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Illuminating Engineering Society

LIGHTING PRACTICE: LIGHTING CONTROL SYSTEMS – PROPERTIES, SELECTION, AND SPECIFICATION

AN AMERICAN NATIONAL STANDARD

Approved American National Standard ANSI

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1.1 Introduction

Lighting controls are an essential component of any lighting system, serving multiple purposes and ranging from simple user-activated switches to advanced scene controllers, automatic sensor-controlled systems, and networked digital control systems. In addition to basic on/off control, they are used to tailor lighting to space functions, tasks, and user preferences while enhancing comfort, performance, aesthetic appeal, and energy savings. For multicolor systems, such as red-green-blue (RGB) and tunable-white LEDs, the control system can also vary source color. These functions support visual needs (see A*NSI/IES LP-1-20, Lighting Practice: Designing Quality Lighting for People and Buildings*[1]) by allowing users to design for appropriate illuminance and color characteristics, thus enabling mood setting and/or task-illuminance tuning to achieve optimal viewing and working conditions. This approach allows the lighting to become responsive to the users' needs within each space, resulting in a higher level of user satisfaction, increased safety and security, greater energy savings and, potentially, a healthier environment.[1]

Lighting controls play a key role in energy management. As electric light sources have become more energy efficient and installed lighting power density values have declined over the past 40 years, lighting control has become the primary means to achieve additional energy savings, by minimizing or eliminating the use of electric lighting whenever possible. Lighting control that reduces lighting power for aesthetics also saves energy. To understand how to accomplish both aesthetic and energy conservation goals, designers and installers need to have an understanding of the control devices and approaches available and in common use; these largely fall within some basic device and system categories.

In recent years, as the importance of an increased focus on sustainability within current design practice has gained prominence, and local and national energy usage codes and guidelines have tightened, energy-saving automatic lighting controls have become a more standard feature in the design and construction of nonresidential buildings. These devices and systems automatically switch or dim designated loads in response to events such as time of day, daylight fluctuation, occupancy, or energy-demand reduction events. The current U.S. energy reference standard, *ANSI/ASHRAE/IES Standard 90.1-2019, Energy Efficiency Design of New Buildings Except Low-Rise Residential Buildings*, contains comprehensive mandatory control requirements.[2]

1.2 Scope

This Lighting Practice document is intended to help designers, users, commissioning providers, and other interested parties understand fundamental characteristics and purposes of lighting control systems. These may include design considerations, energy-saving strategies, equipment, and the variety of organizing protocols and methods in common usage. The importance of commissioning as an ongoing process is briefly covered in this document but is fully addressed in *ANSI/IES LP-8-20, Lighting Practice: The Commissioning Process Applied to Lighting and Control Systems*.[3]

2.0 Core Concepts

2.1 User

For the purposes of this document, a *user* is either: 1) a manual interaction by a person with a control point such as a touch screen, preset station, computer, or fader station; or 2) an automated interaction such as an occupancy sensor, daylight sensor, time switch (often called a *timeclock*), or other digital interface.

2.2 Controller

A *controller* is a device that originates a command to execute a lighting change. Controllers are most commonly associated with a lighting control station or control console; a controller may also be a sensor or other automatic device operating without human interaction. In lighting control applications, the lighting controller usually contains all of the instructions for operating all of the connected luminaires based on information from the various sensors—e.g., occupancy and light—as well as the user-operated switches and