

Designers Lighting Forum

Creating Control Clarity: How to Write Control Intents & Sequences

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March 15, 2022, 9:00AM – 10:30AM Murray Hill Room



Credit(s) earned on completion of this course will be reported to **AIA CES** for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

This course is registered with **AIA CES** for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any

material of construction or any method or manner of handling, using, distributing, or dealing in any material or product.

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

Learning Objectives

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

1. Review and understand why lighting control intent narratives and sequence of operations will document an owner's operational intent, a designers specification requirements and how it can deliver clear guidance to contractors, integrators and commissioning agents.
2. Apply documentation tools, control matrixes and guiding questionnaires from the Lighting Practice that assist a designer in creating solid, contractually enforceable language that gives an owner what they want, specifies what a contractor installs, directs integrators what to program and identifies what a commissioning agent must verify.
3. Know the difference between Control Intent Narratives and Sequence of Operations and break specification "writers block" by reviewing ready-made application examples inside the Lighting Practice document.
4. Learn the role each professional discipline plays in correctly creating, documenting and implementing lighting control operation including the deliverables needed in each phase of the construction documentation process

IES LP – Documenting Control Intent and Sequence of Operations

- Unpublished BSR/IES LP, completing edits, public review and approval process
- Our experience on documenting control intent narratives and sequence of operations does not represent views of the IES
- Encourage participation in the Lighting Practice public review and comment process this spring

ANSI PUBLIC REVIEW OF IES STANDARDS

By Pat McGillicuddy, IES manager of standards development

The following draft will be available for ANSI Public Review comment March through April 2022 (please check back for exact dates):

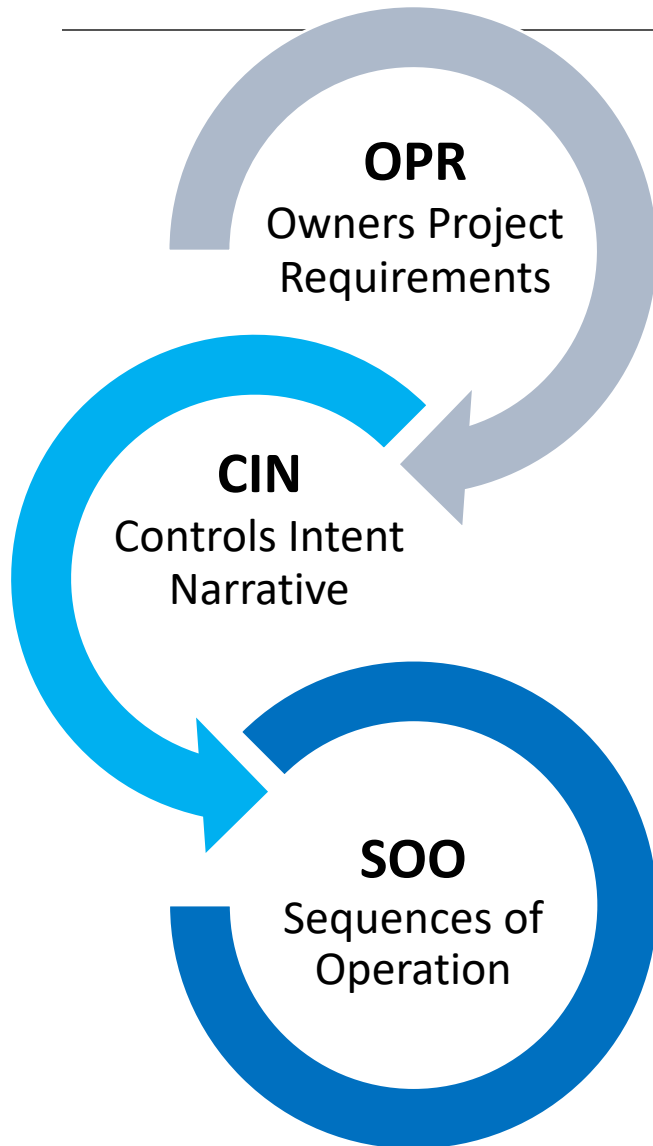
BSR/IES LP-16-xx, Lighting Practice: Documenting Control Intent Narratives and Sequence of Operations

Additional information may be found [here](#), or you can contact Pat McGillicuddy (pmcgillicuddy@ies.org) or Albert Suen (asuen@ies.org). (Note: Admin fee required.)



Source: IES Standards Bulletin – Feb 8, 2022

OPR > CIN > SOO... BRIEFLY



DEFINITION

The OPR defines the specific functional and operational requirements for all building systems and their interaction FROM THE OWNER'S POV.

The CIN provides a broad brushstroke view of the lighting control system and its functionality. It draws on information from both the OPR and other Basis of Design docs.

*The SOO is the specific, **contractually enforceable** expression of how the lighting control system operates. It specifies limits and set points, timing, and equipment.*

WHY IT MATTERS

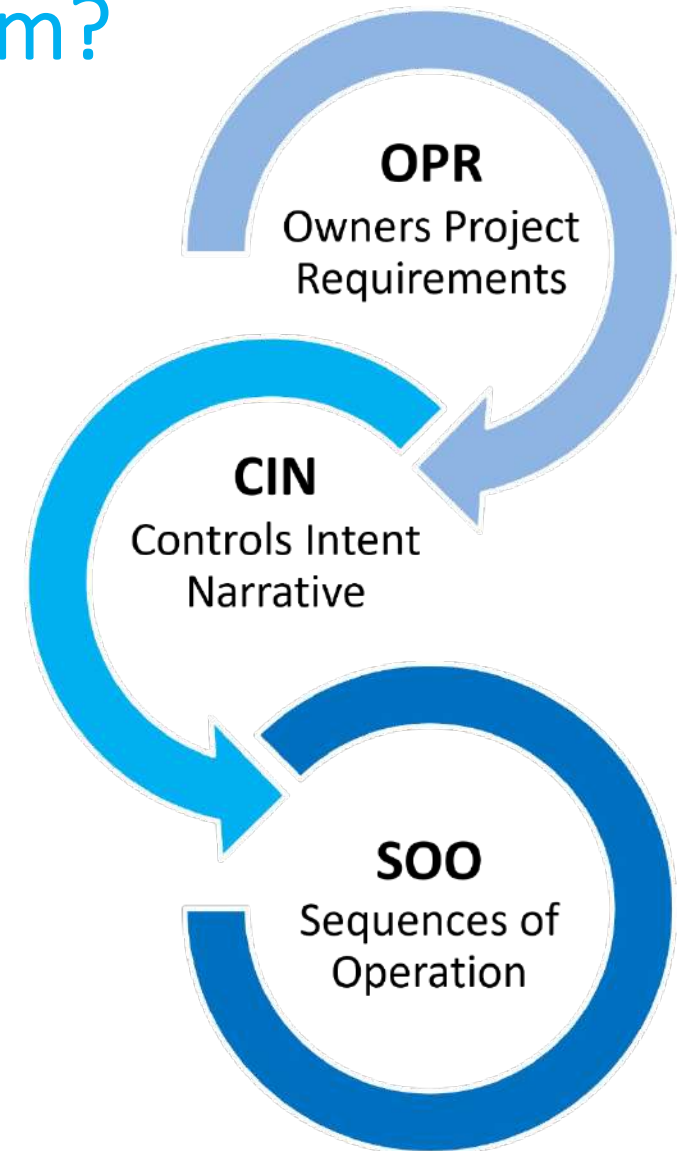
This is the owner's brief for the project. It tells the design and commissioning teams what's expected from the building/project.

An overview, IN ENGLISH, of how the lighting control operates and what happens. Provides both description and guidance.

Defines the system and its function for suppliers, programmers, and installers. Provides guideposts for M&V.

Why is the CIN important to the Design Team?

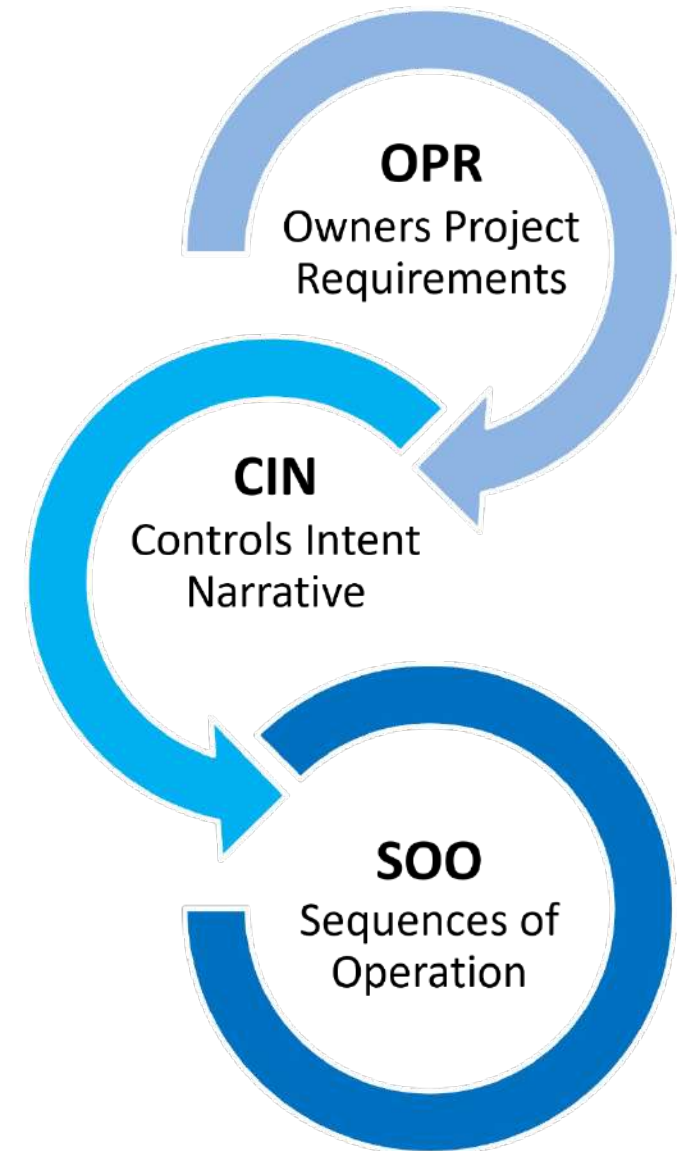
- How do I communicate my design vision?
- What do I think needs to happen?
- What specific actions do I expect?
- What information do I need to provide?
 - Installation
 - Technical req's
- How do I help the client understand the space we are designing?



Questions the CIN should answer

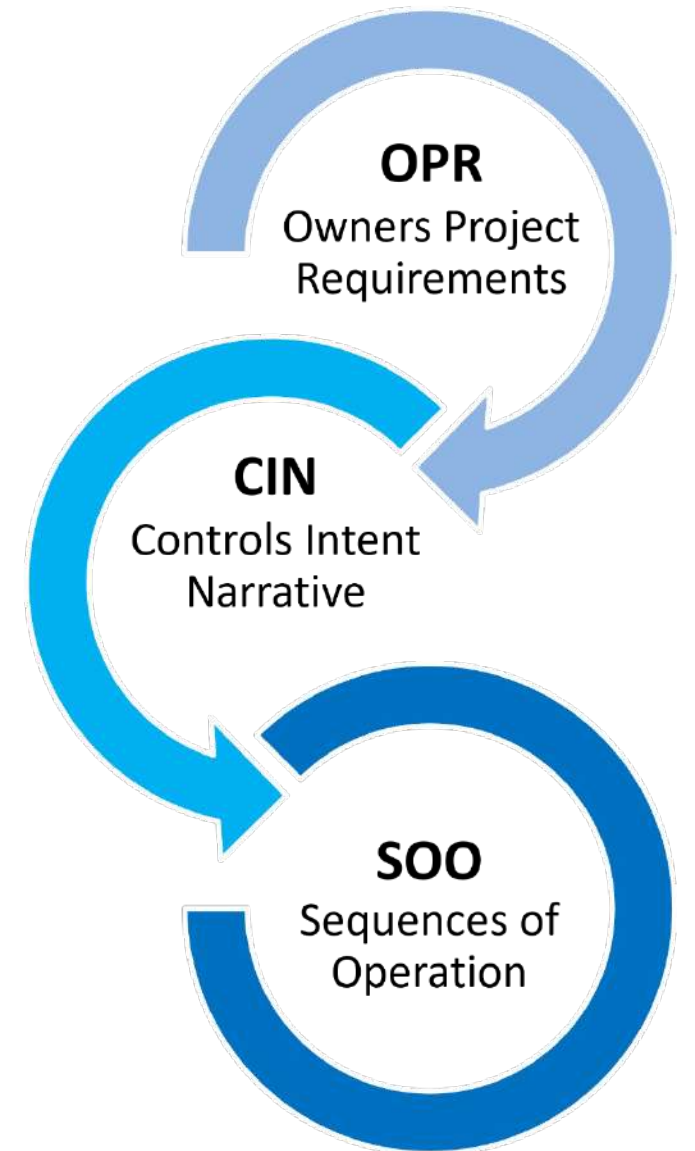
How will the control system provide (or support)

- Code Compliance
- Space Functionality
- Luminaire control
- Design Aesthetics
- Daylight Integration



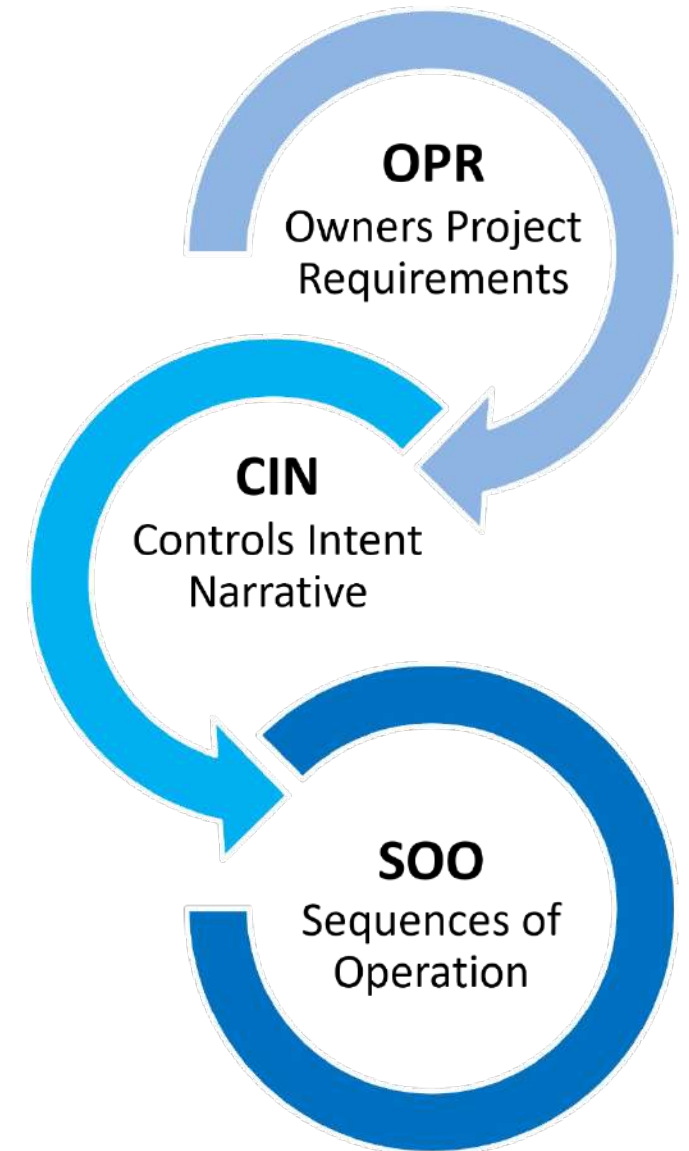
Why is the SOO important to the Design Team?

- How do I ensure that my design information has been communicated?
- What have I designed and how will it work?
- How will I know?
- How will I demonstrate functionality?



Questions the SOO should answer

- How will the control system provide (or support)
 - Code Compliance
 - Space Functionality (space by space description)
 - Luminaire control (illumination levels)
 - Daylight Integration (Specific ACTIONS/REACTIONS)



What does each include?

CONTROL INTENT NARRATIVE

- DESCRIPTIVE LANGUAGE
(Higher/Lower)
- BROAD OVERVIEW
“Lighting should automatically dim”
- WRITTEN IN ENGLISH
“This narrative seeks to describe....”

SEQUENCE OF OPERATION

- SPECIFIC SET POINTS
(30% of full - Adj)
- CLEAR PARAMETERS
“general lighting in private offices shall maintain 300 Lux...”
- CONTRACTUALLY ENFORCEABLE LANGUAGE
SHALL NOT SHOULD

A Quick Example

- In all areas where lighting power within daylighting zones exceeds the wattage threshold of the relevant energy code, the lighting shall automatically dim based on daylight contribution to maintain average design illuminance and distribution.
- Adjust general lighting (type FXX) in all private offices with daylighting zones to maintain 300 lux avg. When daylight contribution level changes, delay change for 1 min (adj.). If daylight level increases, decrease type FXX by 5% (adj.)/sec. If daylight level decreases increase Type FXX by 5% (adj.)/sec.

Some more details...

CONTROL INTENT NARRATIVE

- General description of project goals
- Control strategies to satisfy goals
- Description of the control system
- Preliminary description of Lighting Control Events for each space type

SEQUENCE OF OPERATION

- Specific steps to achieve goals
- Functional and programming requirements
- Equipment requirements
- Set points, levels, timing

Why Important to Contractor

- What needs to be provided?
- How do I cost labor and materials?
- What sub-contractors do I need?
- What will I need to coordinate?
- How do I determine a timeline?
- How will I get off the job?

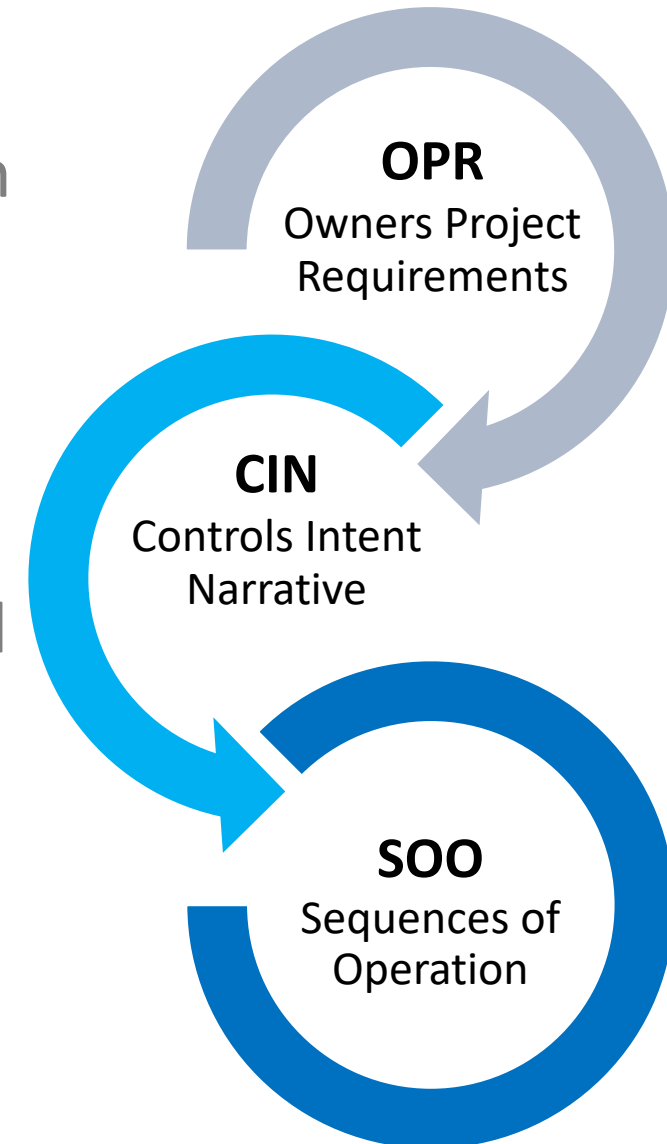


Why Important to a Commissioning Agent?

- Responsible to protect owner's interest
- How is this intended to function?
- How will I know what to verify?
- How do I tell if it's operating properly?
- How will I quote my labor costs?

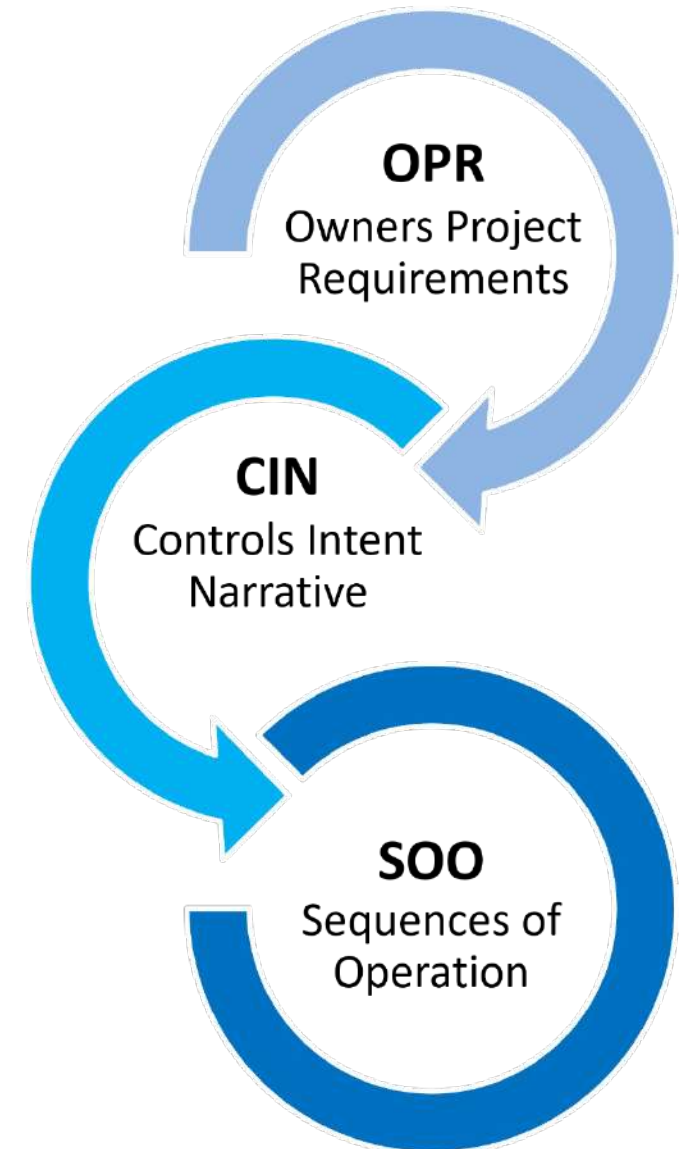
The Four Voices

- The Owner's Voice
 - The Building's Voice
 - The Code's Voice
 - The Design Team's Voice
- What is the design team being asked to provide?
 - What are the spaces involved?
 - What are the required functions or operational characteristics?
 - How does the control system function as an aspect of the project design?



Creation Timeline

Phase	CIN	SOO
Schematic Design SD	REACTION TO OPR/CONCEPTUAL DEVELOPMENT PRELIM. MATRIX	REVIEW OF BOD DOCUMENTATION
Design Development DD	CREATION OF DOCUMENT, CIRCULATION, REVIEW	PRELIMINARY DEVELOPMENT TECHNOLOGY REVIEW
Construction Documentation DD	FULL SPECIFICATION WITH PROTOCOLS, ZONING, & SCHEDULES	COMPLETED DOCUMENT WITH MATRICES AND SETPOINTS
Construction Administration CA	REVIEW SUBMITTALS AGAINST CIN PRE-PROGRAMMING CHECKLISTS	REVIEW SUBMITTALS AGAINST SOO, FIELD ADJUSTMENTS, M&V



Important to Manufacturers & Delivery Chain

- What manufacturers want...
 - Improve usability and satisfaction
 - Execute envisioned space design
 - Energy efficiency & functionality
 - No drama, no callbacks
 - Happy designers & specifiers



Important to Manufacturers & Delivery Chain

- Challenges of poor documentation
 - How should the lighting operate?
 - What should be provided?
 - Can't determine good costing
 - How should it be configured?
 - What coordination is needed?
 - Change orders, project delays
 - Added labor, added \$\$



Roles and Responsibilities

- A long relay race, many handoffs
- Design & implementation actors
- Defined roles and responsibilities
 - Map Creators
 - Map Users



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- A long relay race, many handoffs
- Design & implementation actors
- Defined roles and responsibilities
 - Map Creators
 - Map Users

Map Creators

Owner
Architect
Lighting Designer
Interior Designer
Electrical Engineer
Lighting Control Specifier



Map Users

Manufacturer's Rep
Controls vendor
Control Systems Integrator
Construction Manager
Installing Contractor
Startup Provider
Commissioning provider
Facilities Engineer
End User



Roles and Responsibilities

- A long relay race, many handoffs
- Design & implementation actors
- Defined roles and responsibilities
 - Map Creators
 - Map Users
- Key to execution – know role
- Answers “Who Does What”

Map Creators

Owner
Architect
Lighting Designer
Interior Designer
Electrical Engineer
Lighting Control Specifier



Map Users

Manufacturer's Rep
Controls vendor
Control Systems Integrator
Construction Manager
Installing Contractor
Startup Provider
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Facilities Engineer
End User



How To Tools & Examples

- Sample CIN & SOO
 - Discrete control strategies
 - Space type examples
 - Integration examples
- Side by side comparison
- Control matrix examples
- Helpful questionnaires

Stop Writer's Block



Source: <https://www.purdueglobal.edu/blog/student-life/7-ways-overcome-writers-block/>

How To Tools & Examples

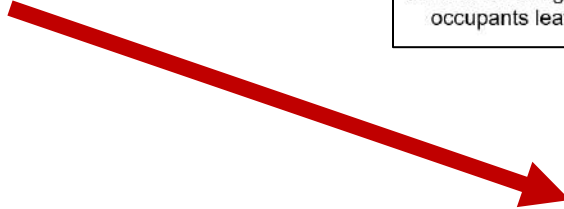
- Sample CIN & SOO
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CONTROL INTENT NARRATIVE

- Wall switch at each entrance providing general lighting on, off and dim control from a single switch
- Wall switches at teacher location for room and white board projection
- Energy code compliant
- Auto on lighting
- Daylight responsive lighting in window
- Automatically turn off
- Turn emergency

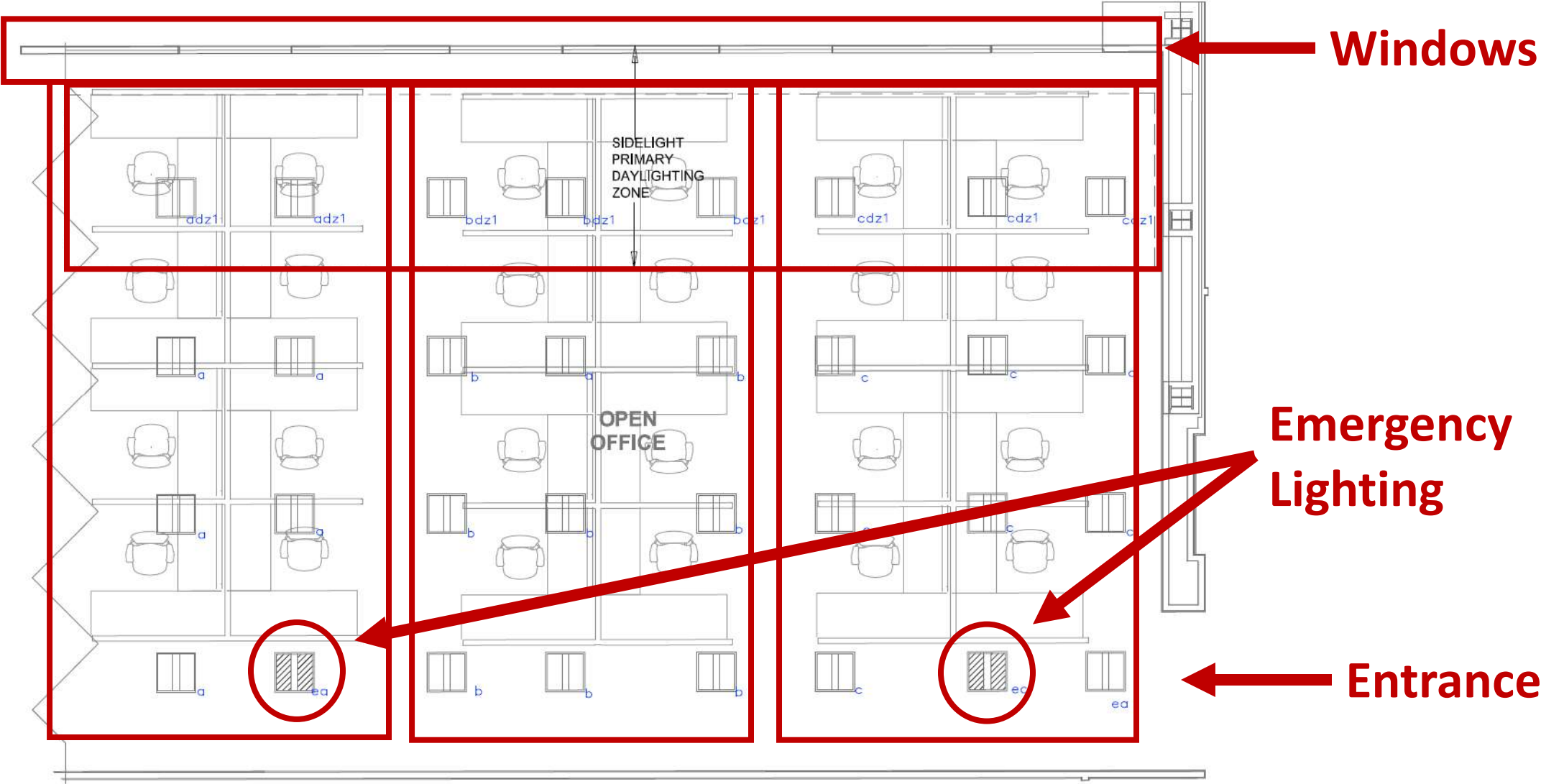
SEQUENCE OF OPERATION

1. General lighting (a, adz1) auto On to 50% when occupancy detected.
2. Manual On/Off/Dim, light reduction control of general lighting (a, adz1) with dimmer switches.
3. Manual On/Off/Dim white board lighting (b) with dimmer switch.
4. Lighting in daylight dim based on daylight level at least xxFC at task level.
5. Auto Off all lighting occupants leaving.



ROOM TYPE	OCCUPANCY SENSOR	TIME SWITCH	DAYLIGHT	LT	MANUAL CONTROL	SEQUENCE OF OPERATION						
							AUTO ON	MANUAL ON (WALL SW)	AUTO OFF (NORMAL HOURS)	PARTIAL OFF (NORMAL HOURS)	AUTO OFF AFTER HOURS (WALL SW)	TIME ON
Janitor Closet	●	20 min				Manual On, Occupancy sensor Auto Off, Manual control device.						
Restroom	100%	20 min			●	Auto On 100% Occupancy sensor Auto Off, Manual control.						
Lunch/Break Rooms/Lounges	50%	20 min		D	●	Auto On 50% Occupancy sensor Auto Off, Manual control and 20% light reduction with two ceiling controls. Where 100% in daylight area, use continuous dimming daylighting control and dimmer switch.						
Public Lobbies	100%	20 min		D	●	Auto On 100% Occupancy sensor Auto Off, Manual control device. Where 100% in daylight area, use continuous dimming daylighting control and dimmer switch.						
Corridor	100%	20 min		D	●	Auto On 100% Occupancy sensor Auto Off, Manual control device. Where 100% in daylight area, use continuous dimming daylighting control and dimmer switch.						
Stairwell	100%	20 min		D	●	Auto On 100% Occupancy sensor Auto Off, Manual control, Where 50% in daylight area use continuous dimming daylighting control and dimmer switch.						
Storage Room	50%	20 min		D	●	Auto On 50% Occupancy sensor Auto Off, Manual control and 20% light reduction with two ceiling controls. Where 100% in daylight area, use continuous dimming daylighting control and dimmer switch.						
Library Stacks			close	D	●	Manual On, Time On with occupancy sensor. After hours 2 hour override from manual control device. Where 100% in daylight area, use continuous dimming daylighting control and dimmer switch.						
Library Open/Reading Area			close	D	●	Manual On, Time On with occupancy sensor. After hours 2 hour override from manual control device. Where 100% in daylight area, use continuous dimming daylighting control and dimmer switch.						
Cafeteria / Gym	●		11 PM	D	●	Manual On, Time On with occupancy sensor. After hours 2 hour override from manual control device. Where 100% in daylight area, use continuous dimming daylighting control and dimmer switch.						
Multipurpose Rooms	50%	20 min		D	●	Auto On 50% Occupancy sensor Auto Off, Manual control and 20% light reduction with two ceiling controls. Where 100% in daylight area, use continuous dimming daylighting control and dimmer switch.						
Locker Room	50%	20 min		D	●	Auto On 50% Occupancy sensor Auto Off, Manual control and 20% light reduction with two ceiling controls. Where 100% in daylight area, use continuous dimming daylighting control and dimmer switch.						
Lab	50%	20 min		D	●	Auto On 50% Occupancy sensor Auto Off, Manual control and 20% light reduction with two ceiling controls. Where 100% in daylight area, use continuous dimming daylighting control and dimmer switch.						

Example: Open Office



Example: Open Office

CONTROL INTENT NARRATIVE

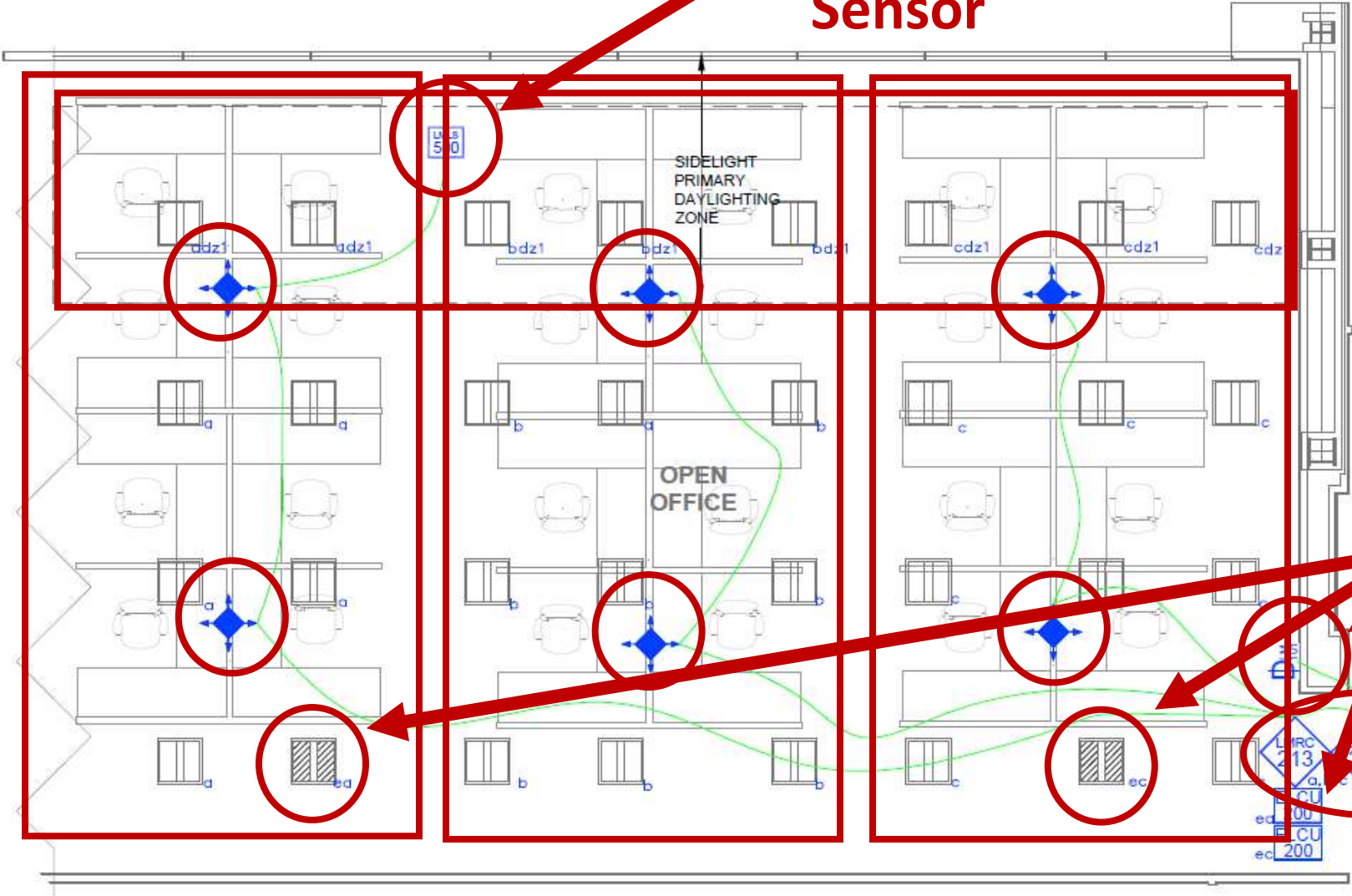
- Wall switch at each entrance providing on, off and dimming control
- Energy code compliant (2018 IECC)
- Auto on lighting in each zone to last lighting level
- Daylight responsive controls automatically and continuously dims lighting in window daylight zone
- Automatically turn off all lighting when unoccupied
- Turn emergency lighting full on when power is lost

SEQUENCE OF OPERATION

1. General lighting in each ≤ 600 ft² zone (a, b, c, adz1, bdz1, cdz1) shall auto On to last light level when occupancy detected.
2. Manual On/Off/Dim general lighting for all zones (a, b, c, adz1, bdz1, cdz1) in unison with dimmer switch.
3. Lighting in daylight area (adz1, bdz1, cdz1) shall continuously dim based on daylight contribution to maintain at least XXFC (adj.) at task level
4. Auto Off all lighting in an individual zones within 20 minutes of occupants leaving individual zone.
5. Emergency lighting transfers to emergency power source and shall turn full On with loss of normal power.

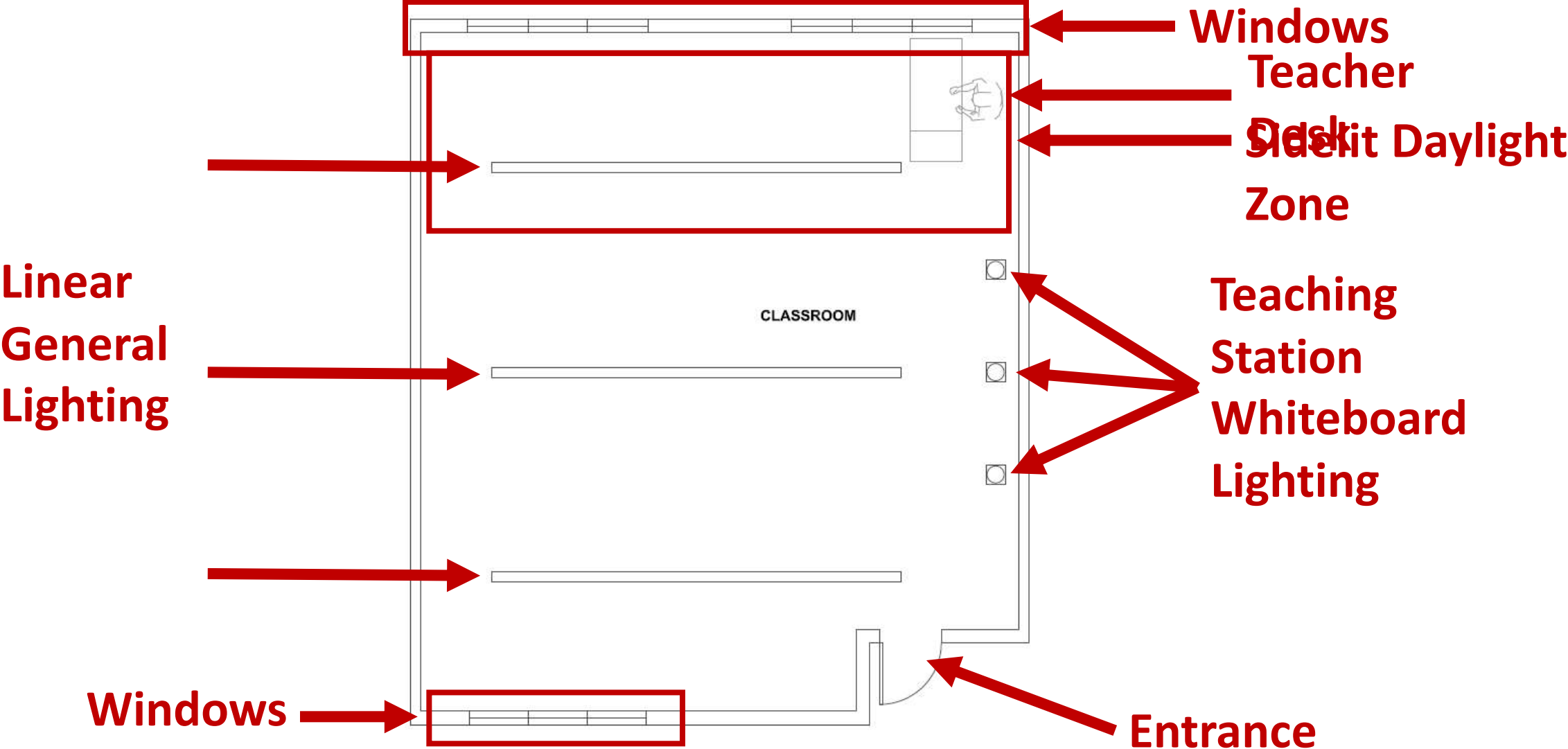
Example: Open Office

**Daylight
Control
Sensor**



**Emergency
Lighting
Dimmer
Switch
Control**

Example: Tunable White in a Classroom



Example: Tunable White in a Classroom

CONTROL INTENT NARRATIVE

- Provide each classroom with tunable white lighting that automatically adjusts all lighting to accommodate incident daylight color.
- Provide manual on, off and intensity control for general illumination at both the classroom entrance and at the teacher location. Manual on, off and intensity control of the white board provided just at the teacher location.
- Energy code compliant (2018 IECC)
- Daylight responsive controls continuously dim lighting in window daylight zone
- Automatically turn off all lighting when unoccupied

SEQUENCE OF OPERATION

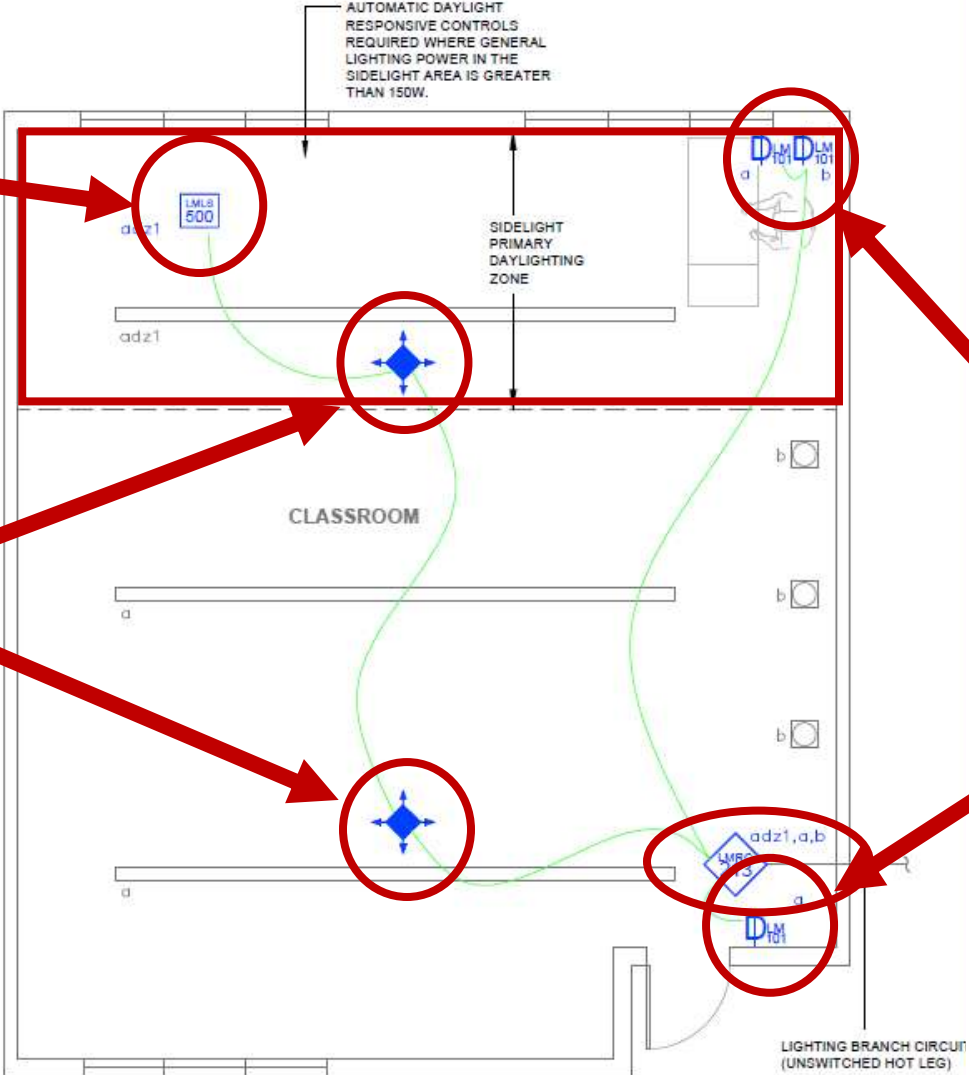
1. General lighting (a, adz1) manual On/Off/Dim at entrance and teacher location wall mount controls
2. White board lighting (b) manual On/Off/Dim at teacher location wall mount controls
3. Lighting white color shall automatically tune with a five-minute fade to the following scenes:
 - Morning: 8am to 11am(adj.), 5000K(adj.)
 - Midday: 11am to 3pm(adj.), 3500K(adj.)
 - Afternoon: 3pm to 8am(adj.) (next day) 3000K(adj.)
4. Daylight zone lighting(adz1) shall automatically continuously dim based on daylight contribution maintaining at least xxFC at task level.
5. Auto Off all lighting within 20 minutes of occupants leaving.

Example: Tunable White in a Classroom

Daylight Control Sensor

Occupancy Sensor Auto-off Control

Dimmer Switches



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