



Compliance with Lighting Standards and Management Systems (ANSI C137)

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Compliance with Lighting Standards and Management Systems

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This course is registered with **AIA CES**



Course Description

This session features a discussion and explanation of the standards development work being done by the new ANSI C137 Lighting Systems Working Group and how these comprehensive lighting standards will impact building and structure commissioning processes.

Learning Objectives

At the end of the this course, participants will be able to:

1. To make the audience aware of upcoming standards that will impact commissioning of lighting systems.
2. To explain the five topic areas of the ANSI C137 Lighting Systems standard.
3. To educate the audience about the value of the new ANSI C137 standard as applied to the commissioning of buildings.
4. To prepare the audience for the use of these new standard.

Being Green

- Who said “its not easy being green?”



Background that led to the creation of
American National Standards Institute
ANSI C137,
Standards for Lighting Systems



History of ANSI C137 – Lighting Systems

- Historically, lighting standards have focused on individual devices.

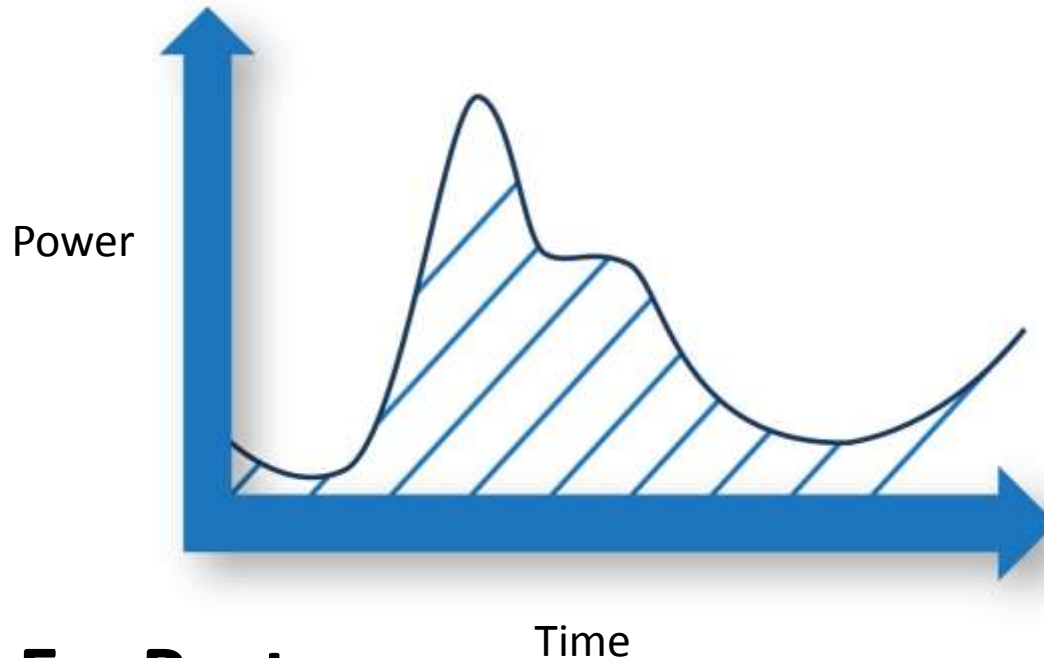


- Regulators and incentive programs did the same and imposed energy efficiency limits on individual devices;

History of ANSI C137 – Lighting Systems

ISSUE

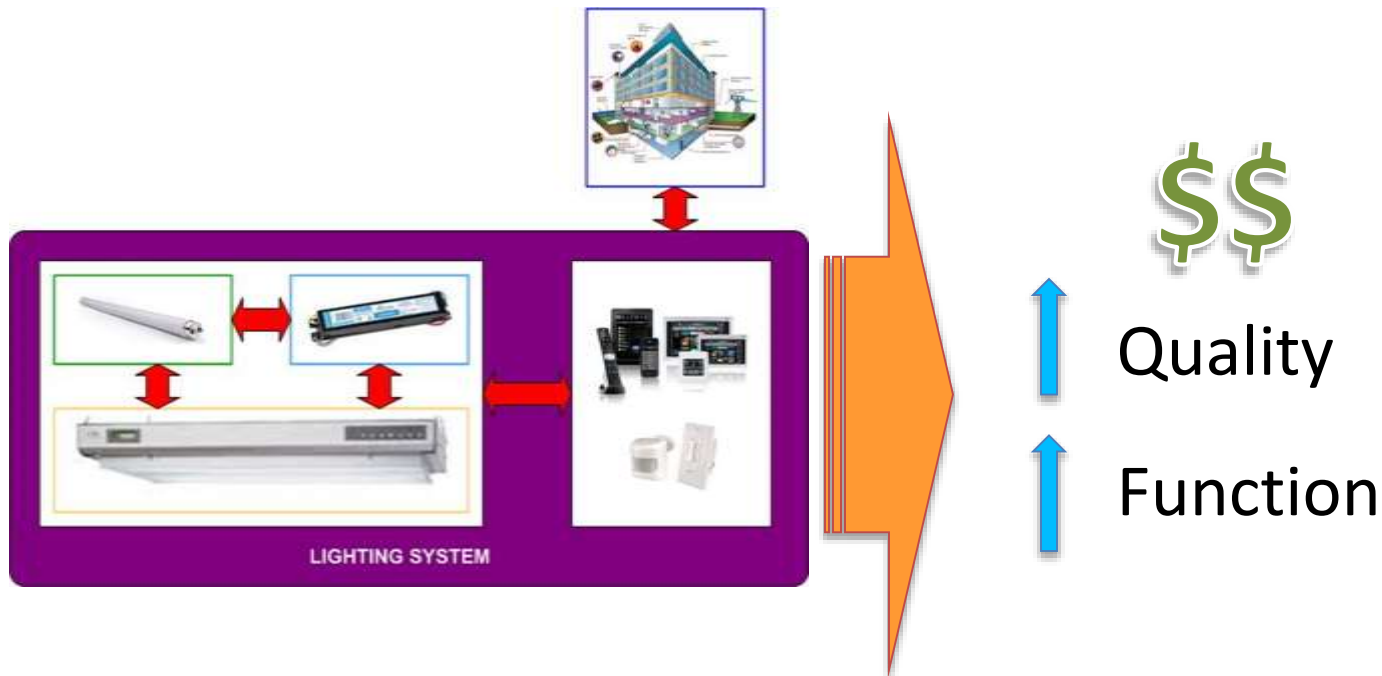
- This ignores the fact that total energy consumption is measured over time, not during an instantaneous moment.



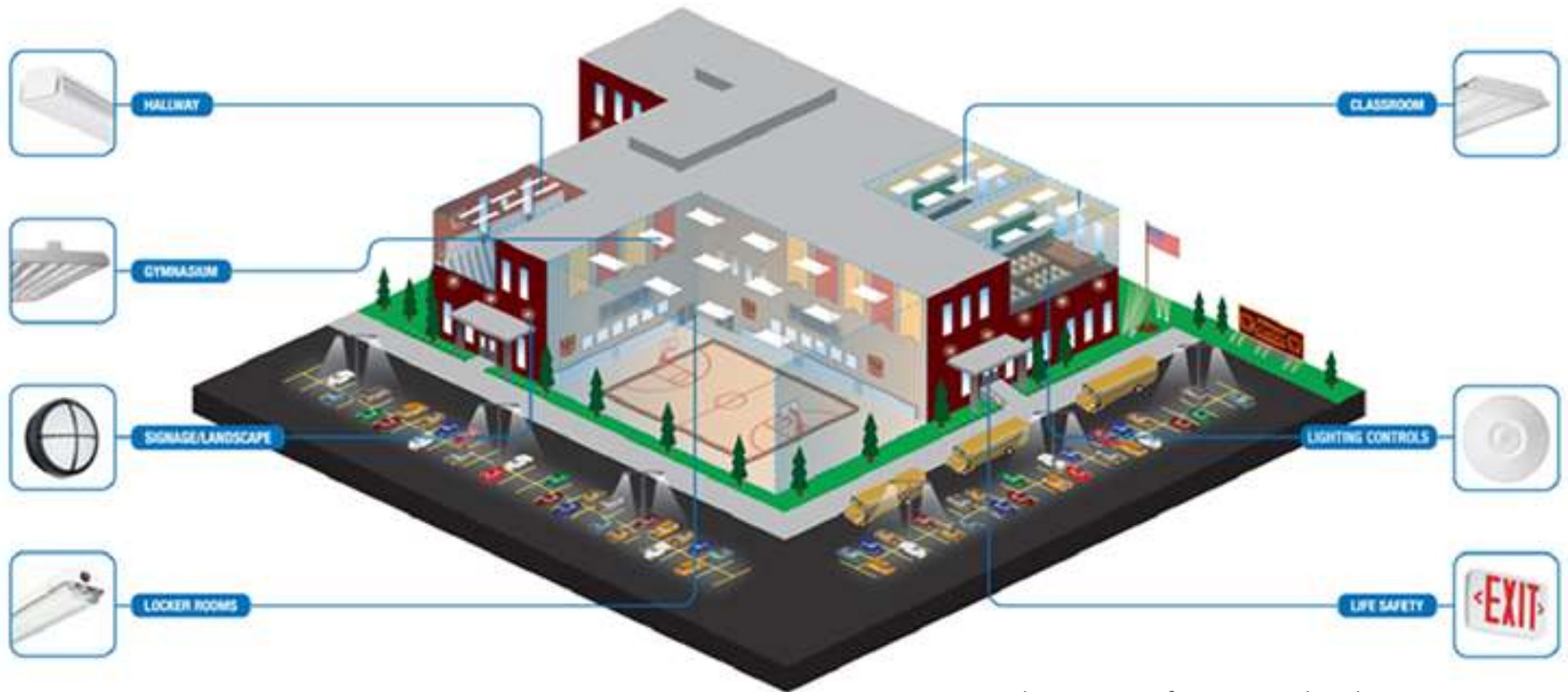
$$E = P \times t$$

History of ANSI C137 – Lighting Systems

- With the appearance of lighting systems, greater total energy savings became possible, along with enhanced lighting quality and function.



Buildings utilize **Lighting Systems**



Graphic courtesy of Acuity Brands Lighting, Inc.

Hallway
Gymnasium
Signage/Landscape
Locker Rooms

Classroom
Lighting Controls
Signage/Landscape
Life Safety

Lighting Systems emergence

- The lighting system approach makes lighting installations intelligent, allowing lighting to respond to external stimulus

Natural Light Levels

Occupancy

Use



Photo courtesy Lutron Electronics

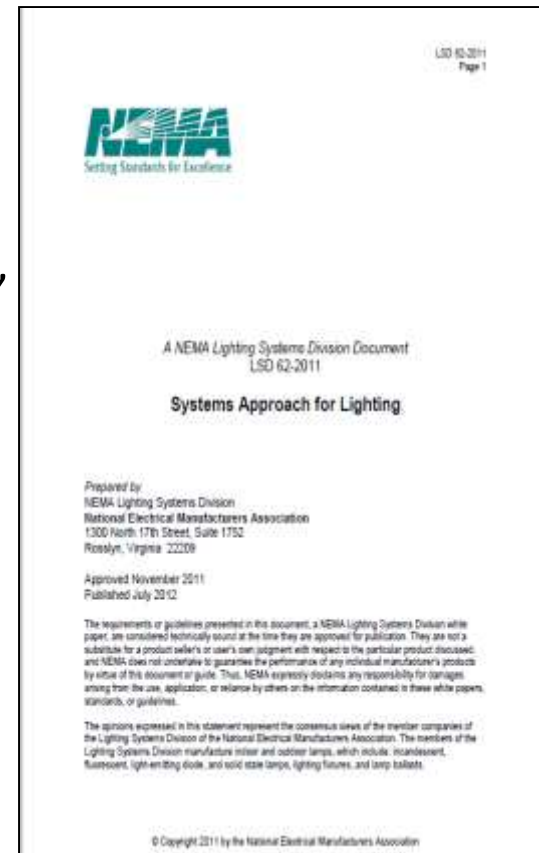
History of ANSI C137 – Lighting Systems

- The lighting industry and its professional associations believed that more energy savings could be obtained
- Replace lighting component regulations with regulations focused on complete lighting systems.
- In 2010, The National Electrical Manufacturers Association (NEMA) formed a Lighting Systems Task Force.



History of ANSI C137 – Lighting Systems

- 2011, The US Department of Energy (DOE) announced that they were evaluating test procedures for lighting systems. RIN 1904 – AC50 Federal Register, Vol. 76, No. 150, Aug. 4, 2011.
- 2012, NEMA published Lighting Systems Division Document LSD 62-2011 Systems Approach for Lighting.
- Clearly define what is meant by a “systems approach”
- Ensure that the approach is optimized for efficiency and ease of use,
- While ensuring that lighting quality and standards for visibility are preserved
- Such an approach must also be enforceable and nimble enough to allow newer technologies to be selected and installed



History of ANSI C137 – Lighting Systems

- It became apparent that there were gaps in standards, codes and regulations; they did not fully address lighting system issues such as security, compatibility & performance measurement.
- In 2012, Discussions in Global Lighting Community began to try to determine a course of action.



History of ANSI C137 – Lighting Systems

- Early 2014 an American National Standards Institute (ANSI) steering committee was established to consider forming the C137 ANSI committee to develop standards for lighting systems.



History of ANSI C137 – Lighting Systems

- During 2014, the ANSI C137 steering committee developed a committee scope, operating procedures and potential projects.
 - To develop standards and specifications for indoor and outdoor lighting systems
 - installed in an application with consideration of human health and comfort, personal security, the physical environment, energy consumption and daylight integration.
 - Such a system includes components (e.g., luminaires, sensors/controllers, and windows or skylights) and associated software designed to **minimize energy use** while **maintaining lighting quality** and that may be **interconnected** to provide control, monitoring functions and interface with related systems.
- The first formal meeting of ANSI C137 took place on Dec. 4 & 5, 2014.

C137 General Committee Structure

- Accreditation of ANSI C137 approved 7/23/14
“To develop standards and specifications for indoor and outdoor lighting systems...”
- The National Electrical Manufacturers Association (NEMA) is the secretariat for the Committee
- Committee participation open to any interested party
 - examples include manufacturers, users, utilities, consultants, testing labs and other SDOs



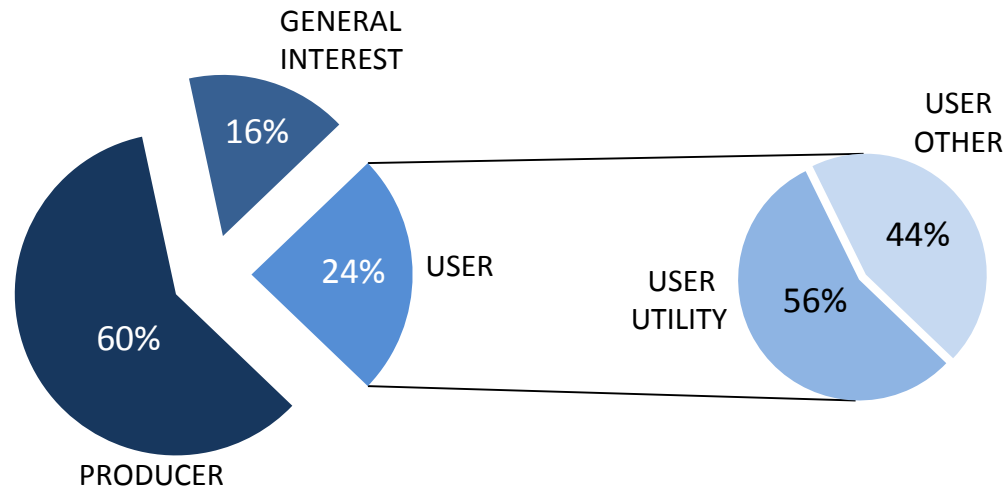
ANSI Essential Requirements

- Openness
- Lack of dominance
- Balance
- Consideration of views and objections
- Consensus vote
- Appeals

Balance

ANSI standards committees are required to try to maintain a balance of members

Balance of 37 organizations as of Feb 2016:



C137 Members by Category

We are actively seeking members in the General Interest & User categories

Expertise

- Expertise in a variety of topic subject areas is needed:

Lighting Components



Component Interactions



Nomenclature

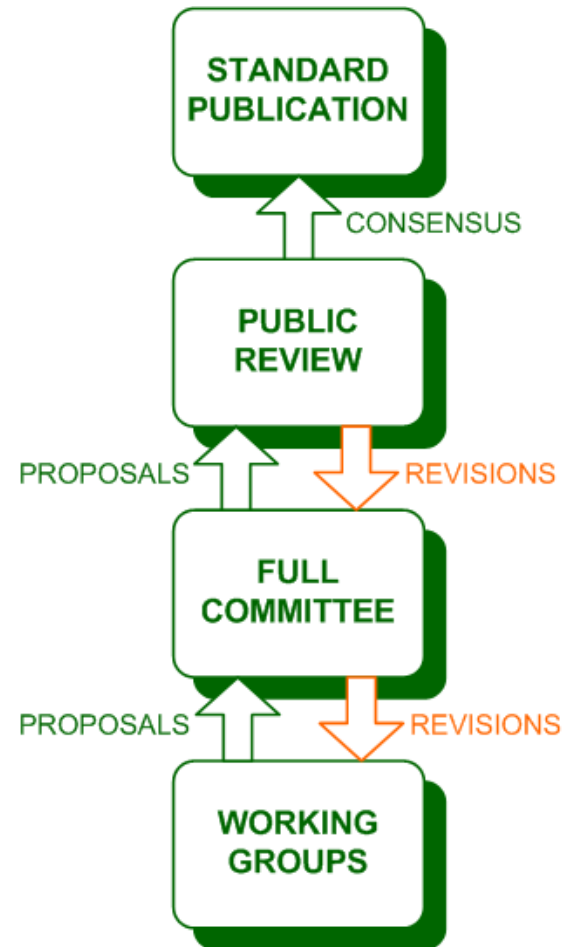


Networks

Working Structure

Working Groups create the document, which goes through different levels of review and revision before it is finalized.

- 5 Working Groups
- Specific Assignments
- Detailed Development of Standards



Meetings

- Full Committee meetings normally face-to-face
- Held at host facilities
- Last meeting (FP&L) was held in January
- Next full meeting at Gulf Power, May 4/5
- Working groups meet more often, normally by webinar/conference call



Committee Priorities

- Glossary of Terms for Lighting Systems
- Standards for Interoperability between Lighting Systems Components (e.g., 0-10V dimming curve)
- Standards for Compatibility with Non-Lighting Systems
- Standards for Interoperability with Non-Lighting Systems
- Guide for Development of Interchangeability Standards
- Best Practices for Ensuring Security in a Lighting Network
- Characterizing System Reliability (e.g., operating temperatures for power supplies and controls)
- Predicting the Lighting Performance of a System
- Predicting the Energy Performance of a System
- Measurement and Reporting of the Energy Performance of a System

Active Projects

- Definitions
- 0 – 10V Dimming
- Energy Reporting and Measurement
- Security
- First application focused system - Networked Parking Lot Lighting Systems
- More to come when the five projects above are completed.



Active Projects

DRAFT Definitions

- Compatibility
- Coexistence
- Interoperability
- Interchangeability
- Physical Interchangeability
- Functional Interchangeability



ANSI C137 – Lighting Systems – Draft Definitions

- **Compatibility**, depending on the context, may mean coexistence, interoperability, and/or interchangeability.
- Because the terms “compatible” and “compatibility” are ambiguous, their use is not recommended when other terms are more specific.
- See definitions of coexistence, interoperability, and interchangeability to determine which are most appropriate.
- **Coexistence**, the ability of systems or system components to operate together without having harmful or undesirable effects on each other.

ANSI C137 – Lighting Systems – Draft Definitions

- **Interoperability**, the ability of systems or systems components to transmit, receive, interpret, and/or react to data and/or power.
- **Interchangeability**, the ability of a system or system component to replace another system or system component and to perform in an equivalent way.
- **Physical interchangeability**
- **Functional interchangeability**

Active Projects

0-10 V LED dimming

- Purpose
- Scope
- Foundation
- Technical Content
 - What's new
- History and status

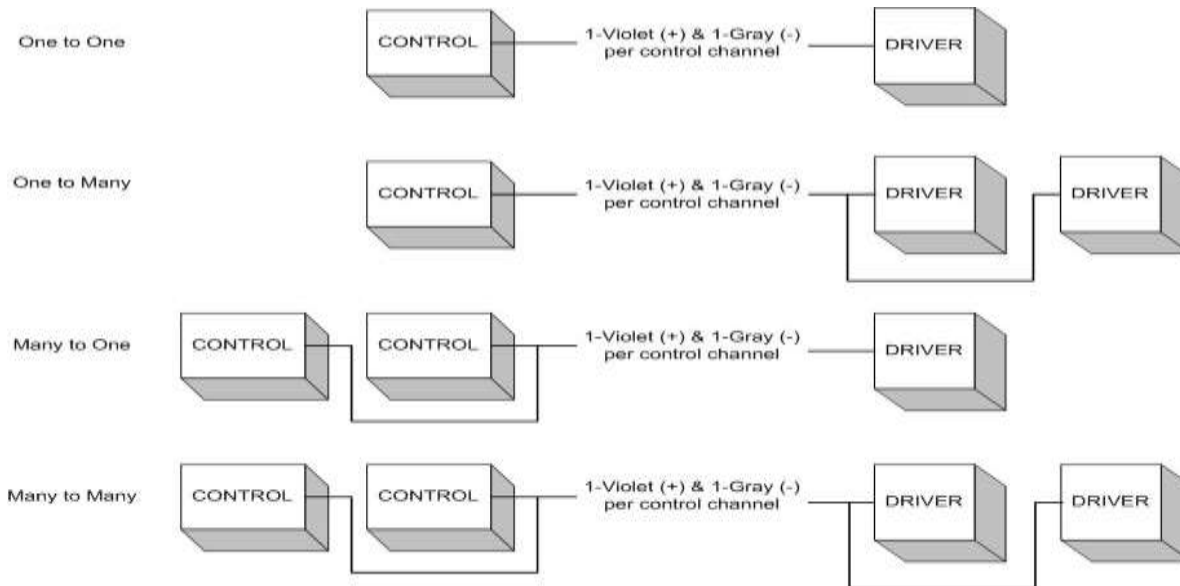
ANSI C137.1, 0-10 V LED dimming Purpose

- Standardize dimming interface of dimmable drivers, fluorescent ballasts and controls
- Improve interoperability



ANSI C137.1: 0-10 V LED dimming Scope

- Dimmable drivers and ballasts
 - External or internal
- Dimming controls
 - E.g., wall dimmers, daylight sensors
- One-to-one and many-to-many systems

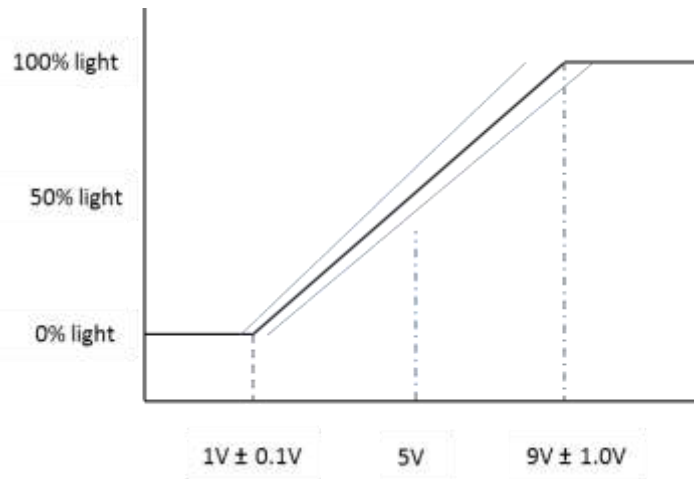


ANSI C137.1, 0-10 V LED Dimming Starting Point

- ANSI C82.11-2011, Annex A
 - Driver sources signal current; control sinks it
 - Similar to IEC 60929-2011, Annex E
- Not ANSI E1.3 (stage lighting)
 - Control sources signal current; driver sinks it

ANSI C137.1, 0-10 V LED dimming Content

- Endpoints of dimming “curve”
- Shape of dimming curve
- Range of control current
- Start time and response time (new)
- Standby (electronic “off”) signal (new)



ANSI C137.1, 0-10 V LED dimming

History and status

- Started February 2015
- Three in-person meetings; several telecons
- About 15 organizations represented
 - Producers, utilities, test labs, consultants
- Draft 0.4 for working group discussion
- Next draft for C137 review
- Next steps: public review, comment resolution, ANSI approval, publication
- Target: complete in 2016

Active Projects

ANSI C137 Energy Reporting

- This Ad Hoc Group is currently in the process of collecting data from industry experts for development of Use Cases.
- Intent is to help the Ad Hoc Group understand WHO will be using the standard, WHY it will be used and HOW it will be used.
- Energy Prediction will be the next phase.



Active Projects

ANSI C137 Security

- This Ad Hoc Group is currently developing a document for Commercial Parking Lots that utilizes the NIST Guide to Industrial control systems security (SP800-82).
- To provide cybersecurity requirements for Lighting Systems in Commercial Parking Lots with public access.



Active Projects

ANSI C137 Applications

- This AHG is currently developing a standard for Networked Parking Lot Lighting Systems.
- Members are reviewing options for communications.
- Preparing PINs information for ANSI



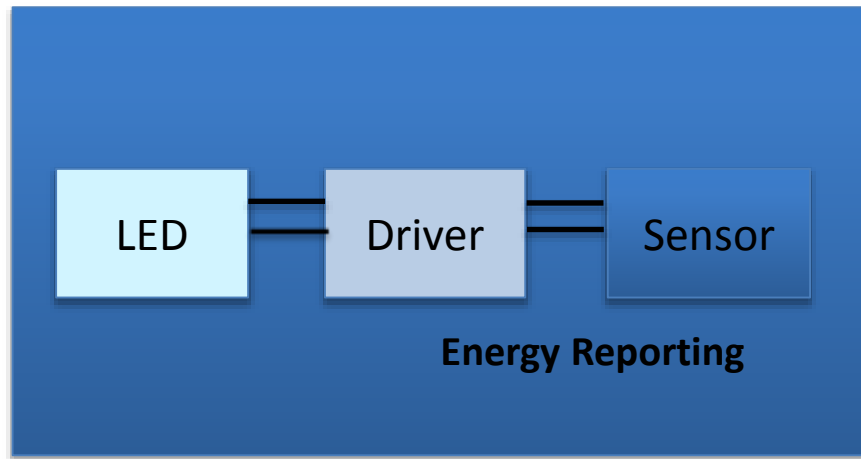
How C137 fits in the 'lighting space'

ASC C137 Role

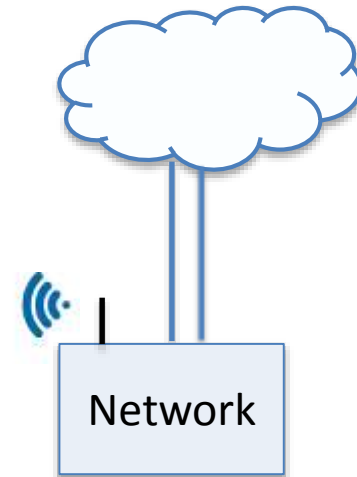


How C137 fits in the 'lighting space'

Development of system level standards for lighting



Luminaire

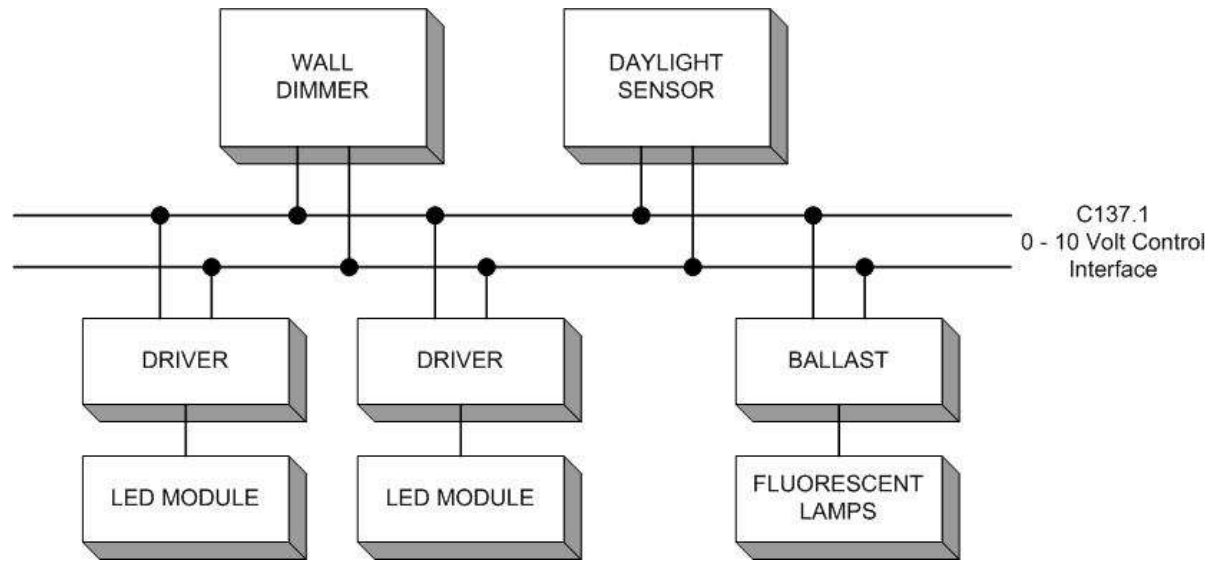


Peter Duine, Philips Lighting
2016 SSL R&D Workshop

Not addressed by component level standards for energy efficiency and other performance parameters

How C137 fits in the 'lighting space'

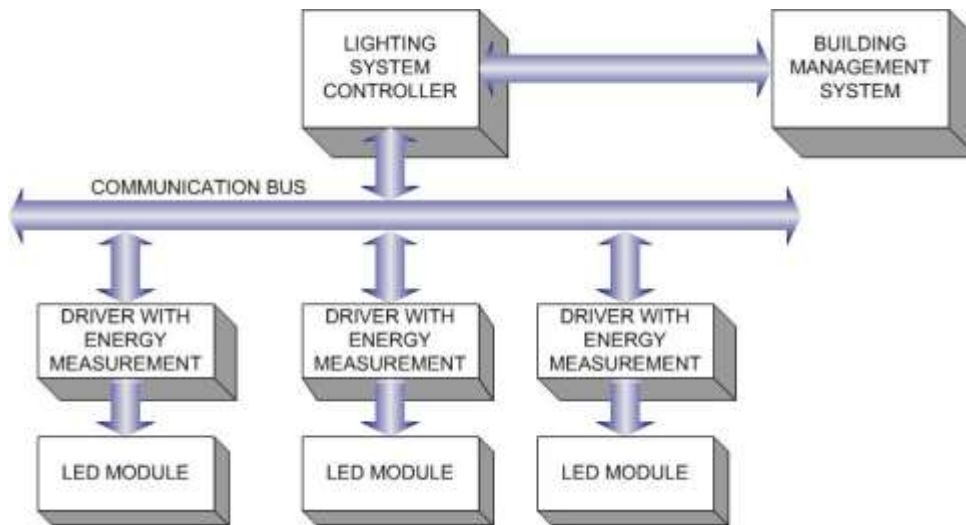
Standards for products that work together as a system, e.g. 0-10V Dimming



(Conceptual Diagram)

How C137 fits in the 'lighting space'

Standards that increase adoption of lighting systems - Energy Reporting



(Conceptual Diagram)

Also Standards for interoperability, methods of measurements, and security

How C137 fits in the 'lighting space'

ASC C137 Role

– **NOT** new standards for communication protocols



– **NOT** Safety Standards



– **NOT** Recommended Practice



– **NOT** Component Standards



ASC C78

ASC C82

ASC C136

How C137 fits in the 'lighting space'

Expected impact of C137 activities

View System Standards as the **minimum expected level** of performance and compliance

Leaving room for differentiation and value added innovation

Voluntary adherence to some ANSI C137 standards by manufacturers **to assure interoperability**



How C137 fits in the 'lighting and Commissioning space'

- **Expected impact of C137 activities**
 - Anticipate reference to various C137.xx standards by North American regulators
 - Energy measurements and reporting, applications
 - Building Codes
 - Energy star, Design Lights Consortium, and other voluntary programs
 - Utility incentive programs
 - Will require commissioning as part of a building retrofit or new building

To Summarize – A Lighting System is

- A collection of luminaires and related lighting equipment
 - Installed in an application to provide the right amount of light where and when needed
 - With consideration of human comfort, visibility, safety and security, the physical environment, and daylight integration
 - Such a system is comprised of multiple components designed to minimize energy use while maintaining lighting quality
 - Luminaires
 - Lighting controls
 - Windows or skylights
 - May be **interconnected** to provide control, monitoring functions and interface with related systems – *all of which will mean Commissioning*

Participation

- There's still time to provide your input
- For ANSI balance, users and general-interest stakeholders are particularly welcome
- If you wish more information, or want to join the C137 Committee, contact :

Karen Willis, Secretary ANSI C137

NEMA

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(703) 841-3277 (Eastern Time Zone)

This concludes The American Institute of Architects
Continuing Education Systems Course

Thank You
Are there any questions??????



acg

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