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LIGHTING SCIENCE: CONCEPTS AND LANGUAGE OF LIGHTING

AN AMERICAN NATIONAL STANDARD

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1.0 Introduction and Scope

1.1 Introduction

Lighting's language fulfills the need to describe, specify, and evaluate luminous environments. Like any language, it is based on concepts and vocabulary. The concepts result from a consideration of the nature of light, vision, and architecture. The vocabulary results from the need for clarity, specificity, and precision. The structure of lighting's concepts is an inverted pyramid: a very few fundamental ideas are identified and described, and from these more-complex concepts are constructed. Simpler concepts form the constituents of the more complex ones required to unambiguously specify luminous quantities or the photometric behavior of materials. In this Lighting Science document, the fundamental or most basic concepts are described first, many of which have their roots in the work of Johann Lambert and André Blondel.[1] These are followed by more-complex or derived concepts.

1.2 Scope

Only the most important quantities and units used in lighting design and illuminating engineering that relate directly to optical radiation, light, and vision are described and defined in this document. The technical words associated with lighting equipment, photometry, lighting calculations, color, and daylighting are defined in other documents in the IES Library, and they rely on an understanding of the material presented in this document. (Refer to *ANSI/IES LS-1-22, Lighting Science: Nomenclature and Definitions for Illuminating Engineering*[2] for the locations of the definition of specific words.)

A full nomenclature and many more derived and specialized quantities are also described in the International Lighting Vocabulary, established by the International Commission on Illumination (CIE) and published jointly with the International Electrotechnical Commission.[3] More than 900 technical definitions of concepts and quantities are given in English, French, German, and Russian.

2.0 Language and Concepts

2.1 General Words

Lighting's conceptual vocabulary adopts words found in common usage and gives them a special, technical meaning. Precision in describing concepts makes this necessary.

radiant energy: This is the general term for energy propagated by radiation through a vacuum or a material, in distinction to energy transported by conduction or convection. The term is used when no particular model of energy transport is implied or when any wavelength or frequency can be involved. Three specific types of radiant energy include:

- **electromagnetic radiation:** In some cases, it is necessary or convenient to imply one of the two physical models of radiative energy transport: electromagnetic waves or photons. (Refer to *ANSI/*

SIDEBAR

Descriptive words are an important part of Lighting's vocabulary. In English, lighting concept names often derive from a stem word, usually a verb, to which suffixes are added, abiding by the following general customs of usage:

-ance added to the verb creates a noun related to an action. This is usually the noun of quantity.

-ive or *-ing* added to the verb creates an adjective of nature that describes having the character of an action.

-ivity added to the verb, or *-ity* added to an adjective, creates a noun of abstraction, giving a name to the active property.

-tion added to the verb creates a noun of state or condition.

An example of this vocabulary construction using the word "reflect" is:

reflect. Verb; to bounce off.

reflectance. Noun of quantity; the amount of reflecting.

reflective. Adjective of nature; able to reflect.

reflectivity. Noun of abstraction; the property of being reflected.

reflection. Noun of state or condition; being reflected.