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Designers Lighting Forum

Beyond the Blueprint: Navigating ASHRAE & IECC 2024 Codes with Measured Success

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Wednesday, April 15, 2026

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

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Learning Objectives

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

1. Understand the varied and complex issues associated with building energy codes
2. Compare lighting and control requirements for IECC and ASHRAE 90.1 and how they have changed in the most recent versions
3. Learn how to integrate Metering & Verification into your compliance strategies
4. Identify how to easily select, plan, and implement solutions to design a code-compliant system

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ENERGY CODE BASICS

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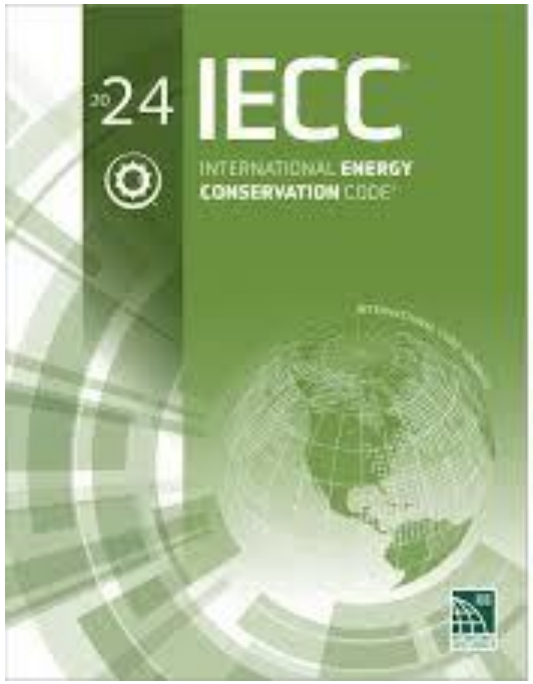
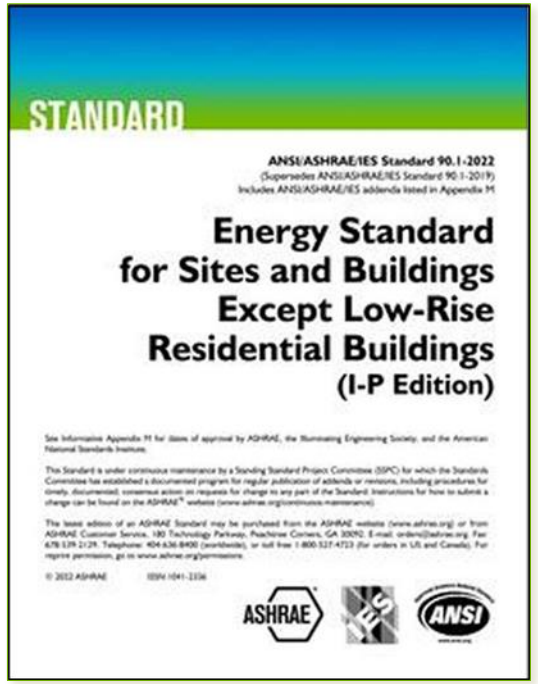
Energy Code and Standard Basics

- Code vs Standard
  - A Code is a compilation of building requirements adopted as law by municipalities, e.g. IBC.
  - A Standard is a set of technical definitions, specifications, and guidelines which are referenced in codes and rating systems, e.g. ASHRAE 90.1.
  - Either can be adopted by a state or local municipality and enforced by code inspectors.
  - Check www.energycodes.gov and local government websites for adoption and local amendment information.





Energy Codes and Standards

- IECC – International Energy Conservation Code
  - Adoptions range from 2009 – 2024 Versions

- ASHRAE 90.1 – Energy Standard
  - Adoptions range from 2007 – 2022 Versions (2025 is coming soon)
  - Required for Government/Federal projects

Commercial Energy Code Adoption

IECC and ASHRAE 90.1

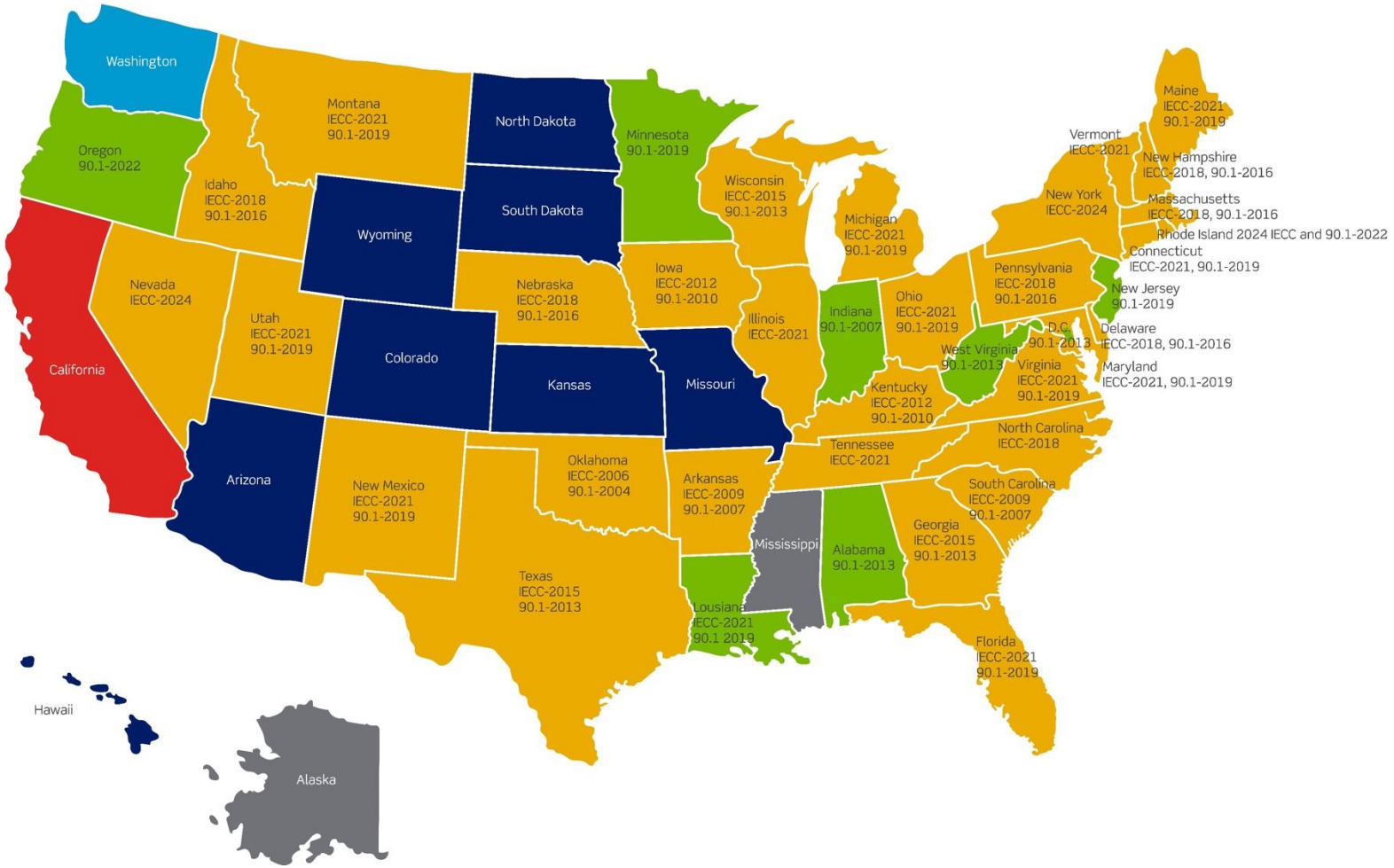
ASHRAE 90.1

Home Rule

No Statewide Code

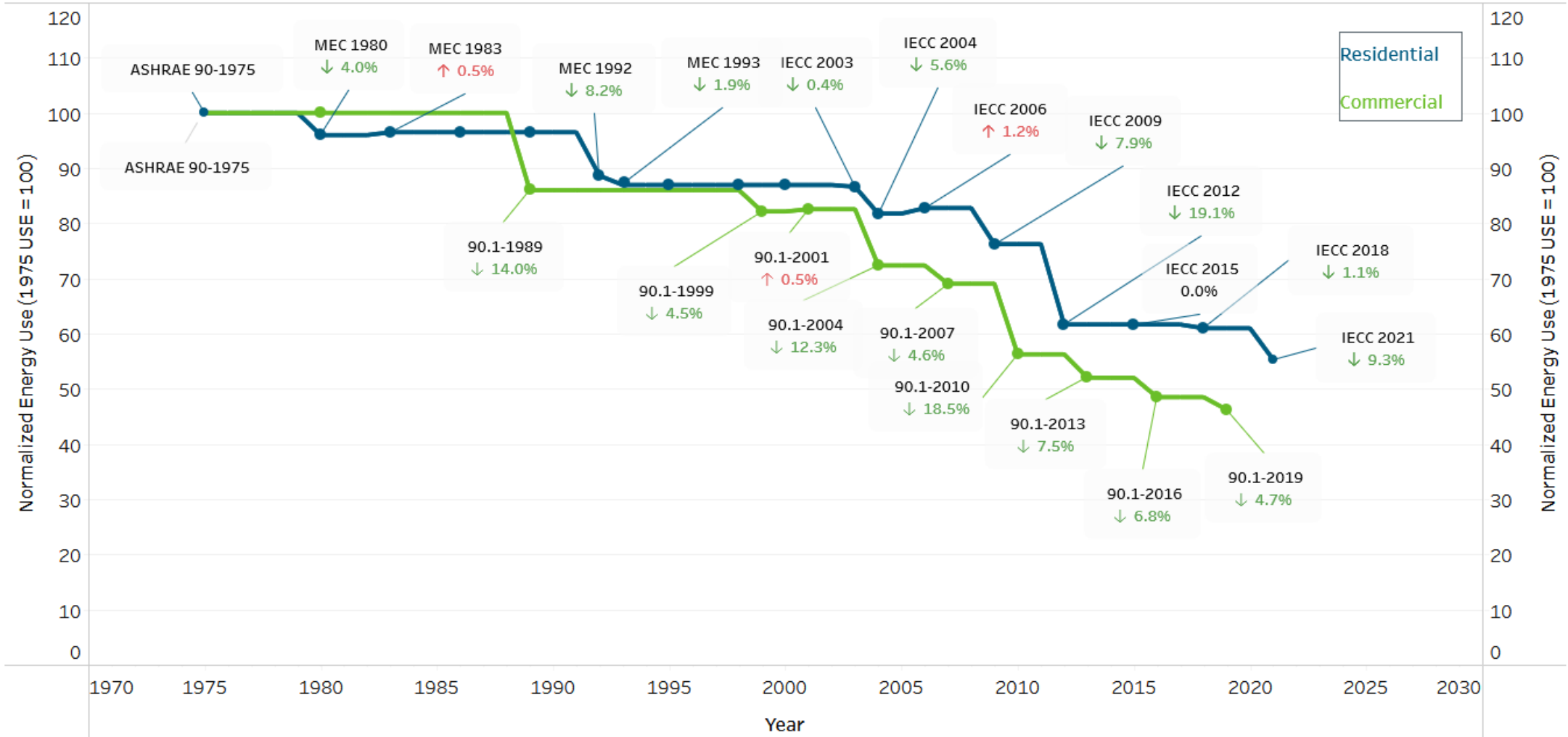
2024 Washington State Energy Code

2025 California Title 20 and Title 24



Source: https://www.energycodes.gov/state-portal - updated on December 31, 2025

Estimated Energy Use Improvement



Source: https://www.energycodes.gov/

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LIGHTING UPDATES

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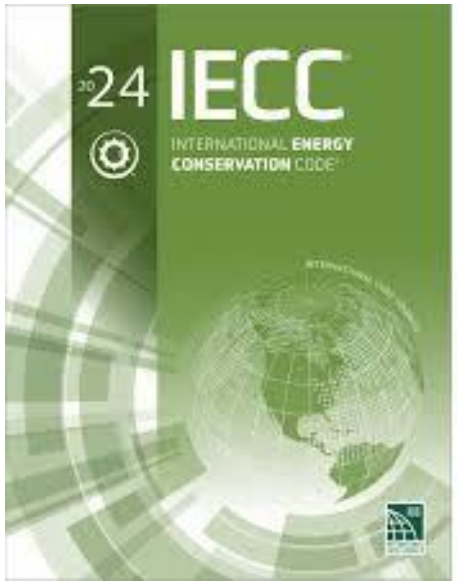
Energy Code Basics for Lighting Controls

- Automatic Shutoff
  - Occupancy/Vacancy Sensing
  - Time of Day
- Light Reduction
  - Daylight Control
  - Manual Dimming
- Specific Applications
- Exterior/Parking Garage
  - Daylight
  - Schedules
  - Occupancy
- Plug Load Control
- Energy Monitoring

Lighting Control Requirements – 2025 IECC

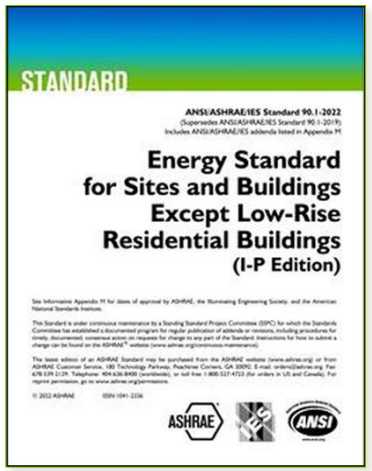
- Code Sections
  - C405.2 – Lighting Controls
  - C405.2.1 – Occupancy Sensors
  - C405.2.2.1 – Time Switches
  - C405.2.3 – Dimming Controls
  - C405.2.4 – Daylight Control
  - C405.2.6 – Manual Controls
  - C405.2.7 – Exterior Controls
  - C405.8.1 – Demand Response Controls
  - C405.2.9 – Interior Parking Area Lighting Controls (Formerly Parking Garage)
  - C405.2.10 – Sleeping and Dwelling Unit Lighting and Receptacle Controls
  - C405.11 – Receptacle Control
  - C405.13 – Energy Monitoring

  - Control areas are outlined in specific code sections
  - Includes list of areas where occupancy sensors are required



Lighting Control Requirements – ASHRAE 90.1 2022

- Standard Sections
  - 8.4.2 – Receptacle Control
  - 8.4.3 – Energy Monitoring
  - 9.4.1.1 – Interior Lighting Control
    - A. Local Control
    - B. Restricted to Manual On
    - C. Restricted to Partial Automatic On
    - D. Multi-level Lighting Control
    - E. Automatic Daylighting for Sidelit Areas
    - F. Automatic Daylighting for Toplit Areas
    - G. Automatic Reduction Control
    - H. Automatic Full Off
    - I. Scheduled Shutoff
    - J. Scheduled Off – Non-Business Hours
  - 9.4.1.2 – Parking Garage Lighting Control
  - 9.4.1.3 – Special Applications
  - 9.4.3.2 – Dwelling Units
  - 9.4.3.3 – Exterior Lighting Control
  - **9.4.4.2 – Horticultural Lighting**



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Lighting Control Updates in ASHRAE 90.1 2022

- 9.4.4 Horticultural Lighting
  - Must be controlled by a device that automatically turns the lights off at specific times

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Lighting Changes to ASHRAE/IES 90.1 - 2022

- 9.3.2 Simplified building method of calculating exterior power allowance
  - Office, retail, and school buildings less than 25,000 ft²

Table 9.3.2 Simplified Building Method for Building Exteriors

Exterior Area Type	Exterior Lighting Power Allowance [a,b]	Controls
All exterior areas		All lighting shall be *automatically* controlled to shut off the lighting when daylight is available.
Base allowance	200 W	*Luminaires* shall be turned off or the power reduced by a minimum of 75% during nonoperating hours.
Façade lighting	0.10 W/ft^2	*Luminaires* shall be turned off or the power reduced by a minimum of 75% during nonoperating hours.
Roof terraces, special feature areas, walkways, plazas and ramps	0.07 W/ft^2	*Luminaires* shall be turned off or the power reduced by a minimum of 75% during nonoperating hours.
Landscape	0.036 W/ft^2	*Luminaires* shall be turned off or the power reduced by a minimum of 75% during nonoperating hours.
Entry doors	14 W/linear ft	*Luminaires* shall be turned off or the power reduced by a minimum of 75% during nonoperating hours.
Stairs	Exempt	No additional controls required.
Parking lots and drives	0.037 W/ft^2	*Luminaires* mounted 25 ft or less above *grade* shall be controlled to reduce the power by at least 50% when no activity is detected for not longer than 15 minutes.
All other areas not listed	0.20 W/ft^2	*Luminaires* shall be turned off or the power reduced by a minimum of 75% during nonoperating hours.

Lighting Changes to ASHRAE/IES 90.1 - 2022

- 9.4.2 Exterior lighting power
  - The total exterior lighting power allowance for all exterior applications is the sum of the base site allowance plus the individual allowances for areas that are designed to be illuminated and are permitted in Table 9.4.2-2 for the applicable lighting zone in Table 9.4.2-1.
    - Trade-offs are allowed only among exterior lighting apps listed in “Tradeable Surfaces”.

Table 9.4.2-1 Exterior Lighting Zones

Lighting Zone	Description
0	Undeveloped areas within national parks, state parks, forest land, rural areas, and other undeveloped areas as defined by the *authority having jurisdiction*
1	Developed areas of national parks, state parks, forest land, and rural areas
2	Areas predominantly consisting of *residential* zoning, neighborhood business districts, light industrial with limited nighttime use and *residential* mixed use areas
3	All other areas
4	High-activity commercial districts in major metropolitan areas as designated by the local jurisdiction

Lighting Changes to ASHRAE/IES 90.1 - 2022

- Table 9.4.2-2 Individual lighting power allowance *reductions* for building exteriors

	Zone 0	Zone 1	Zone 2	Zone 3	Zone 4	Section 9.4.1.4 Required Controls
Building facades (The allowance for each illuminated facade *orientation* shall be calculated by multiplying the allowable value by the entire *facade area* or facades length for that *orientation*.)	No allowance	0.056 /ft^2 of *facade area* or 1.4 W/linear ft of facade length	0.098 W/ft^2 of *facade area* or 2.4 W/linear ft of facade length	0.140 W/ft^2 of *facade area* or 3.4 W/ linear ft of facade length	0.196 W/ft^2 of *facade area* or 4.8 W/linear ft of facade length	(b) and (c)
Automated teller machines and night depositories	No allowance	90 W per location plus 35 W per additional ATM per location	90 W per location plus 35 W per additional ATM per location	90 W per location plus 35 W per additional ATM per location	90 W per location plus 35 W per additional ATM per location	(b)
Uncovered entrances and gatehouse inspection stations at guarded facilities	No allowance	0.144 W/ft^2	0.252 W/ft^2	0.360 W/ft^2	0.504 W/ft^2	(b) and either (d) or (e)
Uncovered loading areas for law enforcement, fire, ambulance, and other emergency service vehicles	No allowance	0.104 W/ft^2	0.182 W/ft^2	0.260 W/ft^2	0.364 W/ft^2	(b) and either (d) or (e)

Key Updates to IECC 2024

- **Revised Lighting Power Densities**
  - The 2024 codes introduce lower lighting power densities (LPDs) for many space types, pushing for greater energy efficiency. This change encourages the use of advanced lighting technologies and careful design to meet stricter energy targets.
- **Expanded Controls Requirements**
  - There is a stronger emphasis on lighting controls, including occupancy sensors, daylight-responsive controls, and time-based scheduling. These requirements aim to reduce unnecessary energy use and provide more flexibility in managing lighting systems

Key Updates to IECC 2024

- **Enhanced Daylighting Provisions**
  - Daylighting requirements have been expanded to maximize the use of natural light in buildings. The new provisions set clearer guidelines for daylight zones and mandate controls that automatically adjust electric lighting based on available daylight.
- **Updated Documentation Standards**
  - The codes now require more comprehensive documentation and verification of compliance. This includes detailed submittals, commissioning reports, and ongoing maintenance records to ensure that installed systems meet code intent throughout their lifecycle.

Lighting Control Changes to IECC 2024

- **C405.2.1 Occupancy Sensors**
  - Expanded to cover more space types including computer rooms, data centers, medical supply rooms, laundry & washing areas, telemedicine rooms
  - Sensors MUST reduce lighting power by at least 50% within 20 minutes of vacancy
- **C405.2.2.6 Manual Lighting Controls**
  - NEW – Lighting for nonvisual applications, such as plant growth and food warming, shall be controlled by a time switch control complying with Section C405.2.2.1 that is independent of the controls for other lighting within the room or space
- **NEW C405.2.8.1 Demand Response**
  - Demand responsive controls for lighting shall be capable of the following:
  - Automatically reducing the output of controlled lighting to 80% or less of full power or light output upon receipt of a demand response signal
  - Where high-end trim has been set, automatically reducing the output of controlled lighting to 80 % or less of the high-end trim setpoint upon receipt of a demand response signal
  - Dimming controlled lights gradually and continuously over a period of not longer than 15 minutes to achieve their demand response setpoint
  - Returning controlled lighting to its normal operational settings at the end of the demand response period
  - Exceptions include storerooms and warehouse storage areas which shall be permitted to switch off 25 % or more of general lighting power rather than dimming

Lighting Changes to IECC 2024

- **NEW C405.10.1 Sleeping & Dwelling Units**
  - Sleeping units and dwelling units in hotels, motels, and vacation timeshare properties shall be provided with the following:
  - Not less than two 125V, 15- and 20-amp switched receptacles in each room, except for bathrooms, kitchens, foyers, hallways, and closets
  - Lighting controls that automatically turn off all lighting and switched receptacles within 20 minutes after occupants have left the unit
  - Exceptions: Automatic shutoff is not required where captive key override controls all lighting and switched receptacles in units with five or fewer permanently installed lights and switched receptacles

Lighting Changes to IECC 2024

- C405.2.7 Exterior Lighting Controls
  - All exterior lighting must have automatic controls (astronomical time switches or photocells)
  - Decorative/façade lighting must shut off or dim during certain nighttime hours

- C405.2.9 Interior Parking Areas
  - Parking garages must use automatic lighting controls that dim or shut off lights when areas are unoccupied
  - Targets large energy loads in parking structures

Lighting Changes to IECC 2024

- C406.5.6 Reduced lighting power *by more than ten percent*
  - The total connected interior lighting power calculated in accordance with Section C405.3.1 shall be 95 percent or less of the interior lighting power allowance in accordance with Section C405.3.2 (Building Area Method or Space-By-Space Method).

Energy Monitoring Changes to IECC 2024

- C405.2.1.2 Energy Monitoring
  - Energy monitoring is required for new buildings 10,000 square feet and larger

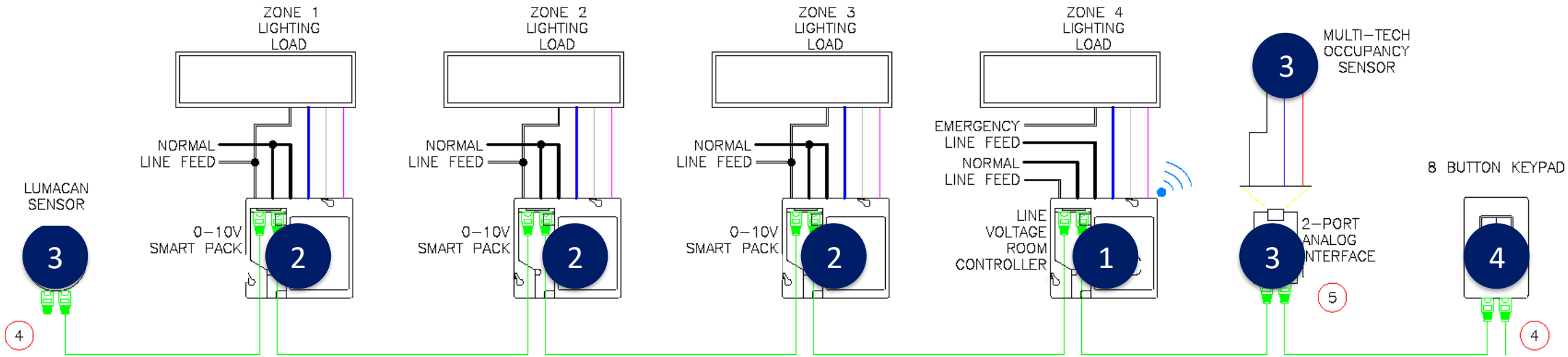
Basic Functions

- All loads are controlled by one or more of:
  - Manual Control
  - Occupancy or Vacancy Sensing
  - Daylight Sensing
  - Time of Day
  - Switching
  - Dimming

Code Compliance Architecture Example

SYSTEM COMPONENTS

1. Room Controller
2. Load Controller
3. Sensors/AI
4. User Controls



Private Office Lighting & Control Solutions

Linear with Integrated Controls

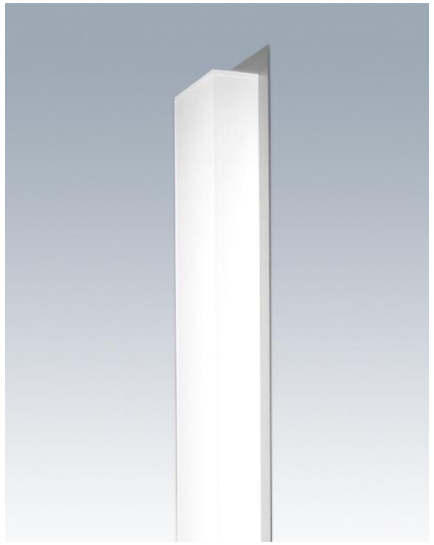
Slim profile with a double teardrop-shaped frosted diffuser featuring soft curves that enhance the visual space, delivering high efficiency, visual comfort, and an integrated wireless occupancy/daylight sensor

Downlight

Shallow profile downlight fits within a 2-1/2” plenum space when plenum space is limited or other obstructions (i.e. HVAC) are present

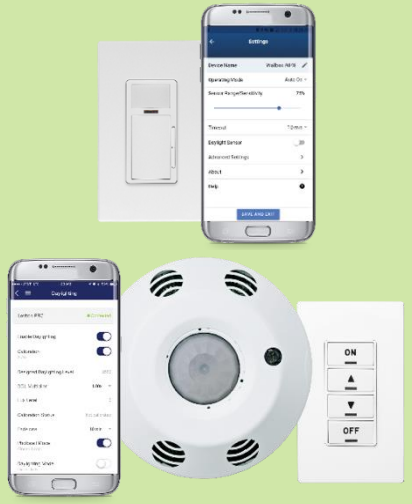
Downlight

Complete family of small aperture (2”, 4”, 6”, 8”) downlights with accent and wall wash options



Recessed Linear

High efficiency options with spotless lensing and multiple mounting styles including T-grid and trimless



Sensors and/or Room Controllers

Sensors provide simple occupancy/vacancy sensing; Room Controllers include dimming and daylighting functionality, ideal for spaces with windows

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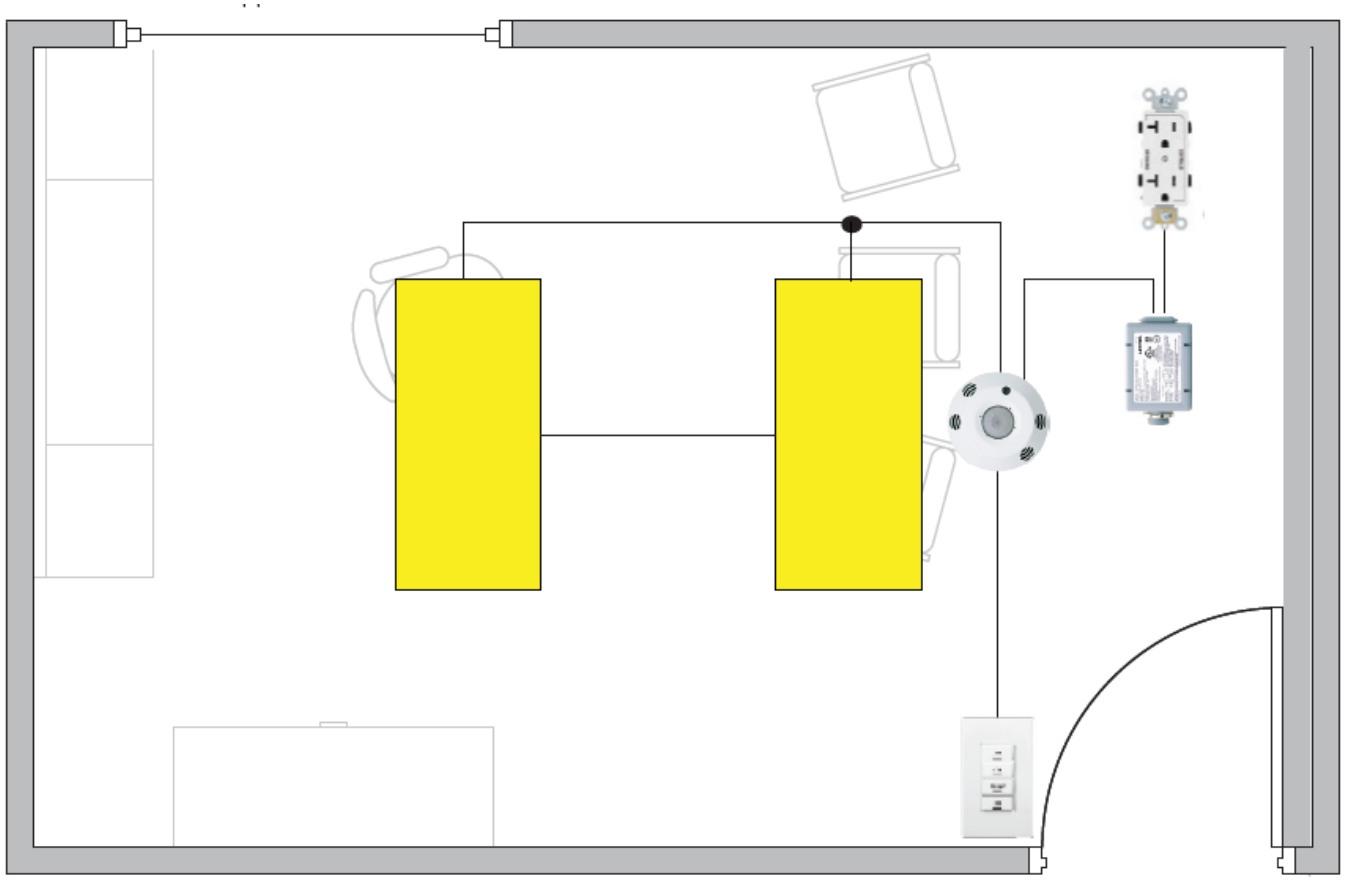
Sample Application – Private Office

- Meets the following IECC requirements:
  - Auto Shutoff
  - Manual Control
  - Multi-Level Control
  - Daylighting
  - Receptacle Control



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Open Office Lighting & Control Solutions

Recessed

A recessed, low-profile design luminaire featuring a single piece luminous lens; for use with indoor applications where high-efficiency, high-performance and ease of installation are required

Downlights

Recessed 4" & 6" LED new construction downlights for spot, narrow flood, flood, and wide flood illumination

Downlights

Featuring a highly configurable single point source LED, ideal for numerous ceiling heights and lighting applications

Recessed Linear

High efficiency options with spotless lensing and multiple mounting stiles including T-grid and trimless

Room Control System

Meet code compliance requirements for auto shutoff, manual control, daylight zone control, multi-level lighting control, and receptacle control

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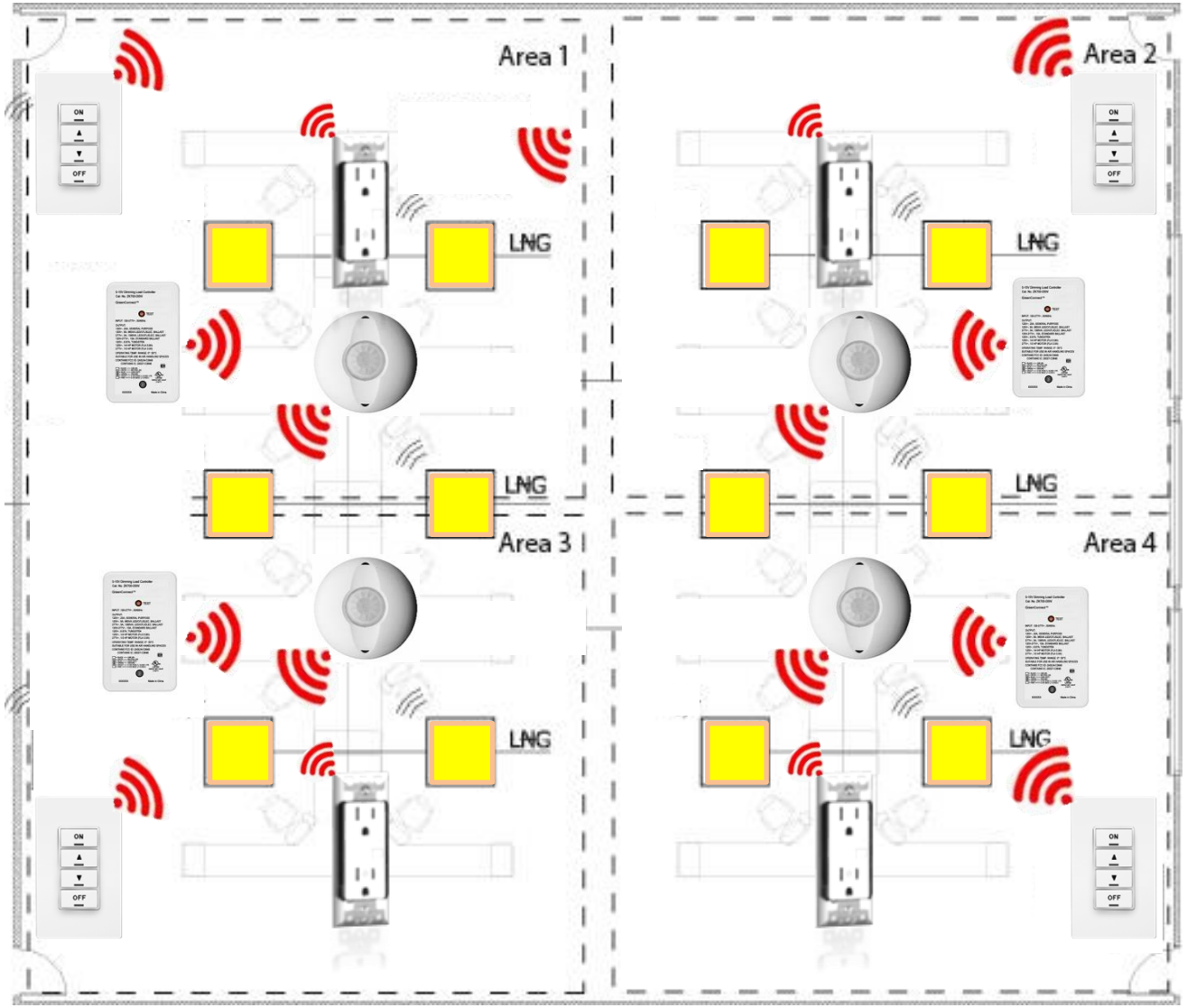
Code Compliance – Open Office Application



- Meets the following IECC requirements:
  - Auto Shutoff
  - Manual Control
  - Multi-Level Control
  - Daylighting
  - Receptacle Control

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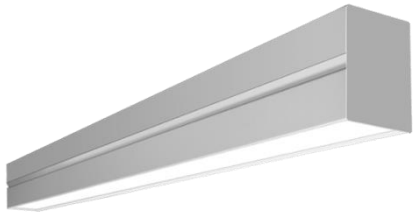
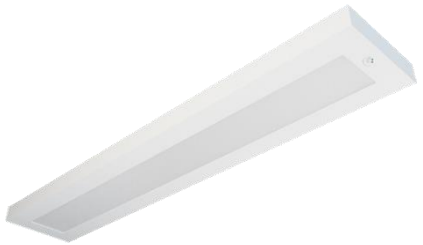
Classroom Lighting & Control Solutions



Linear

This LED modular linear luminaire with direct and indirect illumination features a narrow design and is ideal for architectural applications that require clean and uniform lines



Linear

This LED modular linear luminaire with direct and indirect illumination features a narrow design and is ideal for architectural applications that require clean and uniform lines

Linear

Suitable for surface, suspended or wall-mounting individually or in continuous rows while offering an optional uplight component with an internal baffle that separates uplight and downlight components

Downlights

Performance LED downlights delivering up to 1600 lumens with a wide, smooth beam pattern

Room Control System

Meets code compliance requirements for auto shutoff, manual control, daylight zone control, multi-level lighting control, and receptacle control

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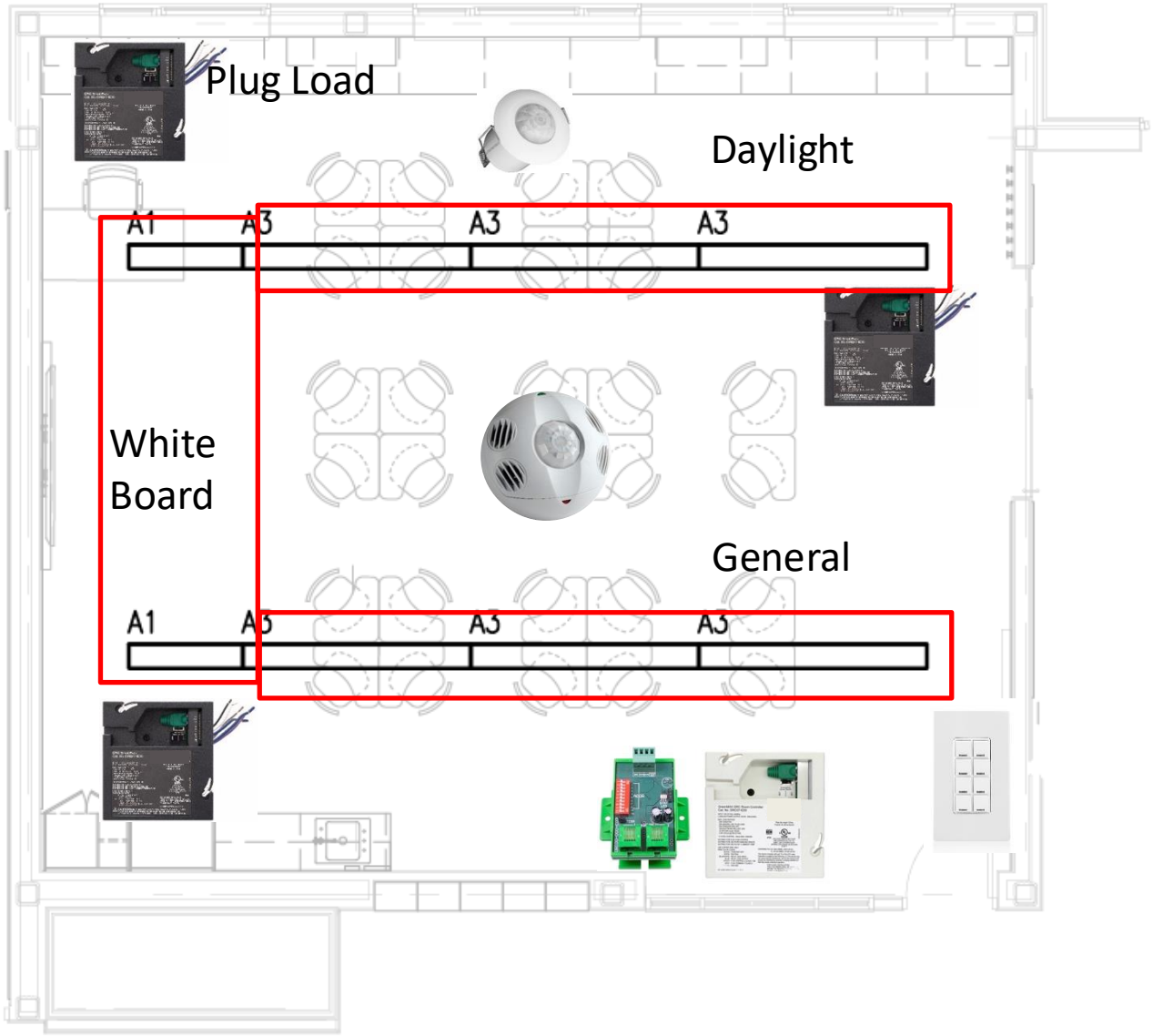
Sample Education Application – Classroom



- Meets the following IECC requirements:
  - Auto Shutoff
  - Manual Control
  - Multi-Level Control
  - Daylighting
  - Receptacle Control

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METERING & VERIFICATION

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Measurement & Verification Basic Functions

- Measure desired loads
- Collect and store data
- Present data

ASHRAE 90.1 2022
8.4.3.1-2 Energy Monitoring

- Energy monitoring required for:
  - New buildings 25,000SF and larger
  - Tenant spaces 10,000SF and larger
  - Residential buildings with greater than 10,000SF of common area

- **Data Acquisition**
  - Energy use for all loads to be recorded a minimum of every 15 minutes and reported at least hourly, daily, monthly, and annually
  - Data for tenant spaces to be provided to each tenant
  - Data must be kept for a minimum of 36 months

- **Graphical Energy Reporting**
  - Buildings with a digital control system, energy use shall be transmitted to the system and be graphically displayed

2024 IECC
C405.12 Energy Monitoring

- Energy monitoring required for new buildings 10,000SF and larger
  - Measurement devices must be installed in new buildings to monitor energy use for each of the following separately:
    - HVAC Systems
    - Interior Lighting
    - Exterior Lighting
    - Plug Loads
    - Process loads – any load not included in HVAC that exceeds 5% of the peak connected load for the building
    - Building operations and other miscellaneous loads

2024 IECC
C405.13.5 Energy Monitoring

- Metering Equipment
  - Automatically communicate consumption to data acquisition system
  - Building systems that can monitor energy consumption can be used instead of meters
  - CTs have a tested accuracy of +/- 2%
  - Provide at least hourly data to the data acquisition system and graphical report
- Data Acquisition
  - Store data for a minimum of 36 months
- Graphical Energy Report
  - Permanent and readily accessible reporting mechanism accessible by building operation and management personnel
  - Provide graphical data for each end use category for every hour, day, month, and year for the past 36 months

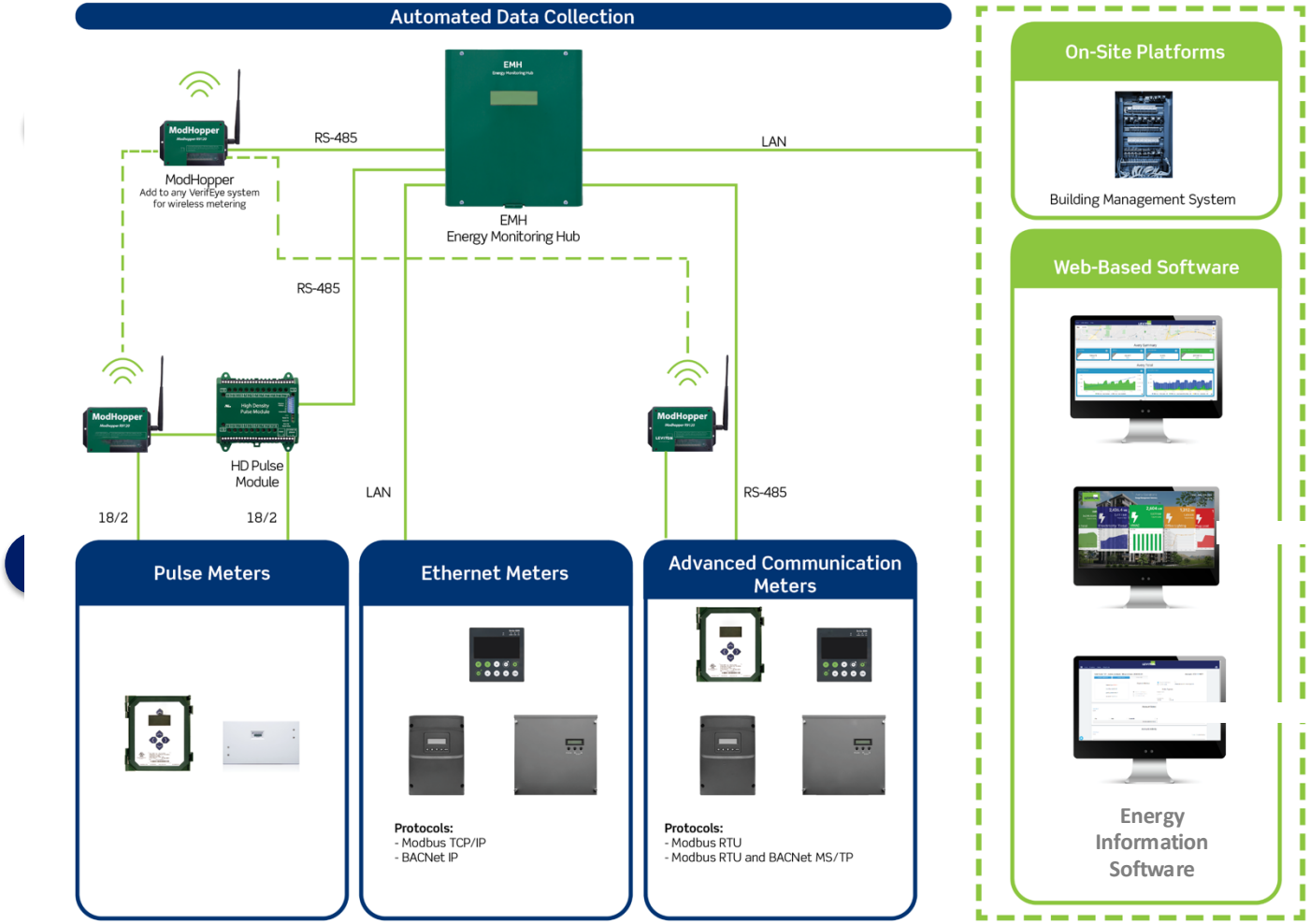
New York Local Law 88

- Local Law 88 (2026 coming soon) requires certain NYC buildings to complete **lighting upgrades** and install **electrical submeters**. This law is part of the city's broader Greener, Greater Buildings Plan.
  - Purpose:
    - Improve energy efficiency
    - Increase tenant visibility into energy use
    - Support NYC's long-term carbon reduction goals

New York Local Law 88

- Buildings covered:
  - Buildings over 25,000 sq. ft.
  - Groups of buildings on the same tax lot or condo board totaling **over 100,000 sq ft**
- Submetering Requirements:
  - Install **electrical submeters** in **commercial tenant spaces larger than 5,000 sq ft**
  - Provide **monthly energy-use statements** to each submetered tenant
  - Submeters must comply with **NYC Administrative Code Article 311**

Code Compliance Submetering Architecture Example



SYSTEM COMPONENTS

1. Submetering Hardware
2. Data Collection
3. Software/Graphical Report

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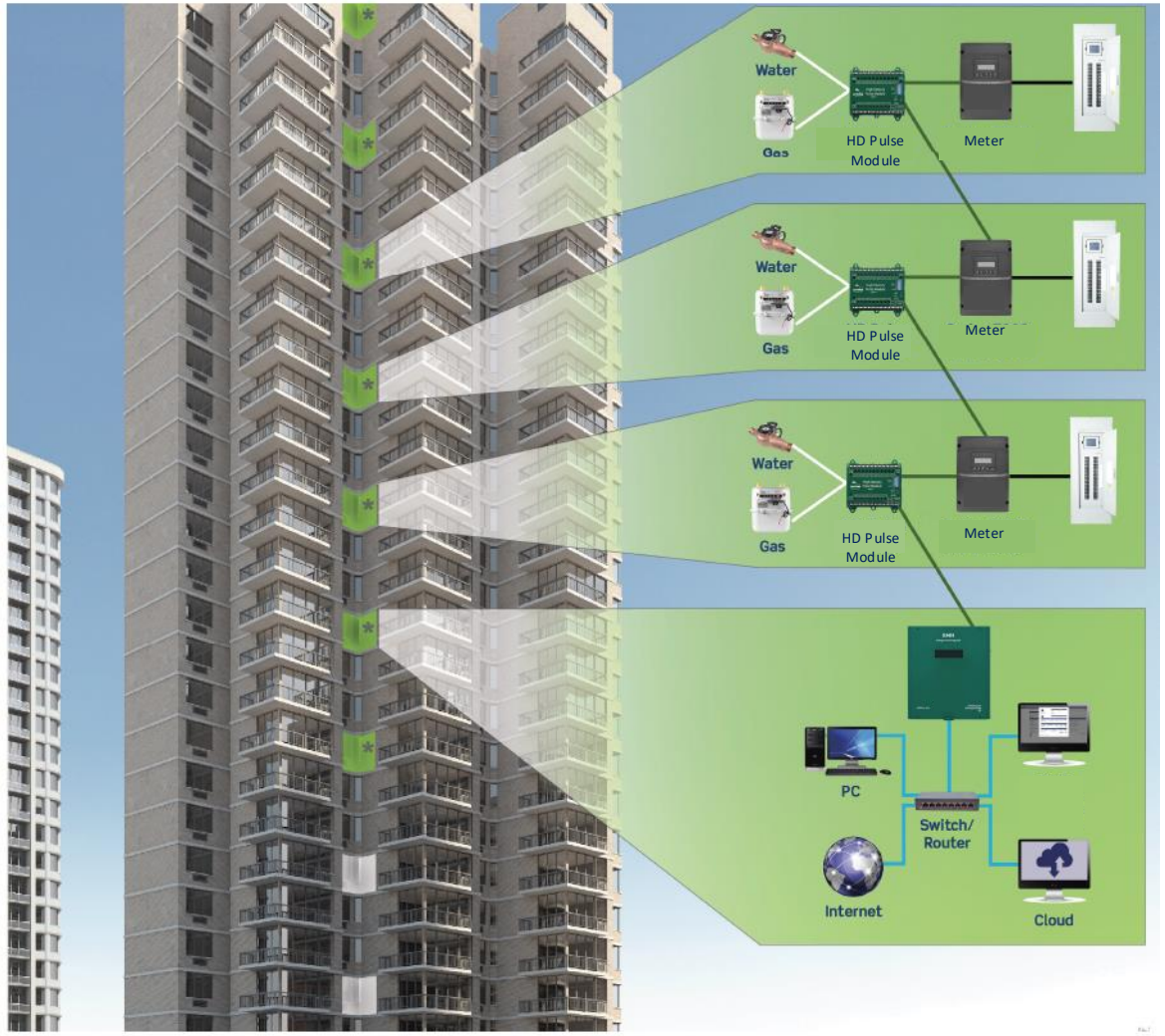
High-Rise Residential MDU Example



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Multi-Dwelling Units Example

Commercial Offices/Mixed Use Example

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