and conspicuity of pedestrians at night and during the day is considered to play a direct role in many of these accidents. An investigation of pedestrian accidents lists the following six driver and pedestrian actions necessary for safe travel: search, detection, evaluation, decision, human action, and vehicle action **(3)**.

Research shows that pedestrians typically overestimate their visibility **(4)**. Since the average pedestrian is not likely to be able to determine means for establishing adequate visibility, guidelines are needed to improve visibility and conspicuity of pedestrians. Guidelines and, in fact, standards **(5, 6)** have been provided for other road users (for example, trucks, passenger cars, motorcycles, and bicycles) in an attempt to meet visibility needs, but not for pedestrians. This guide provides general principles for the enhancement of pedestrian visibility both at night and during the day. These principles also generally apply to anyone else exposed to motor vehicles, including construction workers, airport workers, bicyclists, and motorcyclists.

### 1. Scope

1.1 This guide covers the physical principles and variables involved in the performance and selection of high visibility materials for individual safety.

1.2 It is the purpose of this guide to examine the principles on which future standards relating to individual safety may be used. However, this guide does not set minimum standards for the properties of high visibility materials.

1.3 In reviewing the principles contained in this guide, it must be remembered that there are numerous factors adversely affecting visibility and safety (for example, rain, snow, road grime, alcohol, advanced age, drugs, fatigue, inattention, headlamp misalignment or breakage) that must be taken into account when dealing with actual safety requirements.

1.4 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appro-*

*priate safety and health practices and determine the applicability of regulatory limitations prior to use.*

### 2. Referenced Documents

#### 2.1 ASTM Standards:

D 1535 Test Method for Specifying Color by the Munsell System<sup>3</sup>

D 2244 Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates<sup>3</sup>

E 284 Terminology of Appearance<sup>3</sup>

E 308 Test Method for Computing the Colors of Objects by Using the CIE System<sup>3</sup>

E 808 Practice for Describing Retroreflection<sup>3</sup>

E 809 Practice for Measuring Photometric Characteristics of Retroreflectors<sup>3</sup>

#### 2.2 Other Standards:

CIE S002 Colorimetric Observers<sup>4</sup>

SAE J579c Sealed Beam Headlamp Units for Motor Vehicles<sup>5</sup>

<sup>1</sup> This guide is under the jurisdiction of ASTM Committee E-12 on Appearance and is the direct responsibility of Subcommittee E12.08 on High Visibility Materials for Individual Safety.

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<sup>2</sup> The boldface numbers in parentheses refer to the list of references at the end of this standard.

<sup>3</sup> *Annual Book of ASTM Standards*, Vol 06.01.

<sup>4</sup> Available from the USNC-CIE Publications Office, c/o TLA Lighting Consultants, Inc., 72 Loring Avenue, Salem, MA 01979.

<sup>5</sup> Available from the Society of Automotive Engineers, 400 Commonwealth Avenue, Warrendale, PA 15096.