ANSI/IES LP-13-21

Illuminating
ENGINEERING SOCIETY

LIGHTING PRACTICE: INTRODUCTION TO RESILIENT LIGHTING SYSTEMS

AN AMERICAN NATIONAL STANDARD

Approved American National Standard
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Publication of this document
has been approved by IES.
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should be directed to IES.

Prepared for IES
By the Resilience Committee

Approved by the IES Standards Committee, August 8, 2021, as a Transaction of the Illuminating Engineering Society.

Approved November 2, 2021, as an American National Standard.

Published by the Illuminating Engineering Society, 120 Wall Street, New York, New York 10005.

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Printed in the United States of America.

ISBN# 978-0-87995-412-3

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Prepared by the IES Resilience Committee.

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1.1 Introduction

Every year, buildings and infrastructure are subjected to severely disruptive events caused by natural disasters and human-made intentional attacks. These events create significant disruptions and economic damages in addition to unfortunate injury and loss of life. According to the U.S. National Oceanic and Atmospheric Administration, there were 22 separate billion-dollar extreme weather events across the United States in 2020 resulting in $95 billon of damages.[1] To reduce the impacts of these disasters, communities, building owners, institutions, public agencies, and others are looking to enhance the resilience of buildings, infrastructure, and communities overall.

For the purpose of this document, *resilient design* is defined as the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.[2] Emergency planning is not a new undertaking. However, with such high-profile events as Hurricane Katrina, Superstorm Sandy, and the COVID-19 pandemic, focused efforts to understand how the built environment can incorporate resiliency into homes, buildings, and infrastructure is a distinct goal. The purpose of this Lighting Practice document (LP) is to introduce the concept of resilient design and explain how lighting systems can support the goals of enhancing the resilience of buildings. The intent is to provide guidance on lighting performance, controls, and the characteristics of lighting equipment for resilient buildings.

1.2 Scope

The scope of this LP does not include emergency lighting for the purpose of evacuation and marking of egress paths, since building codes already dictate these needs. In addition, this document is not intended for the development of emergency plans or courses of action during extreme events. For example, determining when to evacuate a building or whether to shelter in place is determined by local authorities.

2.0 Definitions

2.1 Resiliency

The term *resiliency* is often used to describe the broad goal of community resilience, which is concerned with addressing functionality of services across a community. Buildings and infrastructure play critical roles in the community; therefore, it is critical that the design of resilient buildings (resilient design) take into consideration community-wide goals. On the other hand, building owners and institutions may have resiliency goals independent of community needs, which will also need to be considered by designers.

Current building codes focus on life safety and dictate how buildings should sustain acute events such as fires and earthquakes, while facilitating building evacuation. The ways that buildings anticipate, adapt, and function through sustained disruptive events may have common approaches to building evacuation, but the goals are distinct from those of evacuation. For example, there is industry consensus and, through model codes and standards such as the *International Building Code* and the U.S. *National Electric Code,* guidance for egress lighting (see **Section 3.0 The Role of Lighting in Resilient Buildings and Infrastructure**).

However, if adverse events require occupants to shelter in place, are there minimal building functions that require lighting? At what levels? For how long? Furthermore, while there are ways to "harden" systems to sustain adverse events, do all systems need to be hardened? Resilient design attempts to address these questions. The broad implication of the phrase *adverse events* can not only encompass a range of natural disasters from tornados to floods, but can also include human-made events that compromise building systems and energy service, such as terrorist attacks and cyber hacking. Planning for and adapting to these widely differing adverse events can result in different and potentially conflicting solutions. For example, planning for flood conditions typically dictates raising critical systems above flood elevations, whereas planning for tornados may encompass storm shelters that are in basements or below grade.