

Key Items for Plan Review & Site Inspection: 2018 IECC Commercial Lighting

3.24.2021



SEDAC

SMART ENERGY DESIGN ASSISTANCE CENTER

Providing effective energy strategies for buildings and communities

Learning Objectives

- 1. Understand energy code plan review requirements for commercial lighting
- 2. Understand energy code site inspection requirements for commercial lighting
- 3. Learn energy code compliance documentation processes for plan review and inspections for commercial lighting
- 4. Identify best practices to demonstrate energy code compliance.

Who We Are

The Smart Energy Design Assistance Center (SEDAC) is an applied research program at University of Illinois.

Our mission: Reduce the energy footprint of Illinois and beyond.



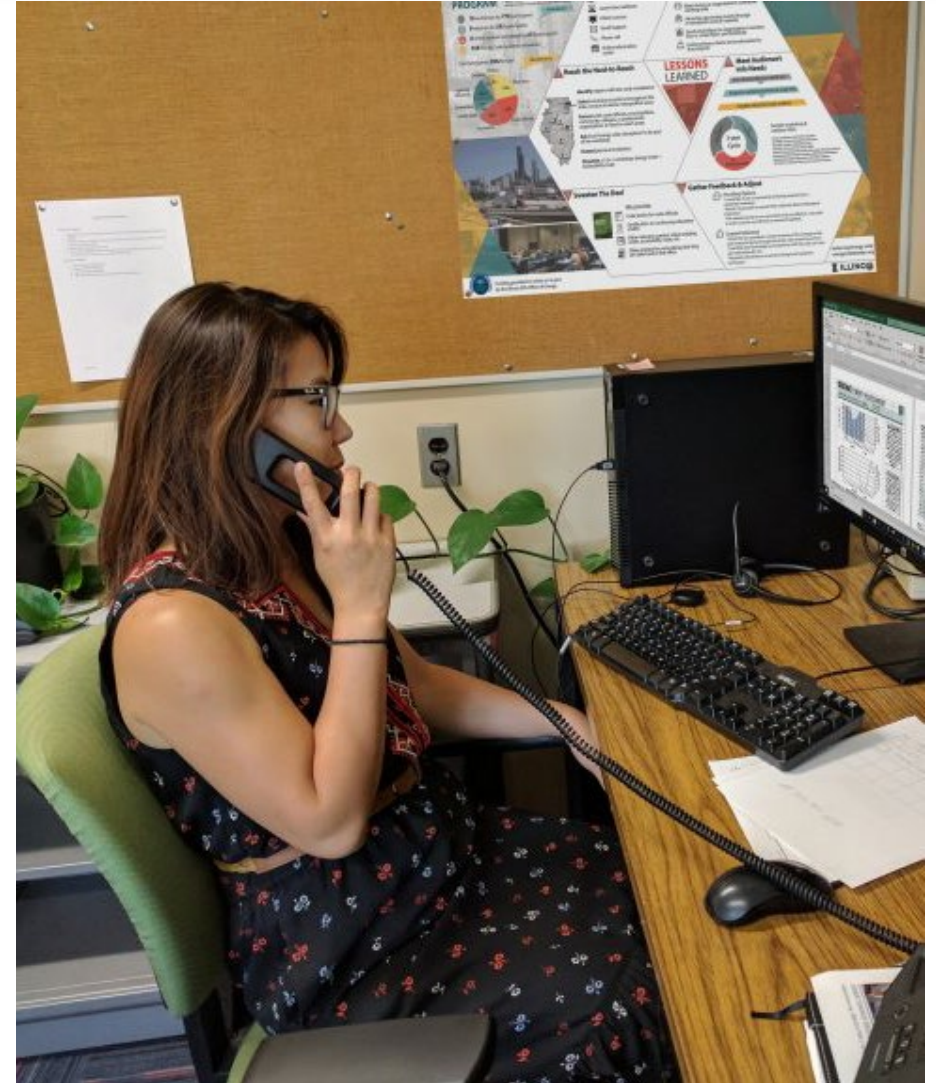
SEDAC is the Illinois Energy Conservation Code Training Provider

This training program is sponsored by **Illinois State Energy Office**



Energy Code Training Program

- Technical support
energycode@Illinois.edu
800.214.7954
- Online resources at
<https://smartenergy.illinois.edu/energy-code/>



www.smartenergy.illinois.edu/energy-code/

TRAINING AND SUPPORT SERVICES



Workshops



Webinars



Online courses



Technical support

ENERGY CODE RESOURCES



What is the Illinois
Energy Conservation Code?



Frequently asked questions



Useful websites

Code Accessibility – IECC and IL Amendments

<https://codes.iccsafe.org/content/IECC2018P4>

All Codes » I-Codes

Search Code Titles

2018 INTERNATIONAL ENERGY CONSERVATION CODE

2018 International Energy Conservation Code
First Printing: Aug 2017

Legend

Use the chapter listing within the bar on the left to navigate contents

The free view provides users with read only access to the code book

The premiumACCESS view includes In premiumACCESS, code change

- Technical code changes from the previous edition of the International Energy Conservation Code are shown in red text
- State amendments to the International Codes are shown in red text
- Indicates deletions
- Active hyperlinks for ease of navigating across section references
- Ability to bookmark or annotate key text with your notes

- Click link sharing () for quick access to key sections
- Click Print icon () for printing section level contents

My Notes and Bookmarks

Recent annotations and bookmarks from this current title. Click here

Purchase premium to take advantage of this feature.

Associated Titles

Available versions for this title.

- 2018 International Energy Conservation Code (Third Printing: Mar 2019)
- 2018 International Energy Conservation Code (Second Printing: Aug 2018)
- 2018 International Energy Conservation Code (Currently Being Viewed (First Printing: Aug 2017))

<https://www2.illinois.gov/cdb/business/codes/IllinoisAccessibilityCode/Documents/2018%20Illinois%20Specific%20Amendments%20with%20Modifications%20Shown.pdf>

CHAPTER 1 [CE] SCOPE AND ADMINISTRATION

SECTION C101 SCOPE AND GENERAL REQUIREMENTS

C101.1 Title. This code shall be known as the International Energy Conservation Code of [NAME OF JURISDICTION] and shall be cited as such. Illinois Energy Conservation Code or "this Code" and shall mean:

With respect to the State facilities covered by 71 Ill. Adm. Code 600, Subpart B:

This Part, all additional requirements incorporated within Subpart B (including the 2018 International Energy Conservation Code, including all published errata but excluding published supplements that encompass ASHRAE 90.1-2016), and any statutorily authorized adaptations to the incorporated standards adopted by CDB are effective July 1, 2019.

With respect to the privately funded commercial facilities covered by 71 Ill. Adm. Code 600, Subpart C:

This Part, all additional requirements incorporated within Subpart C (including the 2018 International Energy Conservation Code, including all published errata and excluding published supplements that encompass ASHRAE 90.1-2016), and any statutorily authorized adaptations to the incorporated standards adopted by CDB, are effective July 1, 2019.

C101.1.2 Adoption. The Board shall adopt

C101.1.3 Adaptation. The Board may appropriately adapt the International Energy Conservation Code to apply to the particular economy, population, distribution, geography and climate of the State and construction within the State, consistent with the public policy objectives of the EEB Act.

C101.5 Compliance. Residential buildings shall meet the provisions of IECC—Residential Provisions. Commercial buildings shall meet the provisions of IECC—Commercial Provisions—the Illinois Energy Conservation Code covered by 71 Ill. Adm. Code 600, Subpart C. The local authority having jurisdiction (AHJ) shall establish its own procedures for enforcement of the Illinois Energy Conservation Code. Minimum compliance shall be demonstrated by submission of:

- Compliance forms published in the ASHRAE 90.1 User's Manual; or
- Compliance Certificates generated by the U.S. Department of Energy's COMcheck™ Code compliance tool; or
- Other comparable compliance materials that meet or exceed, as determined by the AHJ, the compliance forms published in the ASHRAE 90.1 User's Manual or the U.S. Department of Energy's COMcheck™ Code compliance tool; or
- The seal of the architect/engineer as required by Section 14 of the Illinois Architectural Practice Act [225 ILCS 305], Section 12 of the Structural Engineering Licensing Act [225 ILCS 340] and Section 14 of the Illinois Professional Engineering Practice Act [225 ILCS 325].

<https://codes.iccsafe.org/content/document/1491>

ARTICLE XIII. CHICAGO ENERGY CONSERVATION CODE

SECTION 1. The Municipal Code of Chicago is hereby amended by inserting a new Title 14N, as follows:

TITLE 14N ENERGY CONSERVATION CODE

PART I – COMMERCIAL PROVISIONS

CHAPTER 14N-C1 SCOPE AND PURPOSE

14N-C1-C001 Adoption of the commercial provisions of the International Energy Conservation Code by reference.

The commercial provisions of the *International Energy Conservation Code*, 2018 edition, second printing, and all erratum thereto identified by the publisher (hereinafter referred to as "IECC-CE"), except Appendix CA, are adopted by reference and shall be considered part of the requirements of this title except as modified by the specific provisions of this title.

If a conflict exists between a provision modified by this title and a provision adopted without modification, the modified provision shall control.

14N-C1-C002 Citations.

Provisions of IECC-CE which are incorporated into this title by reference may be cited as follows:

14N-C[IECC-CE chapter number]-[IECC-CE section number]

14N-C1-C003 Global modifications.

The following modifications shall apply to each provision of IECC-CE incorporated into this title:

- Replace each occurrence of "International Codes" with "Chicago Construction Codes."
- Replace each occurrence of "International Building Code" with "Chicago Building Code."
- Replace each occurrence of "ASME A17.1" or "ASME A17.1/CSA B44" with "the Chicago Conveyance Device Code."
- Replace each occurrence of "NFPA 70" with "the Chicago Electrical Code."

Upcoming SEDAC Workshops/Webinars

Code Compliance Webinar Series

- Commercial Plan Review: April 13th
- Commercial Site inspection: May 11th
- Commercial HVAC Plan Review & Site Inspection: May 26
- Code Panel Discussion: June 15th

Registration: <https://smartenergy.illinois.edu/events>

When Does the Code Apply?

Building Permit Application Triggers Energy Code

2015 International Building Code, Chapter 1, Section 105, 105.2
Work Exempt from Permit – subject to local codes but generally,
the following list applies:

- **Electrical:**
 - Repairs and Maintenance
 - Radio and Television transmitting equipment
 - Temporary testing systems for electrical equipment or apparatus
- **Gas/Mechanical:**
 - Portable equipment
 - Replacement of parts that don't alter or make unsafe existing equipment
 - Could include motor repair/replacement

How Do I Know if I Have a Commercial Building?

Per 2018 IECC C202 General Definitions: “All buildings that are not included in the definition of ‘residential building’.”

- Residential building is any detached 1- or 2-family dwellings and multiple single-family dwellings (townhouses) and Group R-2, R-3, and R-4 buildings 3 stories (4 in Chicago) or less in height above grade plane.
- Commercial is everything else.



Plan Review – Electrical Document Requirements




Required Documentation from C103.2

- Lighting fixture schedule with wattage and control narrative.
 - Fixture schedule in plan drawings satisfies 1st part of documentation requirement
 - Control narrative can be either a control plan or lighting/electrical drawing with narratives added, or in specification manual
- Plan drawing showing day-lit zones
 - Recommend a sheet with daylit zones shaded in or hash-marked, and one without for customer copying convenience in the future
 - Shading is easier to see and interpret than just a dashed-line border
 - Dash line border option wouldn't require a separate lighting plan without the marks.

Plan Review - Electrical

Fixture Schedule

- Common for lighting schedule to have fixture wattages.
- For code compliance checks, helpful to include W/sf calculations either on a sheet or in the project documents to easily check against C405.3.2(1) or C405.3.2(2), depending on lighting compliance path.

Luminaire Schedule									
Symbol	Label	QTY	Catalog Number	Description	Lamp	Number Lamps	Lumens per Lamp	LLF	Wattage
	A	12	2RT5 28T5	VOLUMETRIC RECESSED LIGHTING FIXTURE	(2) F28T5	2	2730	0.95	59.6
	B	4	LWR9-1-54T5HO	3 1/2"W X 3 3/4"H RECESSED WALL WASH WITH ASYMMETRIC-THROW SPECULAR REFLECTOR AND PERF BLACK TRIM	(1) F54T5HO	1	5000	0.81	60.9
	C	2	DLV ADJ MR16 4AC LP71FL	DLV 4" APERTURE LOW VOLTAGE LENSED ADJUSTABLE DOWNLIGHT WITH SOFTENING LENS 71W MR16 FL	(1) 70MR16FL	1	1100	0.75	71

Building Area vs Space-By-Space Method Documentary

Interior Lighting Power Allowance (Building Area Method)

Building Type	Lighting Power Density (W/ft ²)	Building Area (ft ²)	Lighting Power Allowance (W)
Total			

Interior Lighting Power Allowance (Space-by-Space Method)

Building Type	Common/Specific Space Type	Lighting Power Density (W/ft ²)	Space Area (ft ²)	Lighting Power Allowance (W)
Total				

ASHRAE provides a sample verification table for the two methods. Note each space-type should include total area for the space type in the calculation. Plans should note space type under room labels to assist in verification of area totals

Lighting Power Density Checks

- Must be calculated for Prescriptive Path.
- COMcheck and other softwares often calculate LPD and can print it in reports.

CPL Demo Project.cck - COMcheck 4.1.1.0 Code: 2015 IECC


File Edit View Options Code Help

Project Envelope Interior Lighting Exterior Lighting Mechanical Requirements

Add Fixture Fixture Library

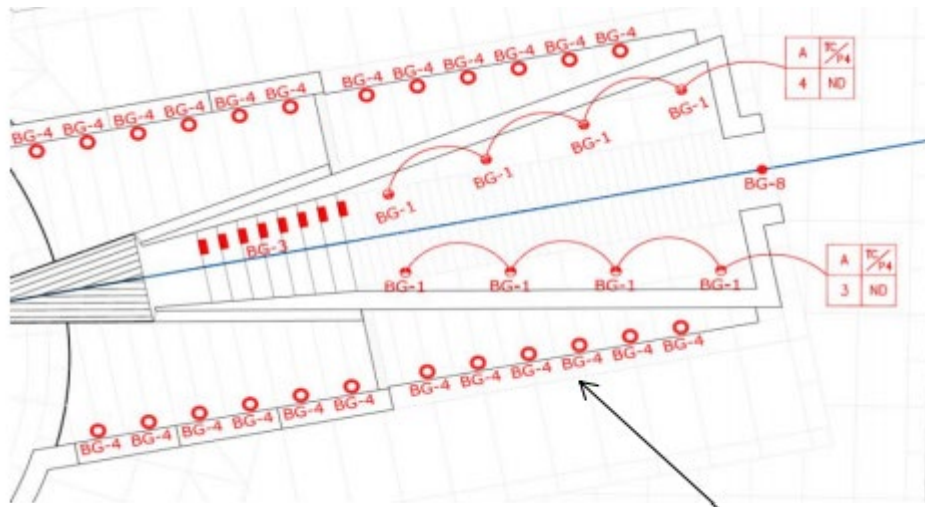
	Component	Fixture ID	Fixture Description	Lamp Description/ Wattage Per Lamp	Ballast	Lamps Per Fixture	Number of Fixtures	Fixture Wattage	Track Lighting Wattage	Exemption Allowance
	▼ Building	Allowed wattage = 134839 Proposed wattage = 97762								
1	▼ CPL (Library 125900 s	Allowed wattage = 134839 Proposed wattage = 97762								
2	Linear Fluorescent 1			48" T5 HO 54W	Electronic	1	973	48.0		None
3	Linear Fluorescent 2			48" T8 32W (Supe...	Premiu...	2	610	55.0		None
4	Linear Fluorescent 3			48" T8 32W	Premiu...	3	18	84.5		None
5	Linear Fluorescent 4			48" T8 32W (Supe...	Premiu...	4	2	110.0		None
6	LED 1			LED Other Fixture ...		1	50	2.5		Exemption:Exit Signs, Saf...
7	Compact Fluorescer			Quad 2-pin 26W	Dimming	2	138	49.5		None
8	Incandescent 1			Incandescent 60W		1	28	60.0		Exemption
9	HID 3			Ceramic Metal Ha...	Pulse start	2	72	87.0		Allowance
10	Compact Fluorescer			Spiral 20W	Electronic	1	16	20.0		None
11	Linear Fluorescent 2			48" T8 32W (Supe...	Premiu...	2	75	55.0		Exemption:Exit Signs
12	Linear Fluorescent 6			Other	Dimming	1	21	32.0		None

Advertisement
Casino C
Display L
Exit Sign
Food Pre
Furniture



Documenting Track/Low Voltage Lighting Power

- Multiple Options:
 - Count fixtures and total wattage for affixed lamps (8 W/ lin ft min)
 - Indicate current limiting device wattage protecting system
 - Low voltage lighting transformers can indicate maximum wattage



BG-4 ○

UNDERWATER NICHE MOUNTED 50 WATT MR16 LOW VOLTAGE TUNGSTEN HALOGEN
ADJUSTABLE ACCENT LIGHT [REMOTE 120/12V TRANSFORMER] [60VA]

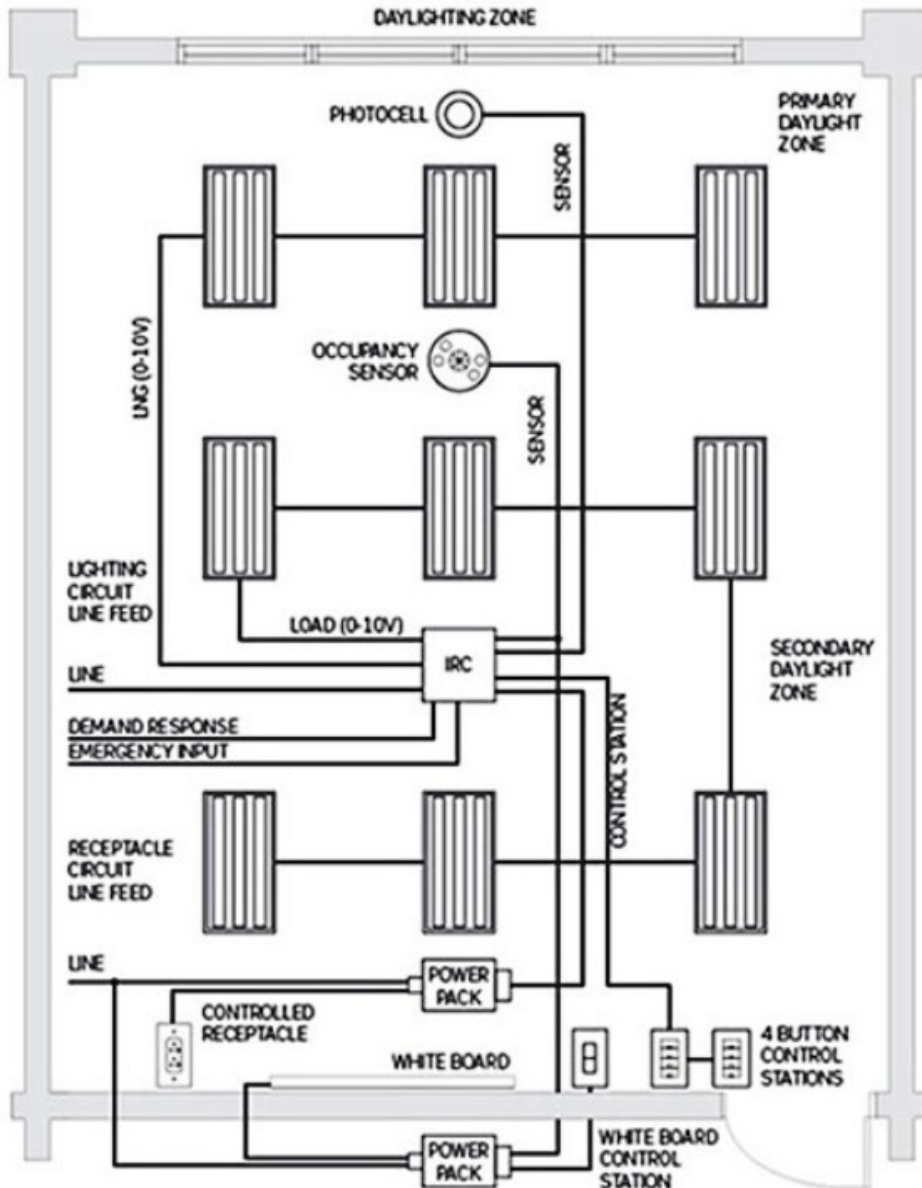
Lighting Controls Documentation

Warehouse Lighting Controls C405.2.1.2

- Must reduce lighting power by at least 50% when unoccupied.
- Controls must cover aisles and open areas.
- Control for each aisleway shall be independent and shall not control beyond the aisleway.



Open Plan Office Lighting Controls C405.2.1.3



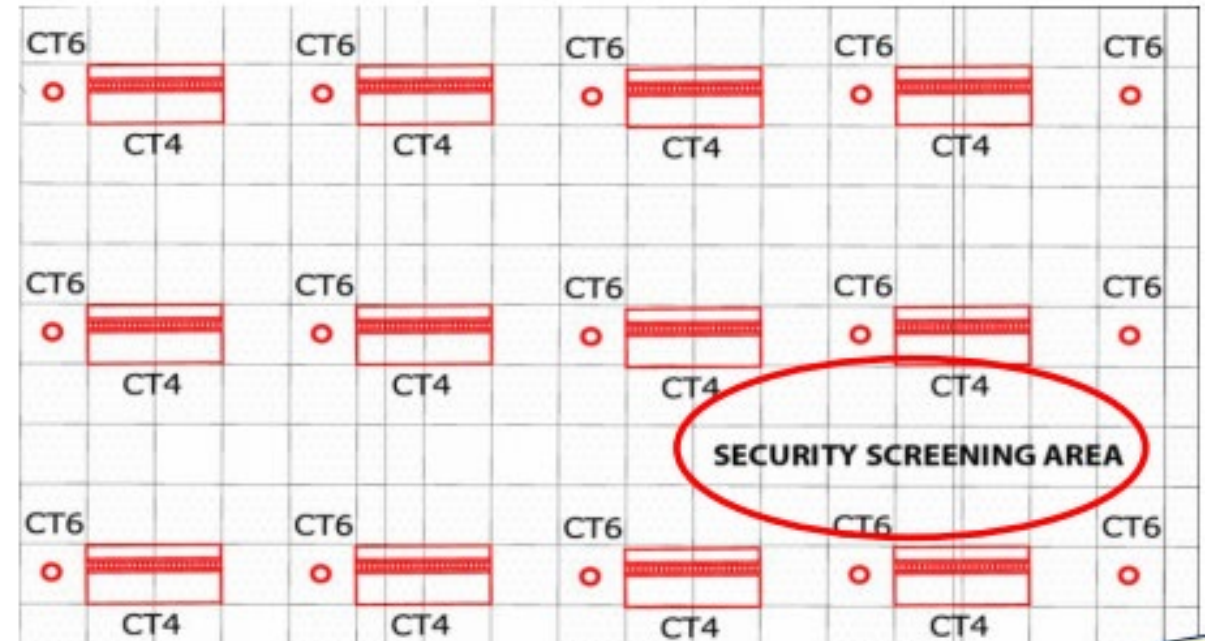
Open plan offices over 300sf under C405.2.1.3:

- #1 – An individual sensor shall not control an area greater than 600sf
- #3 – Lighting reduced by 80% until all connected zones unoccupied, then 100% off.
 - Can achieve with linked zone sensors
 - Individual zones can also just turn off 100%
- Sequence write-up should denote
 - #2 – Sensor should shut off lights within 20 minutes of unoccupancy.
 - #4 – Daylight controls should be overridden by occupancy sensors (only turn on if occupied).

Plans Should Document Emergency Lighting

Security and Emergency lighting is exempt from controls.

- Safe Passage Lighting
- Stairwells
- Security Checkpoints
- Egress Lighting that is normally off



Control Narrative as Tabular Summary

	AUTO SHUT OFF W/1 20 MIN	REDUCE LIGHTING TO 50% W/1 20 MIN	AISLEWAYS SEPARATE FROM EACH OTHER	AISLEWAYS SEPARATE FROM OPEN AREA	SETBACK 80% W/1 20 MIN	100% SHUTOFF W/1 20 MIN	MANUAL ON	AUTO ON TO 50%	AUTO ON TO 100%	OCCUPANT SHUT OFF	ZONES <600SF
Occupant Sensor Controls											
Classrooms/lecture/training rooms	X						A	A		X	
Conference/meeting/multipurpose rooms	X						A	A		X	
Copy/print rooms	X						A	A		X	
Lounges/breakrooms	X						A	A		X	
Enclosed offices	X						A	A		X	
Open plan office areas (300 SF+)					X	X					X
Restrooms	X						B		B	X	
Storage rooms	X						A	A		X	
Locker rooms	X						A	A		X	
Other spaces 300 SF or less	X						A	A		X	
Warehouse storage areas		X	X	X							
Time switch controls											
All other spaces not on occupant sensor control											

Control Narrative as Tabular Summary

Space Type	Room #s	MANUAL ON	MANUAL OFF	DIMMING	OVERRIDE SWITCH	KEY SWITCH	TIME CLOCK	OCCUPANCY SENSOR	VACANCY SENSOR	DAYLIGHT HARVESTING	PHOTOCELL
Break Room	Etc	X							X		
Cafateria	Etc	X				X	X				
Corridors	Etc					X	X				
Electric/mechanical room	Etc	X	X								
Exterior Grounds	N/A						X				X
Exterior Parking Lot	N/A							X			
Exterior Secirity Lighting	N/A						X				X
Floor Lobby	Etc	X	X								
Kitchen	Etc	X			X				X		
Main Lobby	Etc	X	X			X	X				
Meeting Room	Etc	X	X	X					X		
Open Office	101,103,205,204,2	X			X		X		X	X	
Pantry	Etc	X							X		
Private Office	104,105,106,107,1	X		X					X	X	
Rest Room	Etc					X	X	X			

Application Lighting

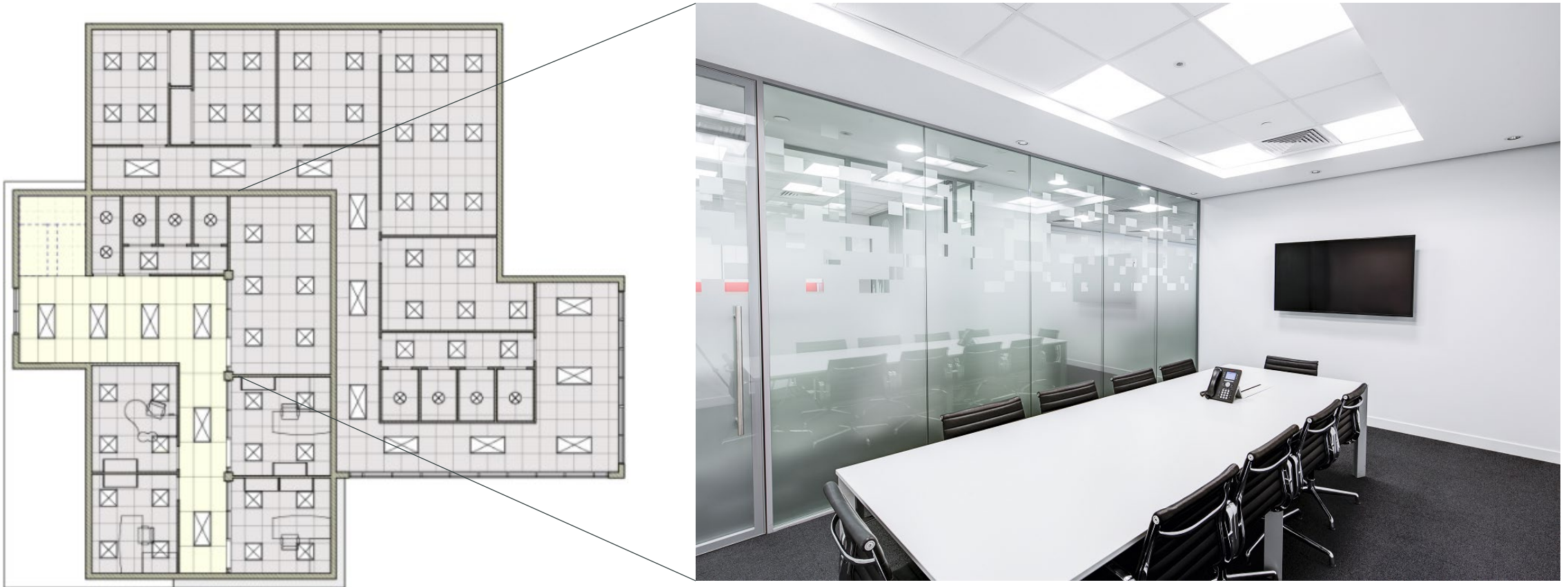
Documentation should show controls for display cases, accent lighting, and signage lights separate from general area lighting controls



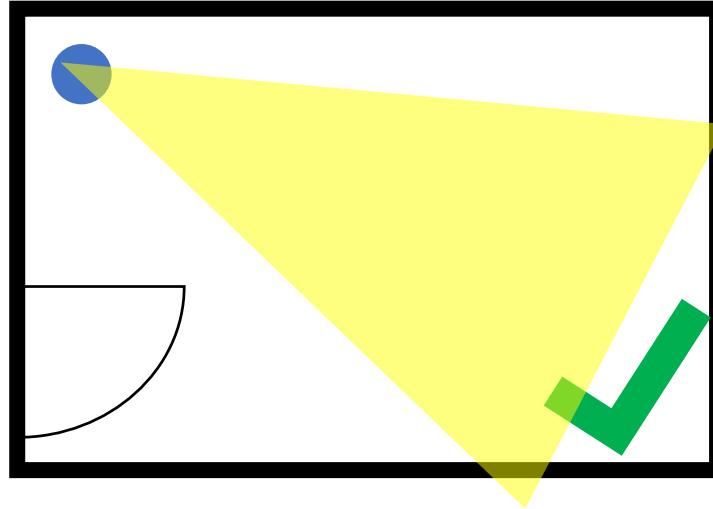
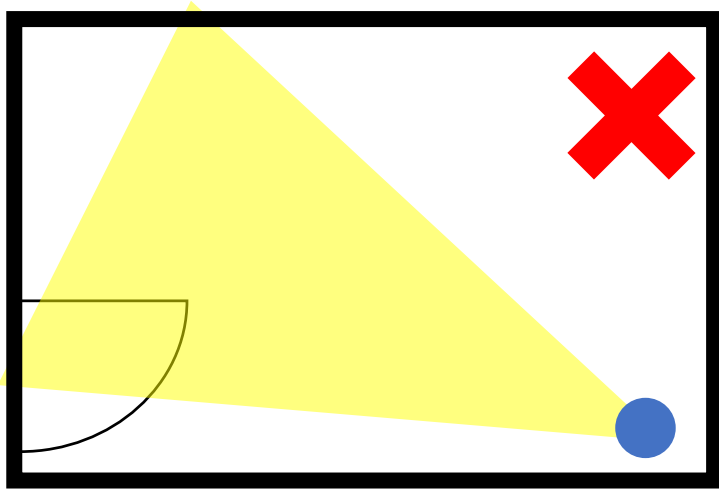
Lighting Site Inspection

Verify Schedule Lighting Matches Installed

- Lighting location and type match as-built plan drawings



Verify Lighting Controls Commissioning



Don't point into common spaces to avoid false triggers. Point into room

Ensure daylight harvesting sensors can see the light!



C105.2.5 Electrical System Inspections

- Lighting system controls need to be appropriate to application
 - Commissioning should check sensor appropriate for space
 - PIR sensors where occupancy is viewable by sensor
 - Ultrasonic or dual technology for spaces with obstructions



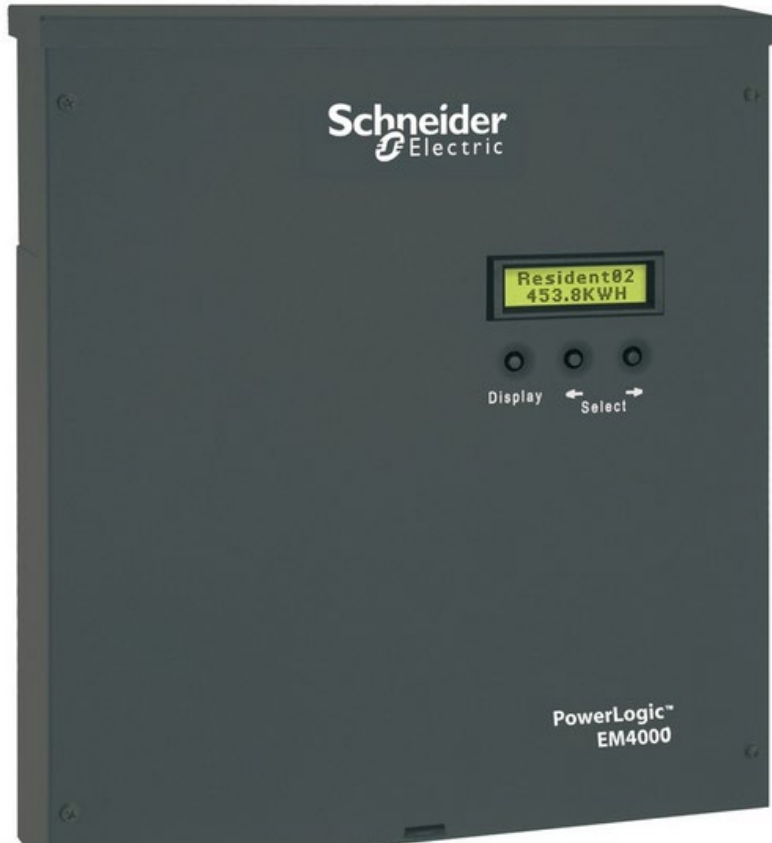
C105.2.5 Electrical System

- Lighting system components



C405.5 Dwelling Electrical Meters

- Electrical system meters (R-2 occupancies)
[>2 dwelling units w/ permanent occupants]



Control Verification Worksheet

Space Type	Room #s	MANUAL ON	MANUAL OFF	DIMMING	OVERRIDE SWITCH	KEY SWITCH	TIME CLOCK	OCCUPANCY SENSOR	VACANCY SENSOR	DAYLIGHT HARVESTING	PHOTOCELL
Main Lobby	100										
Open Office	101										
Open Office	103										
Private Office	104										
Private Office	105										
Private Office	106										
Private Office	107										
Private Office	108										
Kitchen	109										
Floor Lobby	200										
Open Office	204										
Open Office	205										
Cafateria	206										
Open Office	208										
Floor Lobby	300										
Corridors	304										
Break Room	305										
Electric/mechanical room	305										
Meeting Room	405										
Pantry	Etc										
Rest Room	Etc										
Exterior Grounds	N/A										
Exterior Parking Lot	N/A										



Questions?

energycode@illinois.edu

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