

Building Energy Education for Architects – Lighting & Electrical

4.15.2021



SEDAC

SMART ENERGY DESIGN ASSISTANCE CENTER

Providing effective energy strategies for buildings and communities



Stacey Pfingsten
Executive Vice President



Presentation Education Credits

SEDAC is a Preferred Education Provider with the International Code Council (ICC). Credits earned on completion of this program will be reported to ICC for ICC members. Certificates of Completion will be issued to all participants.



This workshop is approved for 1.5 LU/HSW CES credits from the American Institute of Architects (AIA). Credits earned on completion will be reported for AIA members.



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.





Building Energy Education for Architects

**Comprehensive energy efficiency training.
Learn how to design for efficiency.**

Learn more and register at
smartenergy.illinois.edu/events

Training delivered by the University of Illinois Smart Energy Design Assistance Center (SEDAC) in partnership with the American Institute of Architects Illinois



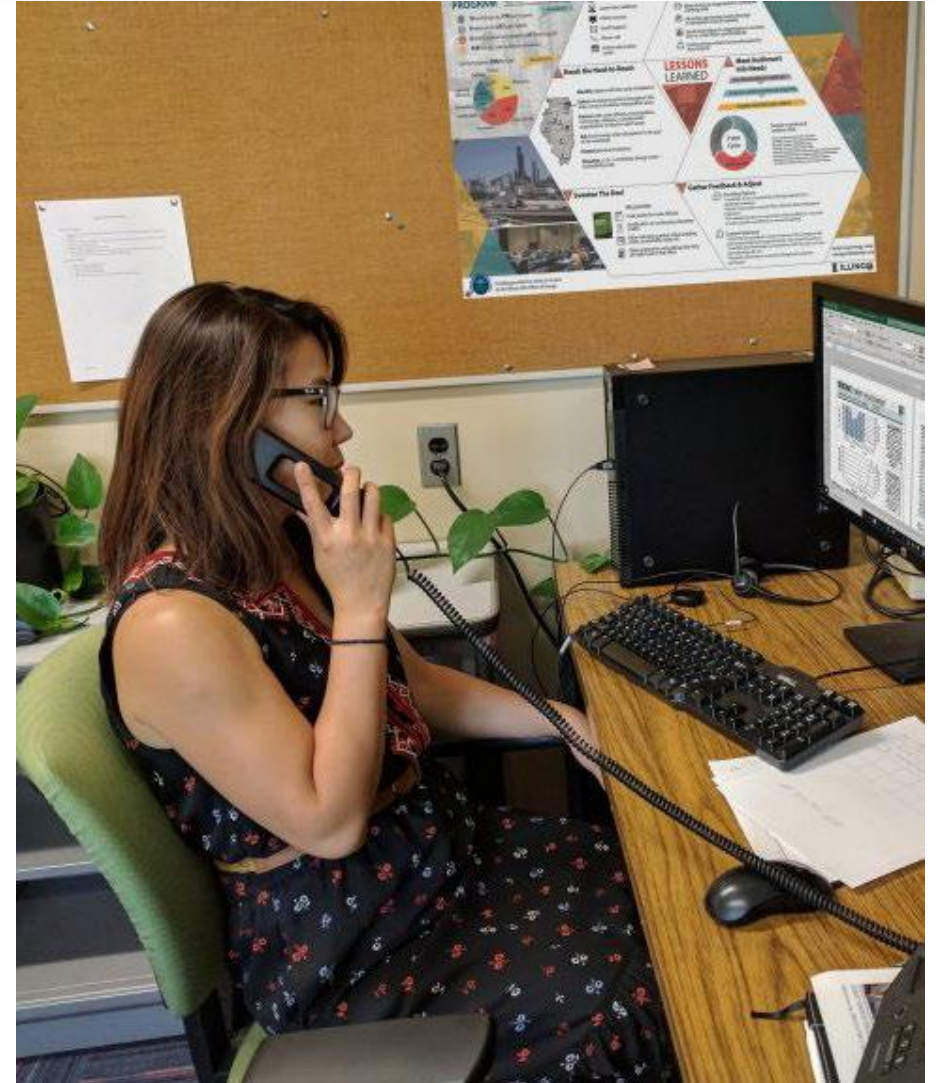
3/18/2021, 1-2:30 pm: Thermal Envelope

4/15/2021, 1-2:30 pm: Lighting & Electrical

5/20/2021, 1-2:30 pm: Indoor Air Quality & Comfort

SEDAC Program Contacts

- Technical support
sedac-info@illinois.edu
800.214.7954
- Online resources at
<https://smartenergy.illinois.edu/>
 - Blog Posts on current issues in efficiency and sustainability
 - Energy Smart Tips
 - Technical Notes



TRAINING AND SUPPORT SERVICES



Workshops



Webinars



Online courses



Technical support

ENERGY CODE RESOURCES



What is the Illinois
Energy Conservation Code?

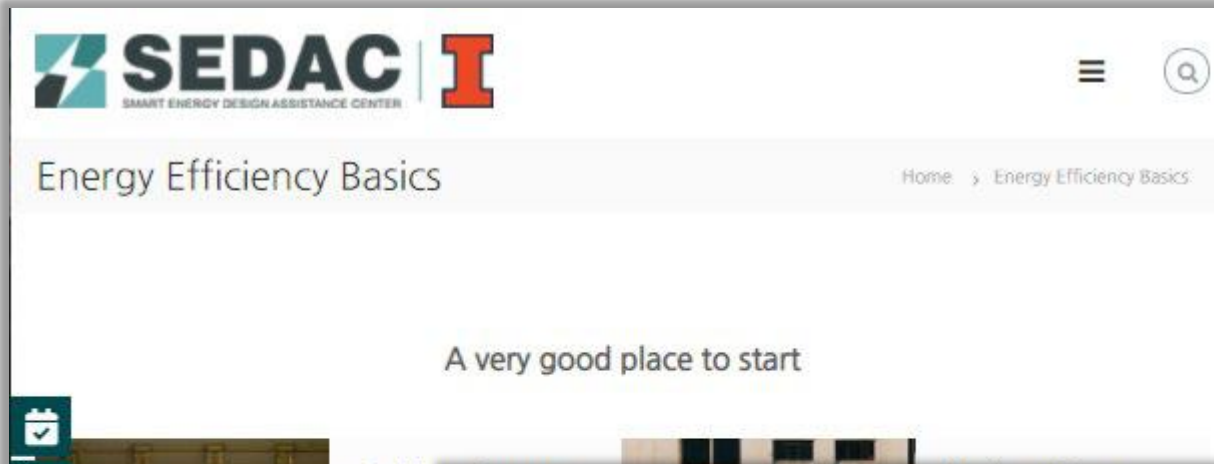


Frequently asked questions



Useful websites

SEDAC Building Energy Resources

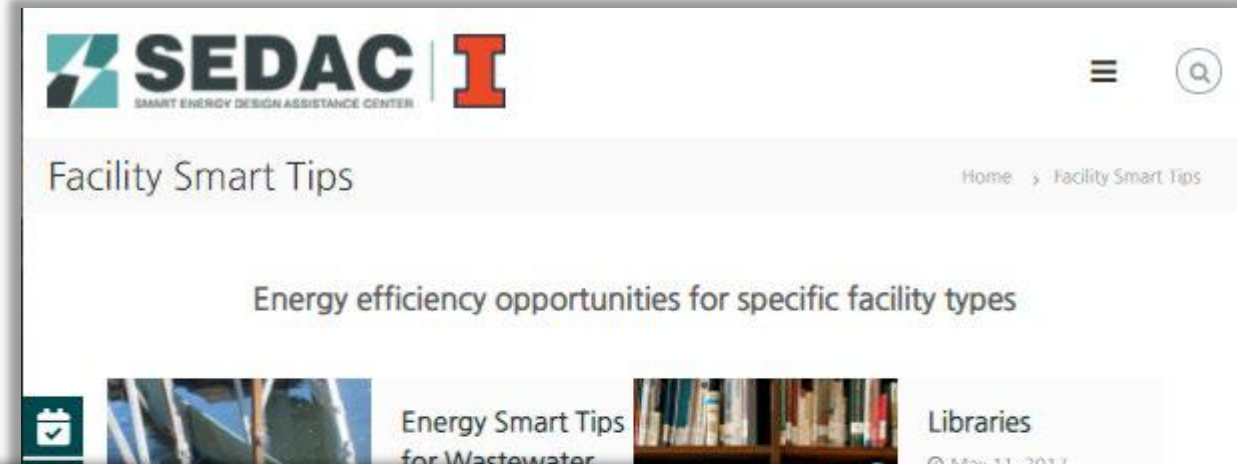


SEDAC | I
SMART ENERGY DESIGN ASSISTANCE CENTER

Energy Efficiency Basics

Home > Energy Efficiency Basics

A very good place to start

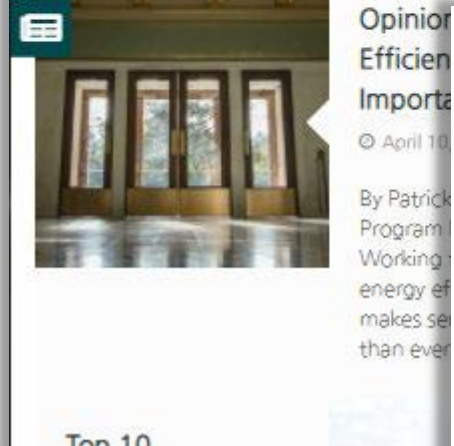


SEDAC | I
SMART ENERGY DESIGN ASSISTANCE CENTER

Facility Smart Tips

Home > Facility Smart Tips

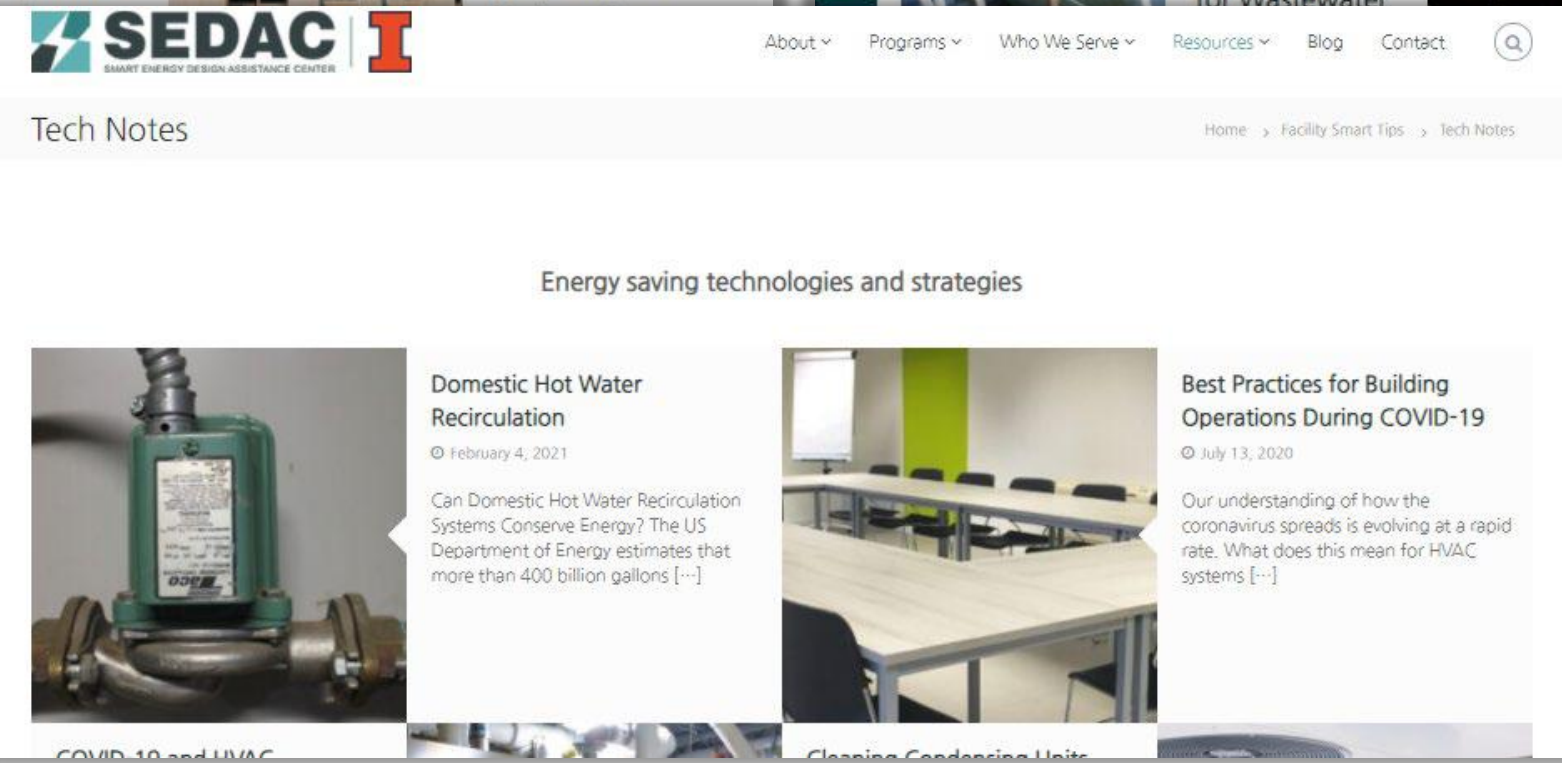
Energy efficiency opportunities for specific facility types



Opinion: Efficient Windows are Important

By Patrick Program

Working energy efficiency makes sense than ever



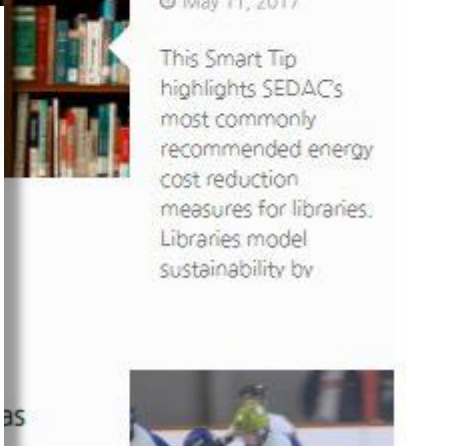
SEDAC | I
SMART ENERGY DESIGN ASSISTANCE CENTER

Tech Notes

Home > Facility Smart Tips > Tech Notes

Energy saving technologies and strategies

- Domestic Hot Water Recirculation**
February 4, 2021
Can Domestic Hot Water Recirculation Systems Conserve Energy? The US Department of Energy estimates that more than 400 billion gallons [...]
- Best Practices for Building Operations During COVID-19**
July 13, 2020
Our understanding of how the coronavirus spreads is evolving at a rapid rate. What does this mean for HVAC systems [...]



Libraries

May 11, 2017

This Smart Tip highlights SEDAC's most commonly recommended energy cost reduction measures for libraries. Libraries model sustainability by

SEDAC Free On-demand Online Training

**Continuing
Education
Credits
Available!
New Course –
Manual J**



[About](#) [Programs](#) [Who We Serve](#) [Resources](#) [Blog](#) [Contact](#) 



Manual J Load Sizing (New!)



Foundation Insulation (New!)



Duct Testing



Blower Door Testing



COMcheck Walk-through



REScheck Walk-through



Commercial Envelope



Commercial Lighting



Commercial HVAC



Residential Provisions



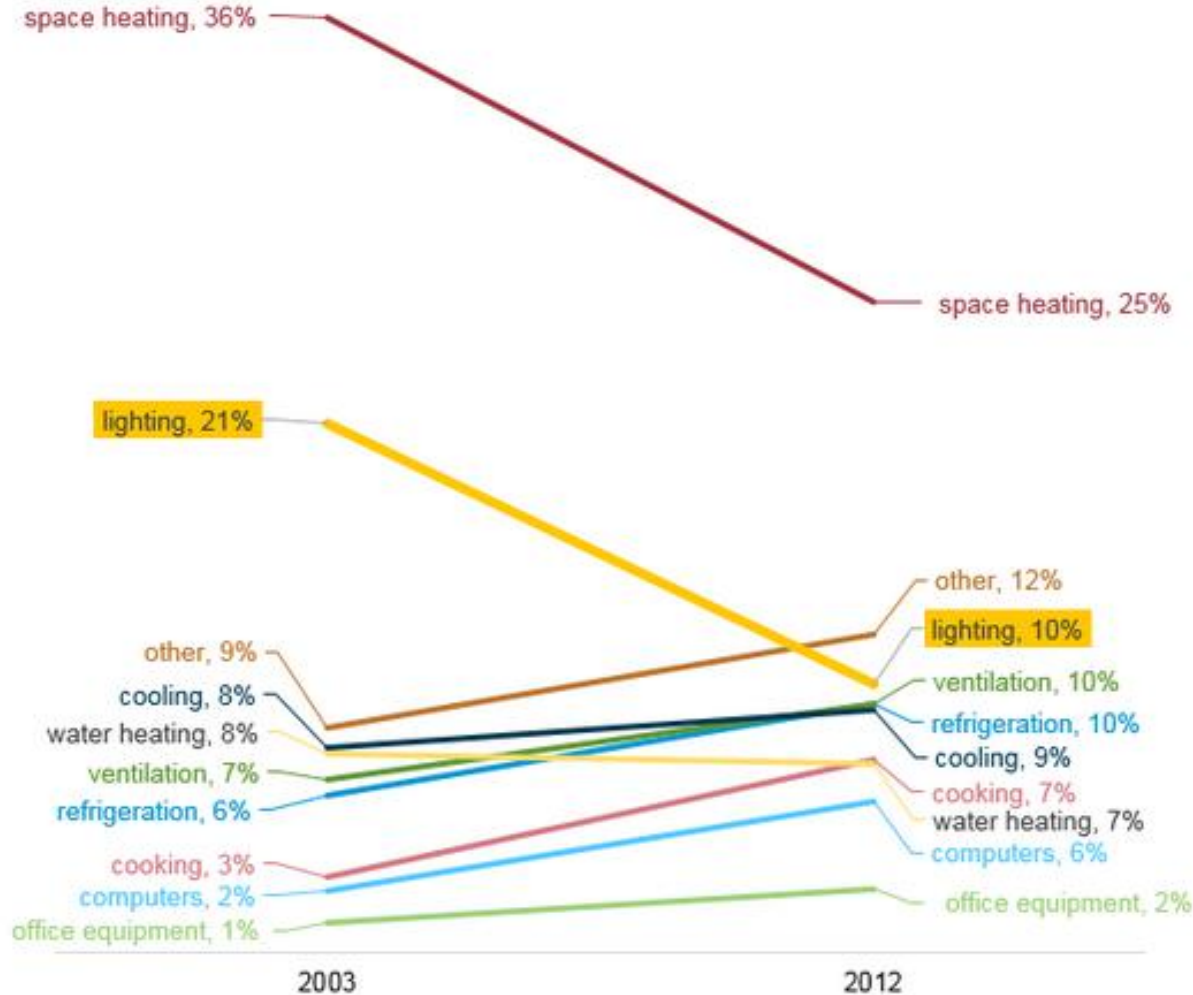
Learning Objectives

1. Understand the roles lighting and electrical systems have on overall building energy use.
2. Explain lighting efficacy and efficiency and how different types of lamps, luminaires and systems affect the building energy consumption.
3. Learn about lighting controls, when and why they are required by the code.
4. Understand how to comply with the current Illinois Energy Conservation Code for lighting and electrical design.

Energy Efficient Lighting Design

Why lighting?

Figure 3: Lighting in the commercial sector has decreased as a share of total major fuel consumption



Lighting efficiency has greatly improved but it still makes up a significant share.



Why lighting?



Quality and quantity of light is fundamental to the experience of buildings as well as health and safety of occupants.

3 Ingredients add up to Lighting Efficiency



1. Illuminance Level

Deliver the right amount of light for the task and the occupant(s)

3 Ingredients add up to Lighting Efficiency



2. Lumens/Watt

(Efficacy of Light Source)

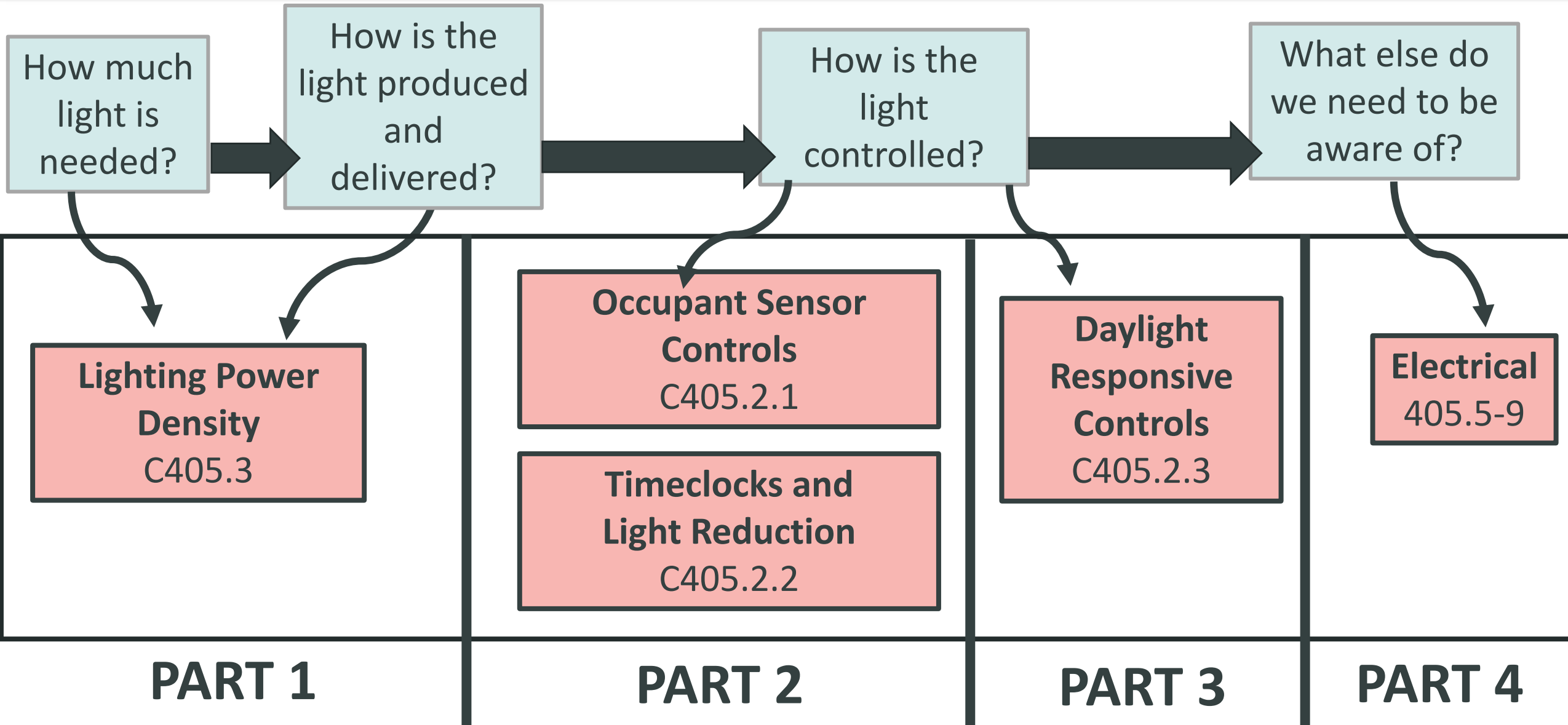
3 Ingredients add up to Lighting Efficiency



3. Hours

Minimize the hours
of operation.
Deliver light only
when it's needed.

Presentation Topic Overview



Lighting Power Density

Goal: Provide the Right Level of Light

Target Illuminance (fc) varies quite a bit based on the **task & the occupant**

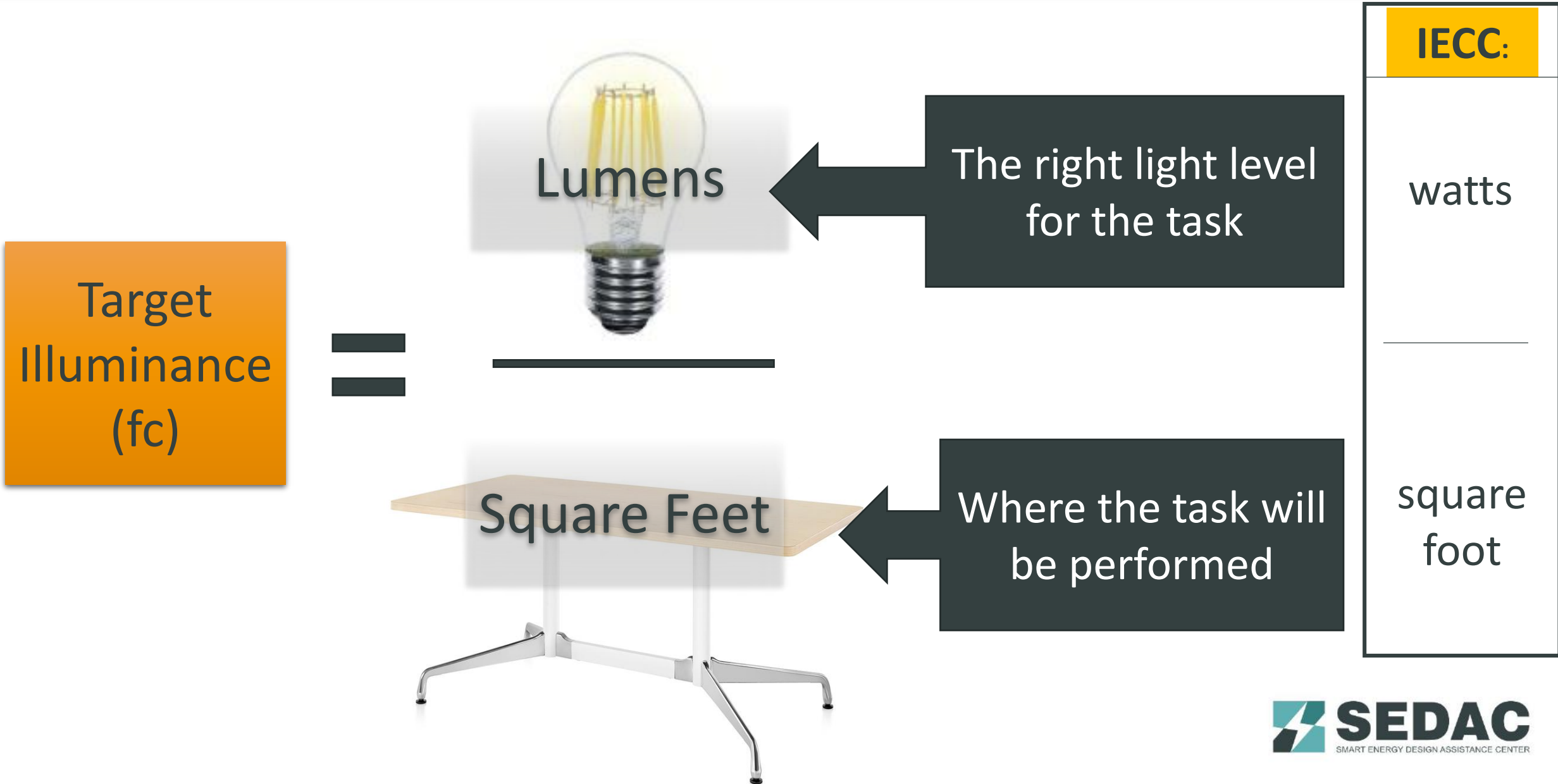


Photo by [Jilbert Ebrahimi](#) on [Unsplash](#)

From the IES Lighting Handbook

- **10-20 fc** Working spaces where visual tasks are only occasionally performed
- **20-50 fc** Performance of visual tasks of high contrast or large size
- **50-100 fc** Performance of visual tasks of medium contrast or small size

Maximize Efficiency



Start with Selecting High Efficacy Light Source



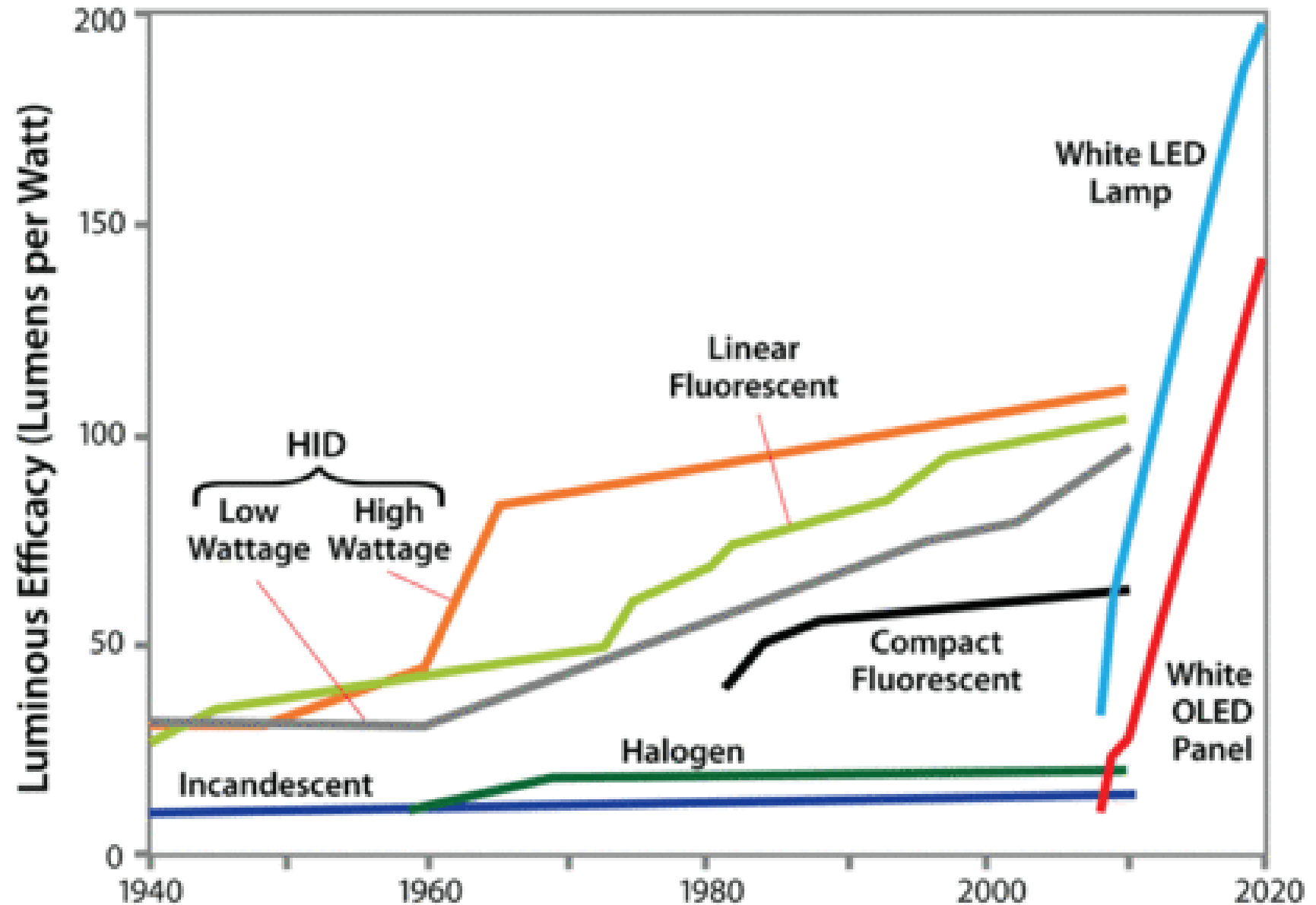
Incandescent =
800 Lumens/
60 watts



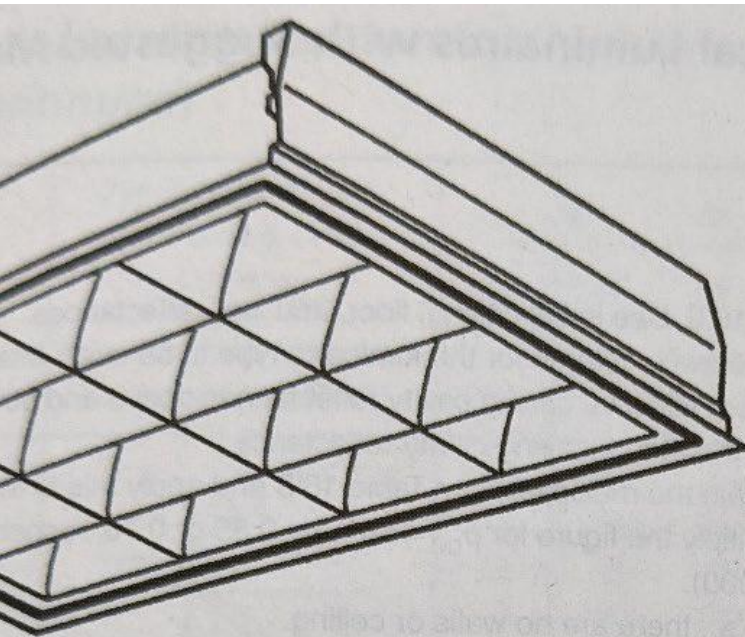
LED =
800 Lumens/
9 watts



Daylight =
infinite
Lumens/watt



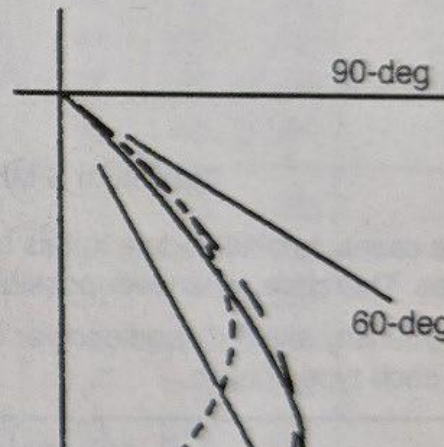
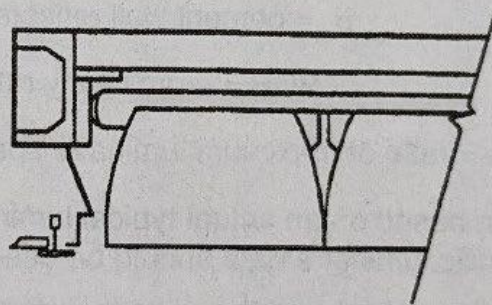
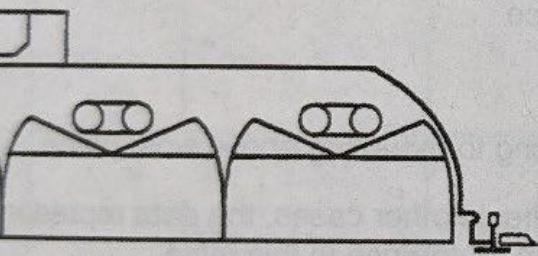
Start with Selecting Efficient Equipment



TOTAL LUMINAIRE EFFICIENCY = 66.0 %
TOTAL REFLECTANCE OF PAINT = 88.3 %
CIE TYPE - DIRECT
PLANE : 0-DEG 90-DEG
SPACING CRITERIA : 1.2 1.6
SHIELDING ANGLES : 36 43
PLANE : 0-DEG 90-DEG
LUMINOUS LENGTH : 21.250 21.250

LUMINANCE DATA IN FOOTLAMBERTS

ANGLE IN DEG	AVERAGE 0-DEG	AVERAGE 45-DEG	AVERAGE 90-DEG
45	2451.	3101.	1927.
55	494.	639.	55.
65	0.	0.	0.
75	0.	0.	0.
85	0.	0.	0.



**Fixture
Efficiency
is also a
Factor**

Residential Code Compliance – R404.1



- 90% of fixtures need to be high efficacy
- Note IL amendment changed definition of high efficacy
 - Fixtures ≥ 55 lumens per watt
 - Lamps (light source) ≥ 65 lumens per watt

Minimize the Area Being Lighted

Fixture layout
is a factor



Image courtesy of
birchwoodlighting.com

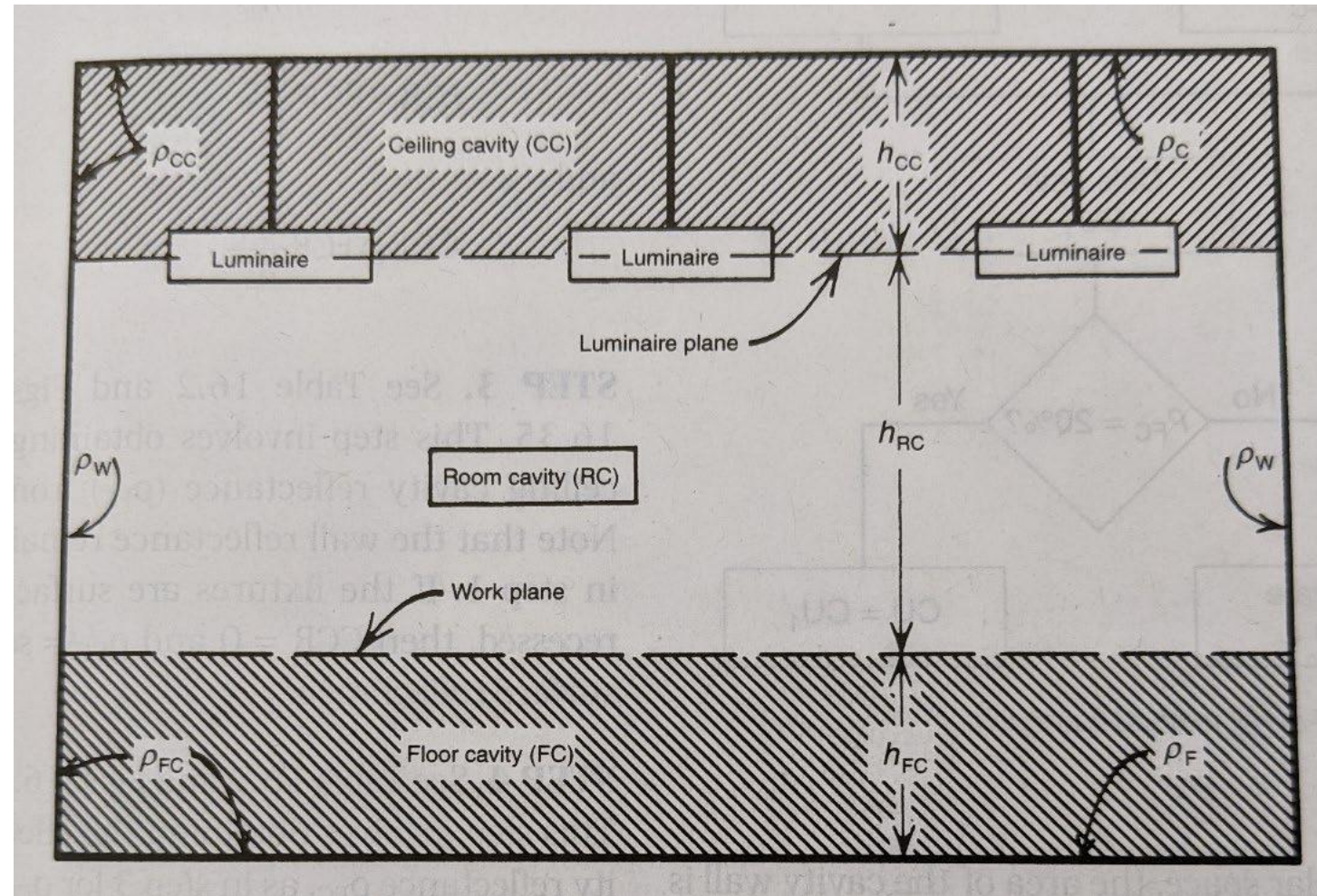


Diagram courtesy of Mechanical and
Electrical Systems in Buildings, 12th Ed.

Minimize the Area Being Lighted



Image courtesy of LEDiL.com

Task: Office Work
Recommended: 20-50 Foot Candles

Task: Circulation
Recommended: 10-20 Foot Candles

Minimize the Area Being Lighted



Possible to provide an even more targeted design?

Task: Office Work

Recommended: 20-50 Foot Candles

Task: Circulation

Recommended: 10-20 Foot Candles

Image courtesy of LEDil.com

Poll Question:

What could make this lighting design even more efficient?

Answer 1 – Design the overhead work area fixtures to provide ~30 foot-candles and include user operated task lighting at the individual workstations to modulate up to 50 foot-candles.

Answer 2 – Provide 50 foot-candles in the circulation areas near the floor to ensure that people can circulate safely through the office.

Answer 3 – Decrease the reflectance of the floor in the circulation areas to ensure that the workspaces feel brighter than the circulation areas.

Commercial - Lighting Power Density – C405.3 and C405.4



Exterior:

Table 405.4.2(1) – Exterior Lighting Zones

Table C405.4.2(2) – Lighting Power Allowances for Building Exteriors



Interior:

Table 405.3.2(1) – Building Area Method

Table C405.3.2(2) – Space by Space Method

Interior Lighting Power Density - C405.3.2(1) and C405.3.2(2)

- Building area method is simpler

Building	LPD (w/ft ²)
Hospital	1.05
Library	0.78
Office	0.79
Religious Building	0.94
Warehouse	0.48

- Space by Space method is more flexible

Space (healthcare)	LPD (w/ft ²)
Exam room	1.68
Imaging room	1.06
Medical supply	0.54
Operating room	2.17
Patient room	0.62

C405.4.2 Exterior Lighting Power Allowance

	Zone 1	Zone 2	Zone 3	Zone 4
Base allowance	350	400	500	900 W
Parking/drives	0.03	0.04	0.06	0.08 W / sf
Walkways <10' wide	0.5	0.5	0.6	0.7 W / lf
Walkways, other	0.1	0.1	0.11	0.14 W / sf
Landscaping	0.03	0.04	0.04	0.04 W / sf
Entry canopies	0.2	0.25	0.4	0.4 W / sf

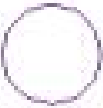


Required Documentation from C103.2

- Lighting fixture schedule with wattage and control narrative.
 - Fixture schedule in plan drawings satisfies Lighting Power Density 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.

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	F28TS	VOLUMETRIC RECESSED LIGHTING FIXTURE	(2) F28TS	2	2730	0.95	59.6
	B	4	WR9-1-54T5HO	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 P71FL	DLV 4" APERTURE LOW VOLTAGE LENSED ADJUSTABLE DOWNLIGHT WITH SOFTENING LENS 71W MR16 FL	(1) 70MR16FL	1	1100	0.75	71

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

Don't settle for the maximum!

Lower Lighting Power Density has many paybacks:

- Lower costs over time
- Sustainability
- 90% or less of allowable LPD qualifies as an “Additional Efficiency Package Option” per C406
- Lower LPD can enable reduced controls requirements

Controls Overview

Maximize Efficiency

LLLC



Switches &
Dimmers



Daylight
Sensor



Controls



Target
Illuminance
(fc)
when it is
needed

Occupant
Sensors



Timers



Digital
Lighting
Control



Two paths to controlling lighting

Luminaire Level Lighting Controls (LLLC)

- Integrates all controls in each fixture.
- Granular control but complex.
 - Reconfigurable

OR

Zones controlled by independent sensors and switching

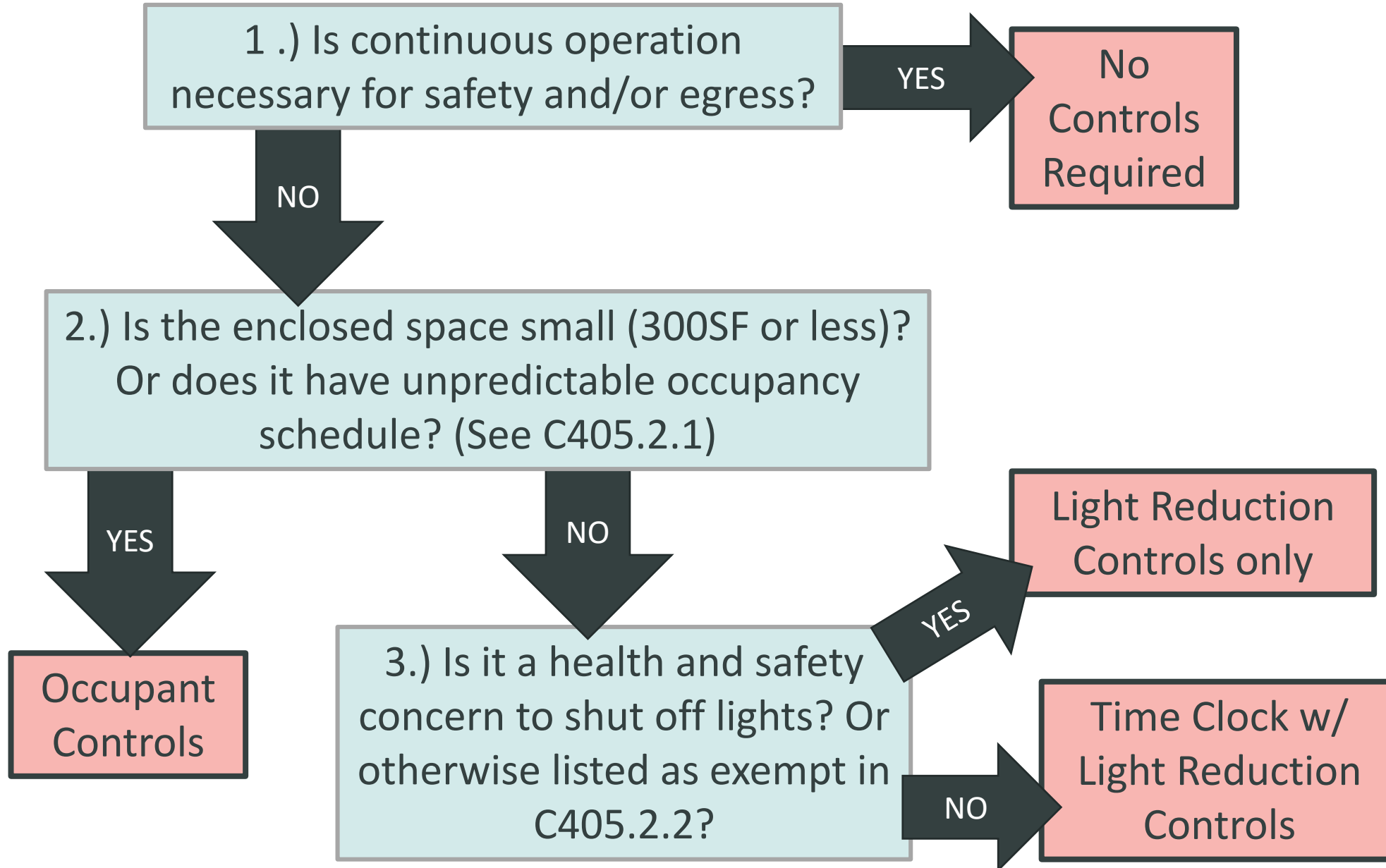
- The larger the space controlled, the less targeted.
- Potentially simpler.

Controlling the controls

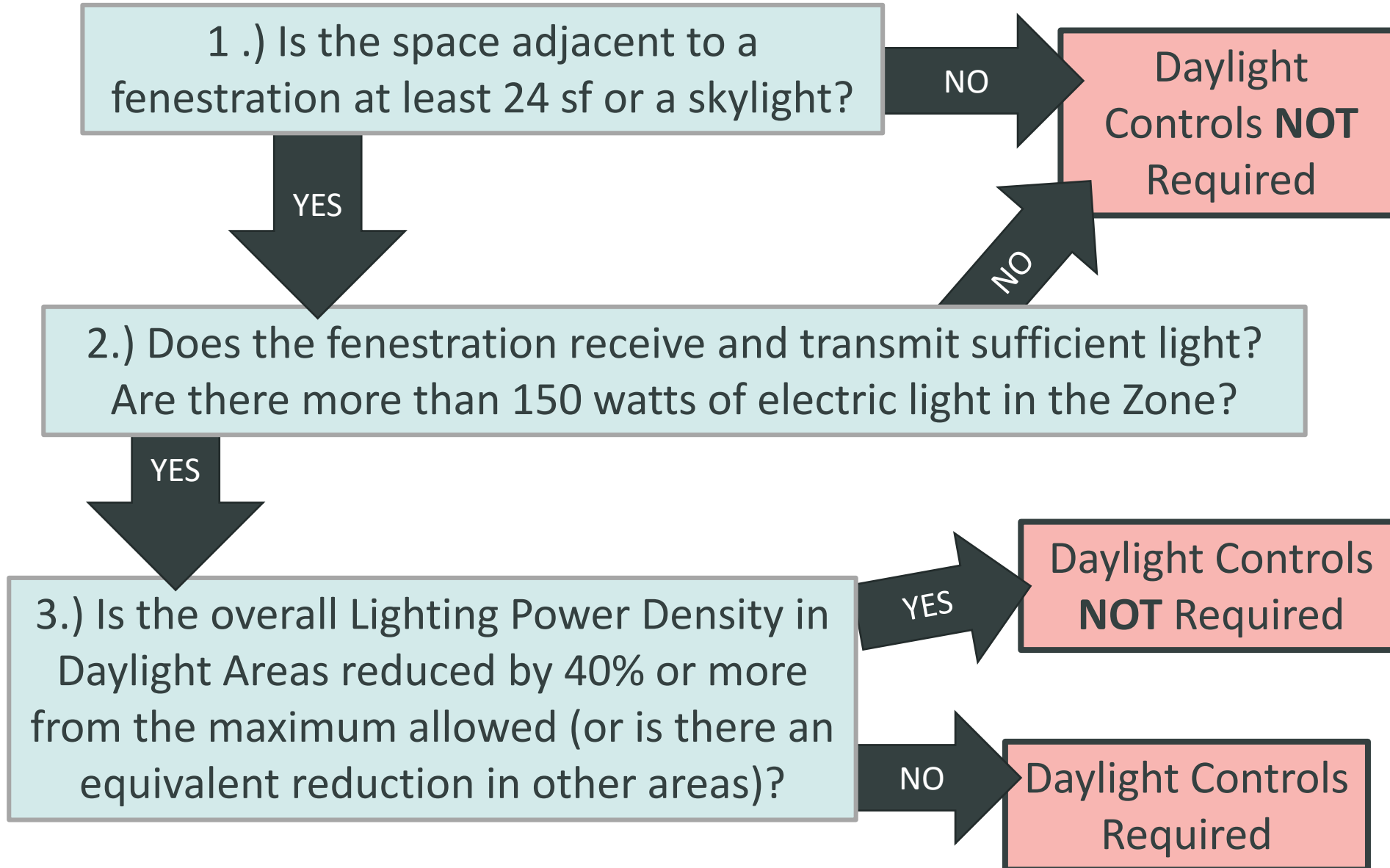
Building Automation and Networking

- Can enable central control of schedules and light levels
- Can manage complex systems for more granular control
 - Reduce labor costs for building operation
 - Additional Efficiency Package Option – C406.4

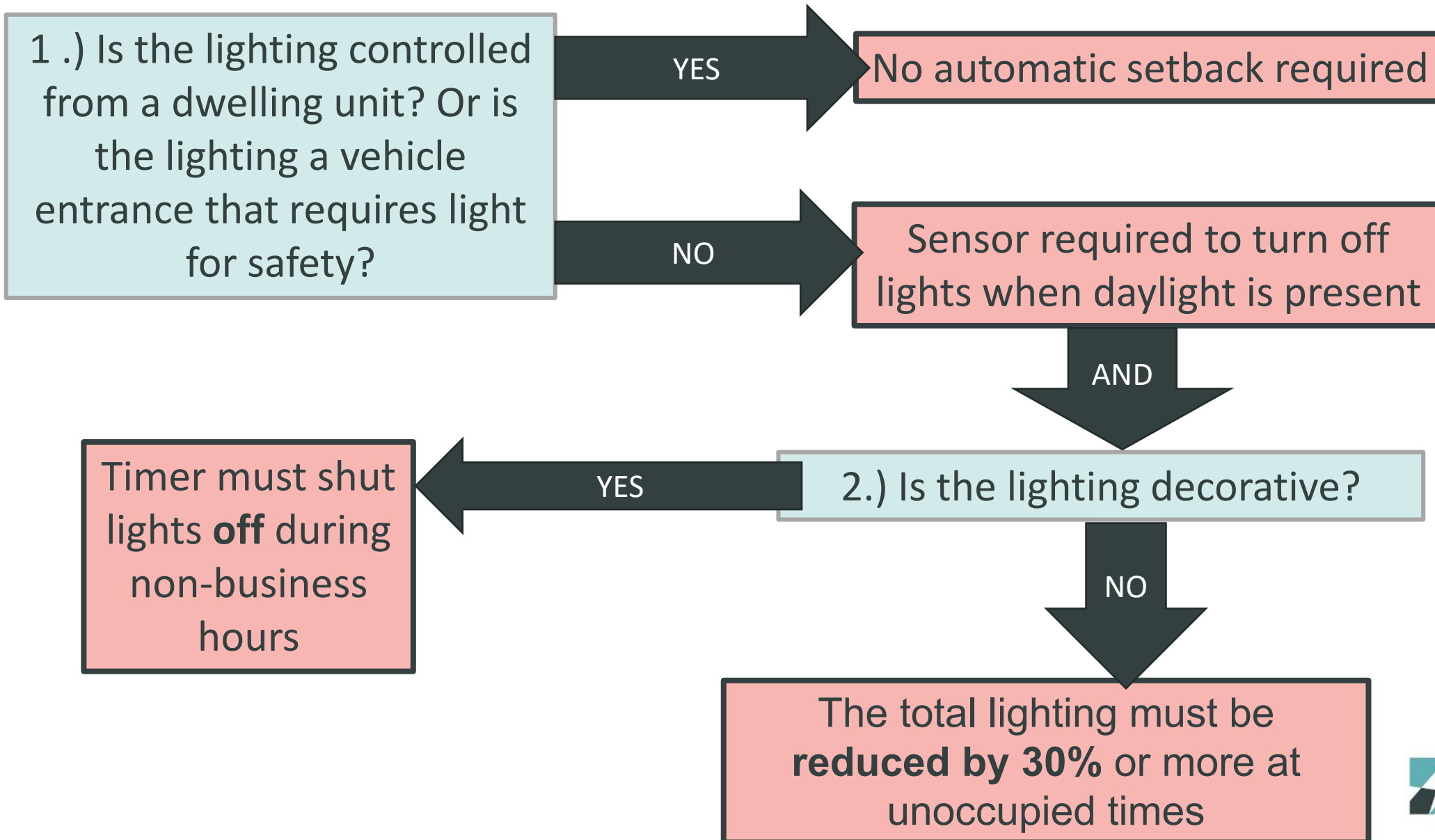
Occupant Controls Overview - Interior



Daylight Controls Overview - Interior



Controls Overview – Exterior Lighting



3 Controls Types

1. Occupant Controls

OR

2. Timers and Manual Controls

AND

(as needed)

3. Daylight Controls

Are occupants present to benefit from the electric light?

Is light present without additional electric light?

Occupant Controls

Automatic Shut-off is Required in Nearly Every Space



Occupant Sensors



Timers



LLLC

Occupant Sensing Devices required – C405.2.1



Occupant sensors are required to ensure that lights are turned **OFF** when there are not occupants in a space. No requirement to turn lights **ON**.

- **Automatic on is limited** to 50% power except for public areas as listed in C405.2.1.1(2) Exception
- **Automatic off required** to be within 20 minutes after occupants leave the space.
- **Manual off required** to allow occupants to turn off the lights.

Occupant Sensing Devices required – C405.2.1

- Classrooms/lecture/training rooms
- Conference/meeting/multi-purpose rooms
- Copy/print rooms
- Lounges/breakrooms
- Enclosed offices
- Open plan offices*
- Restrooms
- Storage rooms
- Locker rooms
- Other spaces 300 SF or less
- Warehouse storage areas*



Occupant Sensors

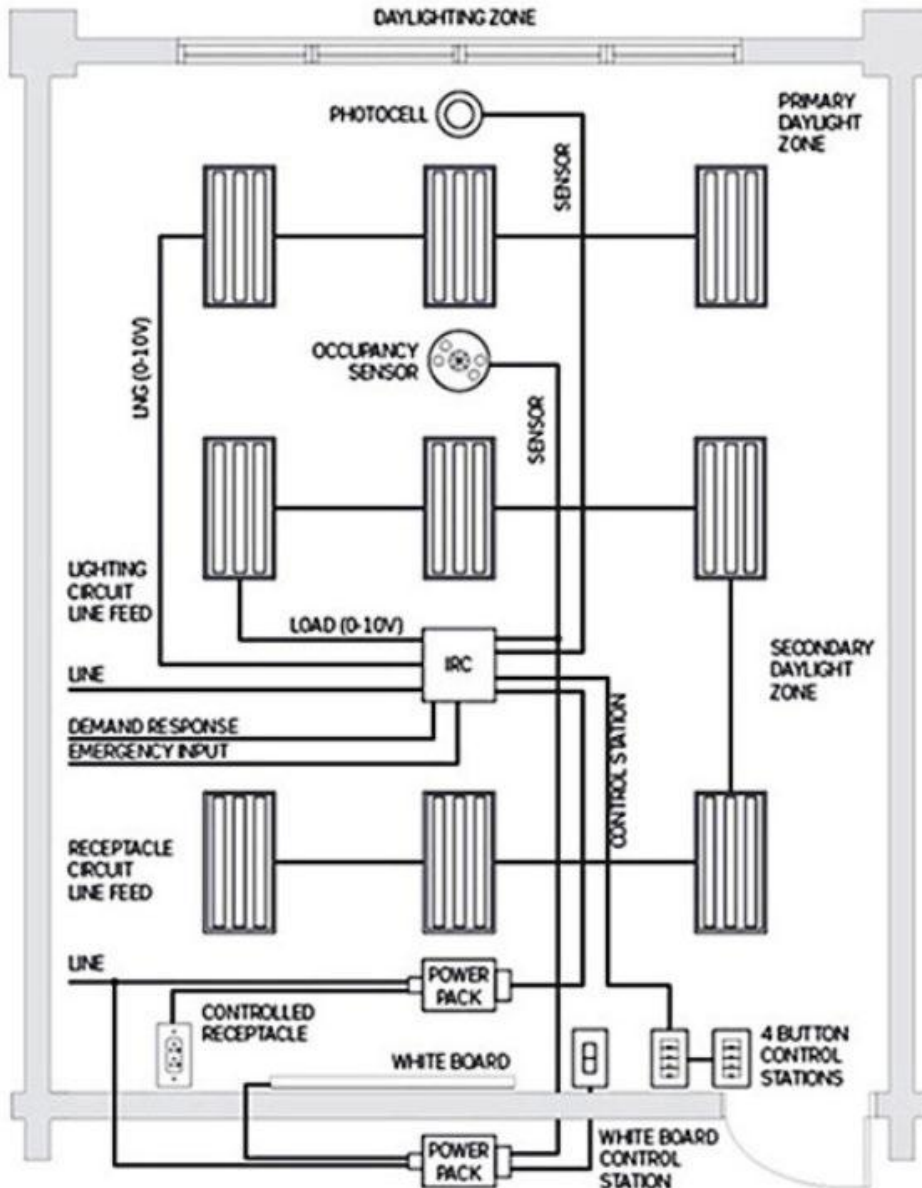
Image from Lighting Controls Association

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).

Select the Best Technology for the Space

- **Passive Infrared (PIR)** – picks up heat patterns – *good for areas with direct line of sight*
- **Ultrasonic Sensors (US)** – radiates ultrasonic radiation, detects motion – *works without line of sight*
- **Dual-technology (DT)** – integrates both PIR and US – *reduces false tripping*

Timeclocks & Special Applications

Time-switch Control – C405.2.2

Time switch controls are required in areas of buildings that are **not** provided with occupant sensors.

Time switches areas must **also** have manual controls

Exceptions available in the following locations (these must have Manual Lighting Controls):

1. Spaces where patient care is directly provided
2. Spaces where an automatic shutoff would endanger occupant safety or security
3. Lighting intended for continuous operation
4. Shop and laboratory classrooms



C405.2.2.2 Light-reduction Controls

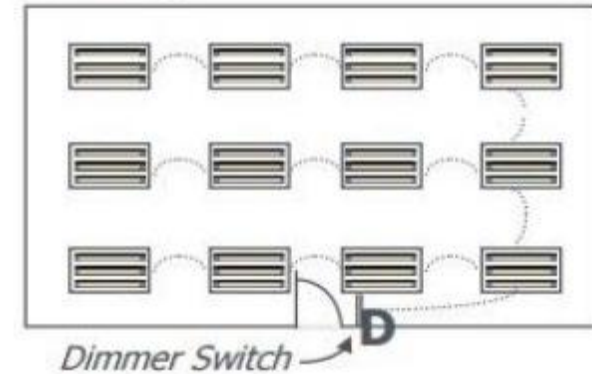
Light Reduction Controls to allow occupants to reduce lighting by **not less than** 50% in reasonably uniform pattern

1. Control all lamps/luminaires
2. Switching alternate rows or luminaires
3. Switching outer lamps
4. Switching each lamp/luminaire

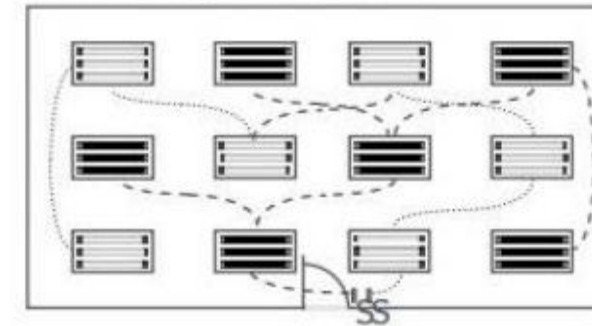
Exceptions for:

1. Spaces with 1 luminaire rated less than 100 watts
2. Spaces <0.6 watts/SF
3. Corridors, lobbies, electrical / mechanical rooms
4. Daylight zones with daylight responsive controls

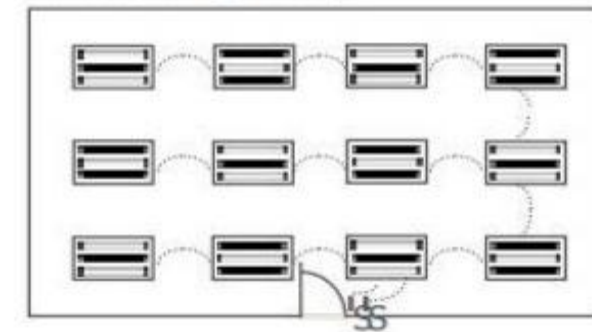
Dimming



Alternating Luminaires



Alternating Lamps



C405.2.4 Specific Application Controls

Specialty Lighting but be controlled **independently** of the General Lighting

Occupant or Timeclock + manual

- Display, display cases and Accent area
- Supplemental task lighting
- Lighting equipment for sale or demonstration



Timeclock + manual

- Nonvisual Application (Plant, Food Warming)

Specific Application Controls

Dwelling Units:

- Occupant sensor control (C405.2.1) or Light-reduction controls (C405.2.2.2)



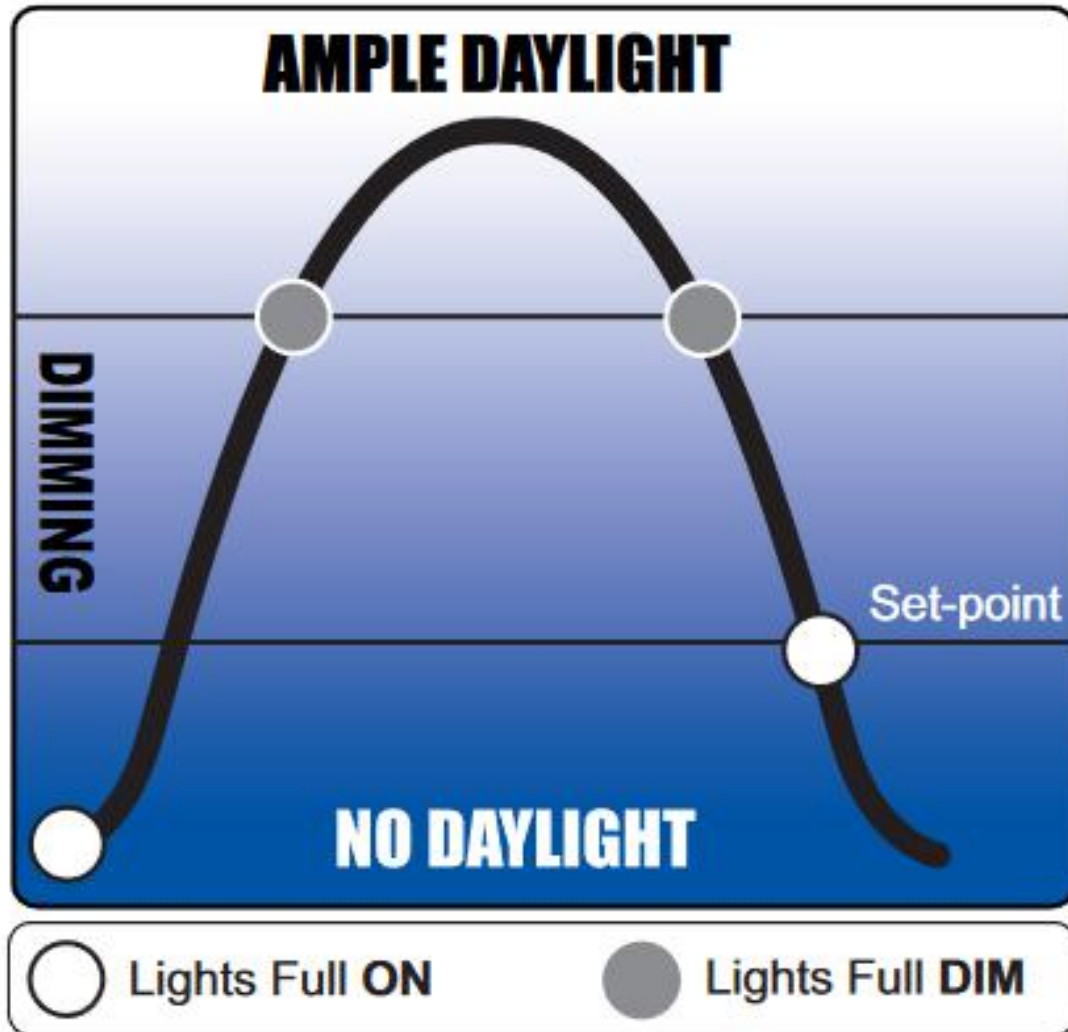
Sleeping Units (C405.2.4)

- Automatically switch off all permanently installed luminaires & switched receptacles within 20 min. after no occupancy
- Exception: Keycard controlled lighting and Patient care space



Daylight Controls

Daylight Harvesting



AUTO DIMMING CONTROL

Daylight sensors reduce electric light as daylight increases to maintain target illuminance

Reduces electrical consumption by reducing draw and/or hours of operation.

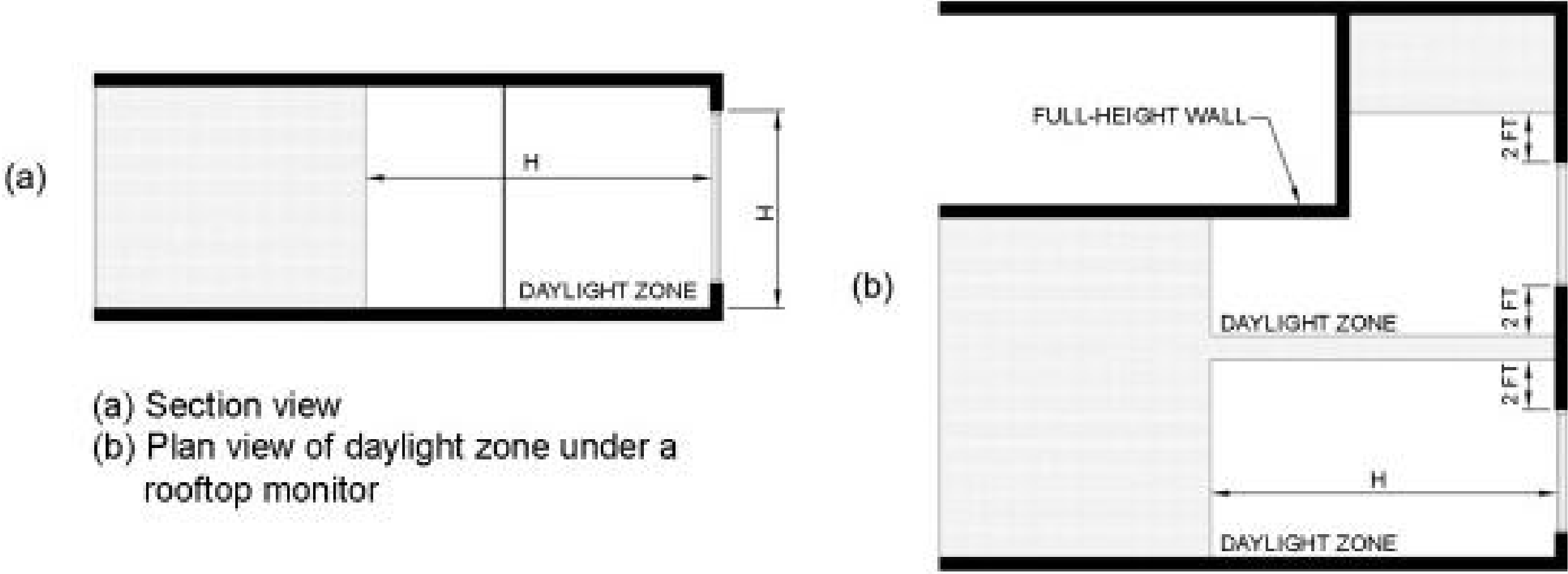
Where is daylight harvesting applicable?



Photo by [Max Vakhtbovych](#) from [Pexels](#)

Areas adjacent to significant windows and skylights are identified as **daylighting zones** in the IECC.

Where is daylight harvesting applicable?



(a) Section view

(b) Plan view of daylight zone under a rooftop monitor

FIGURE C405.2.3.2 SIDELIT ZONE

Where is daylight harvesting applicable?

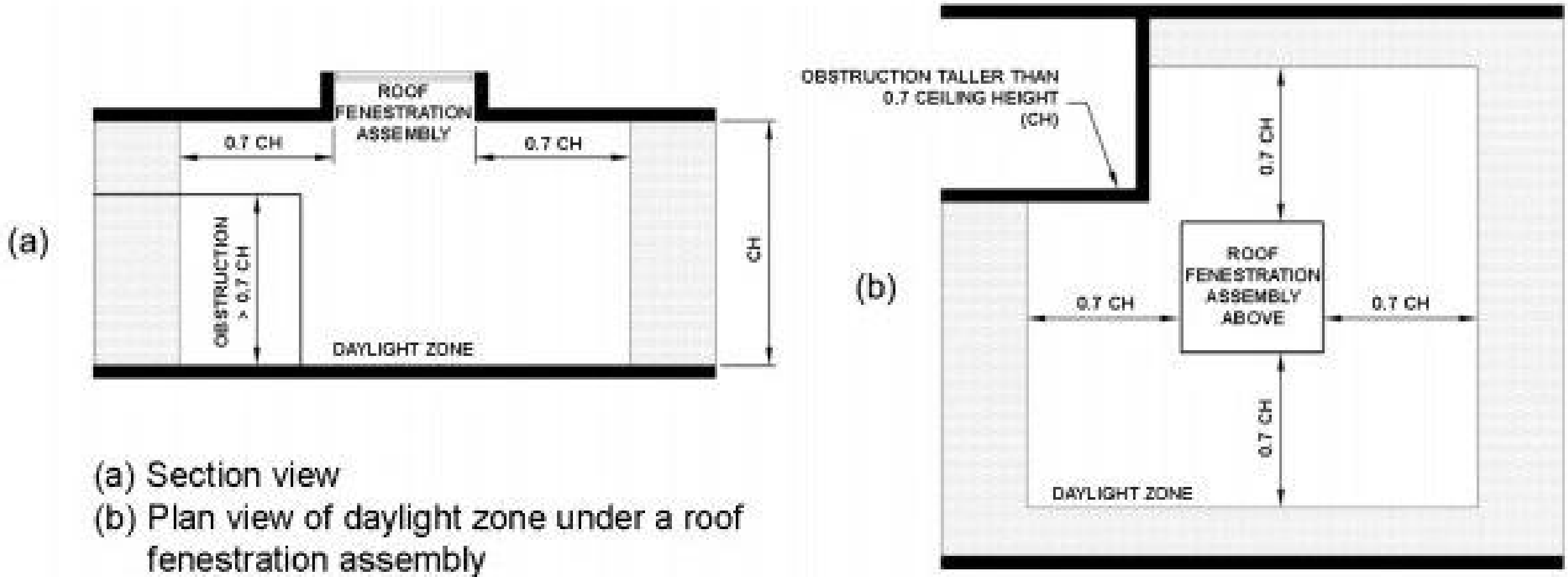
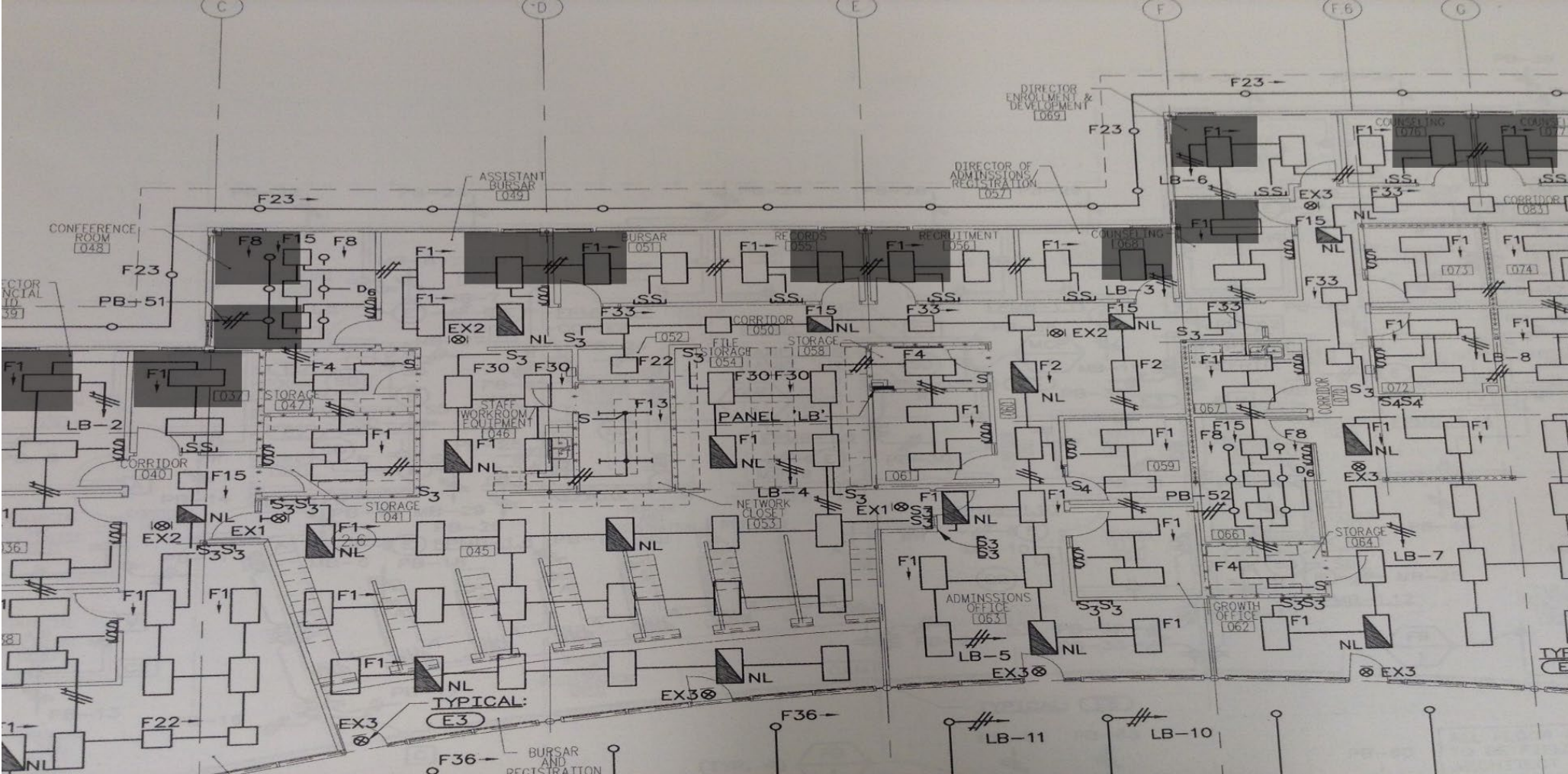


FIGURE C405.2.3.3(1) TOPLIT ZONE

Plan Drawing Showing Daylit Zones



Daylight Controls – Important Exception

- Connected lighting power < Adjusted lighting power budget
- Adjusted lighting power budget = Normal lighting power budget * (1.0- [0.4* weighted average of SF in daylit zone])
- If below this threshold, no daylight controls required



C405.2.3 Daylight Controls

Example Office 1:

200,000 sf total area
100,000 sf daylit zones
LPD: 0.79 W/sf
LPA: 158,000 W

LPA adj
= 158,000 W x (1.0 –
0.4x100,000/200,000)
= 158,000 W x 0.8
= 126,400 W (20% less)
126,400 W/200,000 sf =
0.63 W/sf

Example Office 2:

200,000 sf total area
50,000 sf daylit zones
LPD: 0.79 W/sf
LPA: 158,000 W

LPA adj
= 158,000 W x (1.0 –
0.4x50,000/200,000)
= 158,000 W x 0.9
= 142,200 W (10% less)
142,200 W/200,000 sf =
.71 W/sf

Daylighting Zones

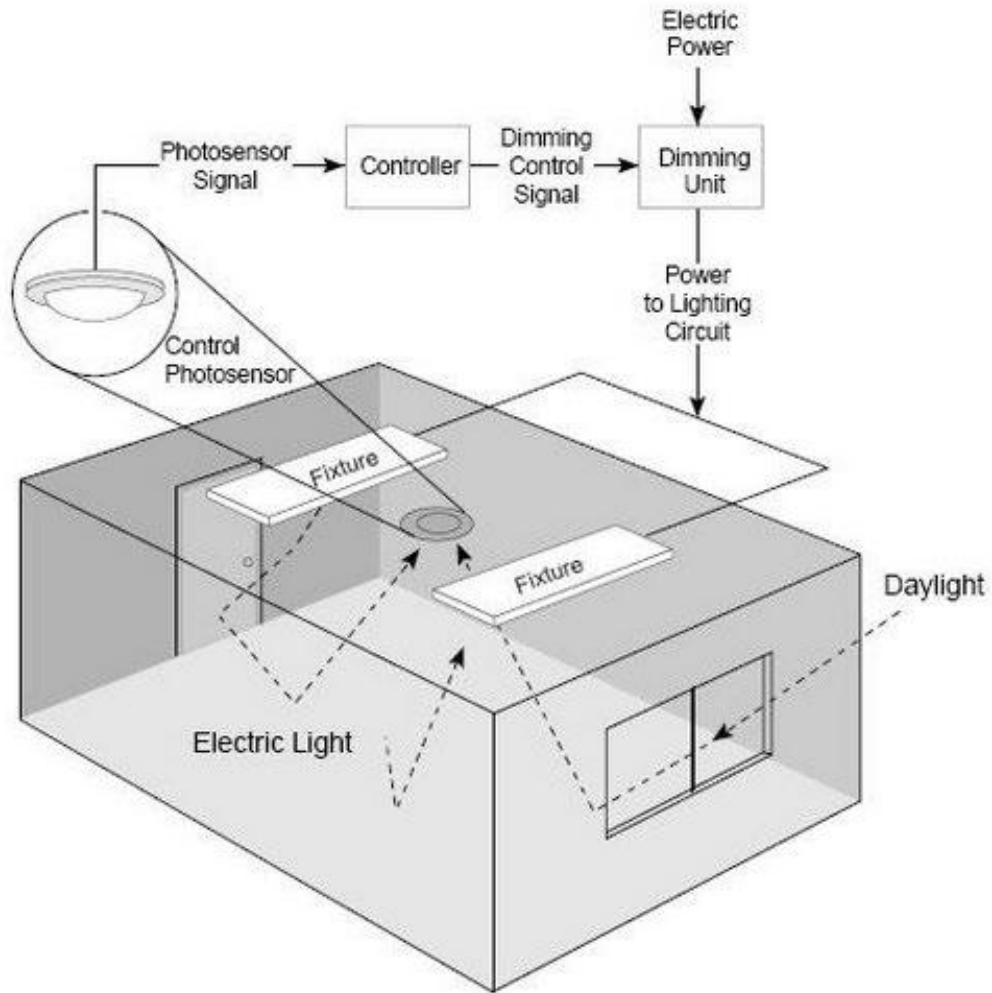


**Example of
Toplighting**

Regardless of Time clock or
Occupant sensor...

- Daylighting control required when more than 150w in top lit or side lit zone
- Lights sense the lumen level in the space and dim or brighten to always maintain the desired light level.
- If banks of lights are controlled together, they must be expected to have similar ambient light.

System Layout



Where required, photosensors dim lights to maintain the light level at the **target illuminance.**

Typical Daylight Harvesting Control System
(Photo Credit: Lawrence Berkeley National Laboratory)

Why go beyond the minimum?

Improving the daylighting control of fixtures is a good idea:

Additional Efficiency Package Options

- C406.4 Enhanced digital lighting controls
 - Continuous dimming, addressed in groups of 4 or less, daylight zones of 8 or fewer luminaires, controlled through digital control system, additional functional testing to comply with C408

Exterior Lighting Controls

C405.2.6 Exterior Lighting Controls

C405.2.6 Exterior Lighting Control

Functional Lighting

C405.2.6.1

C405.2.6.3

C405.2.6.4

Lighting
Setback

Decorative Lighting

C405.2.6.1

C405.2.6.2

C405.2.6.4

Decorative
Lighting Shutoff

Daylight
Sensor

Time switch
Function

C405.2.6 Exterior Lighting Controls

Daylight Shutoff

Decorative Lighting Shutoff

- Building façade and landscape lighting shall automatically shutoff ≤ 1 hr after business closing to ≤ 1 hr before opening

Lighting Setback

- Total wattage reduced by $\geq 30\%$ by switching or dimming during one of the following:

From not later than midnight to not earlier than 6 am

From ≤ 1 hour after business closing to ≤ 1 hour before opening

During any time where activity has not been detected for ≥ 15 min

Time-switch Control

Same as interior time-switch



Documenting Controls

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.

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			

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										

Controls Commissioning

C408.3.1 Functional Testing

- Must be complete before final inspection
- Registered design professional to provide evidence of testing
 1. Occupant sensor controls
 2. Time-switch controls
 3. Daylight responsive controls

Documentation Requirements: Construction documents shall specify that Drawings (location & catalogue # of each equipment), Manuals & Report are provided to the owner within 90 days of the receipt of Certificate of Occupancy

C408.3.1.1 Occupant Sensor Controls

1. Certify sensors located and aimed per manufacturer recommendations
2. Testing of each space geometry sensor combination including 10%+ of each combination
3. Verify status indicators, time delay, dimming or off level, correct auto-on or manual-on functionality, no false tripping due to HVAC operation



C408.3.1.2 Time-switch Controls

1. Weekday, weekend, holiday schedules
2. Documentation of programming including schedules, set-up and preference programs
3. Verify date and time, installation and operation of battery, override time limit, control switches operation when occupied, lighting turns off when unoccupied, proper manual override switch operation



C408.3.1.3 Daylight Responsive Controls

1. Verify control devices properly located, calibrated & setpoints and thresholds set
2. Loads adjust in response to daylight
3. Calibration equipment readily accessible only to authorized personnel



Electrical

Mandatory Provisions

- C405.1 General
- C405.2 Lighting Controls
- C405.4 Exterior Lighting Power Requirements
- C405.5 Dwelling Electrical Meter
- C405.6 Electrical Transformers
- C405.7 Electric Motors

C405.5 Dwelling Electrical Meters

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



Elevators

- Need to include in contract documents
 - Minimum 35 lumens per watt
 - Fans less than 0.33 watts per CFM
 - Deactivate lights and fans when elevator is stopped, unoccupied, and with doors closed for over 15 minutes



Escalators

- Designed for 1 way down or reversable
 - Reduced speed when not conveying persons
 - Need regenerative drive system





Questions?

energycode@illinois.edu

800-214-7954