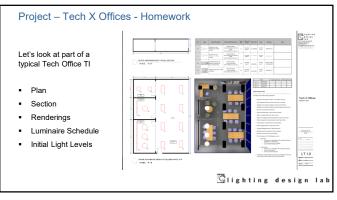


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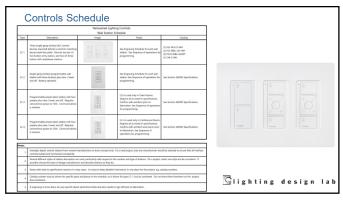




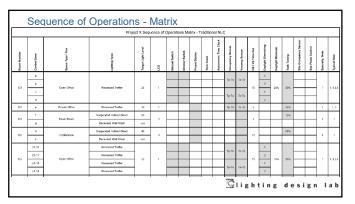




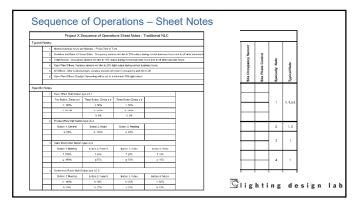




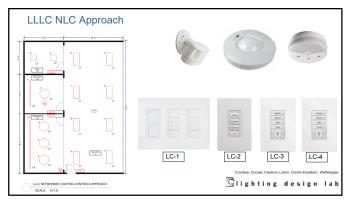


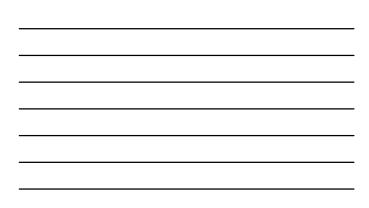


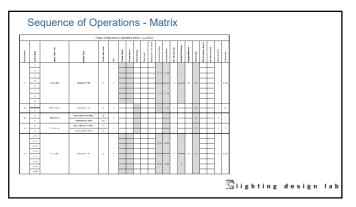


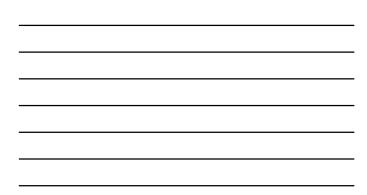




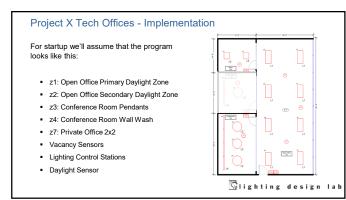


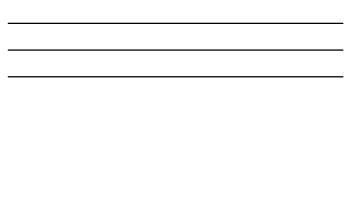






			Pi	oject X S	equence	of Oper	rations	Matrix	- LLLC	NLC										
Room Number	Control Zone	Space Type / Use	ect forst	Target Light Lawel	LCS	Marual Switch	Dimmer Switch	Preset Station	Time Clock	Astronomic Time Clock	Occupancy Sensor	Vectory Sensor	OS / VS Time Out	Duylight Dimmining	Duylight Minimum	Task Tuning	Sile Occupancy Sensor	Sile Photo Centrol	Specialty Note	Typical Note
												3 73-70								
	6	1			,															
	0	1									7.074	74-19								
101	d	Quer Office	Received Troffer	3								-7a 7a-7p			22%	32%			1	1.45.6
191	6	Open Office	RECEIPED INDEED										13		20% 30%	31%				1, 4,5,5
	r										1			2						
0	9										10-13			<i>2</i>						
	h																			
102	k	Private Office	Recessed Troller	30	2						70-70	78-70	5			35%			2	1.5
111	m	11112 0100	received from	50							1,014	74.19	· ·							
103	n	Teen Room	Suspended Indirect Direct	25	,								5			15%			,	
	0	10001	Recessed Wall Wash	r/a	Ľ,								1						1	Ľ
104	р	Conference	Suspended Indirect Direct	40	4								10			25%				
	9		Recessed Wall Wash	n/a															-	L .







Common Energy Code Control Highlights

Energy Codes handle lighting controls in different specific ways, but there are many commonalities.

Washington State, Seattle, Idaho, and Montana energy codes are based on the IECC.

Energy code should be baseline -



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Public spaces





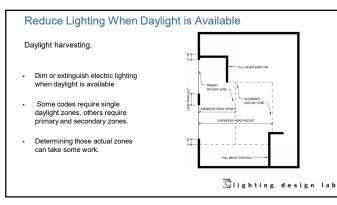


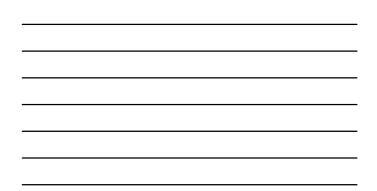


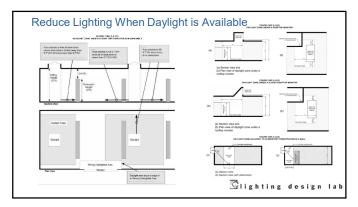
Stairwells and Corridors And Garages Oh My!
 Each stairway shall have one or more control devices to automatically reduce lighting power by not less than 50 percent when no occupants have been detected in the stairway for a period not exceeding 15 minutes, and restore lighting to full power when occupants enter the stairway. (there is more)
 Lighting in parking garages shall have one or more control devices to automatically reduce lighting power in any one controlled zone by not less than 50 percent when no occupants have been detected in that zone for a period not exceeding 30 minutes, and restore lighting to full power when occupants

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enter or approach the zone.













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Exterior Lighting

- Where lighting the building facade or landscape, the lighting shall have controls that automatically shut off the lighting between midnight or business/facility closing, whichever is later, and 6 a.m. or business/facility opening, whichever is earlier.
- Exterior occupancy control
- Exterior dimming
- Migratory patterns, etc



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Commissioning

- Third Party Commissioning may be required
 - Commissioning Plan
 - Certified Commissioning Professional
- Functional Testing
- Final Report
- .
- Startup and Commissioning are not the same thing



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LLLC – Easy Compliance

- Using LLLC luminaires basically guarantees energy code compliance.
- Some jurisdictions allow LLLC use to eliminate the need for further controls documentation.
- www.lightingdesignlab.com/resources
 Videos
- Learning Guides





Commissioning

- One of the most often overlooked Commissioning elements....
- Commission the occupants....

 Let them know what to expect
- from the system and how it operates....and why....



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Quick Case Study

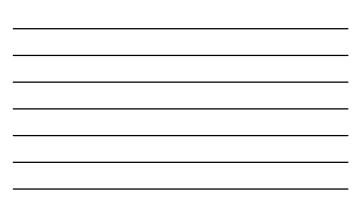
- Occupant is an MEP engineering firm in the third floor of the Bullitt Center in Seattle.
- Approximately 6,100 square feet
- TI renovation
- Completed in 2017



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Lighting Design High performance LED lighting LED decorative 3400 watts connected load LPD: ~ 0.55 W/sf Controls Dimming Task tuning Vacancy sensing Daylight harvesting Manual dimming

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Value Engineering

- Controls design VE
- Met Energy Code…
- Cheapest way possible..
- Barely functional...
- Not possible to fully extinguish electric lights...



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Results

- · Staff can turn all of the lights off
- · Staff can select appropriate dimmed levels

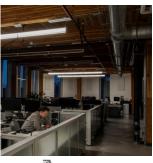


Results

- Task-tuned by more than 25%
- Daylight dimming fully functional
- Vacancy sensing by contiguous row

Effective LPD is ~ 0.15 W/sf

- More than 70% effective reduction
- Controls cost: ~ \$4,500
- ~ \$0.78 / sf



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Control Systems We work with many different control systems manufacturers for VIV/Ē this class. Acuity nLight Air Audacy by Ideal F:T•N Cooper Wavelinx Cree Smartcast Crestron Zum echoflex Encellium Edge ETC Echoflex Lutron Vive 🖫 lighting design lab

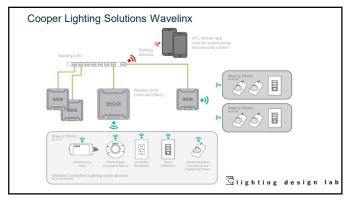


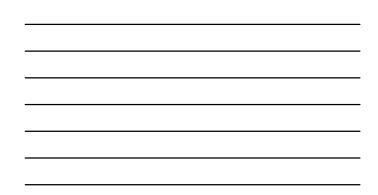
















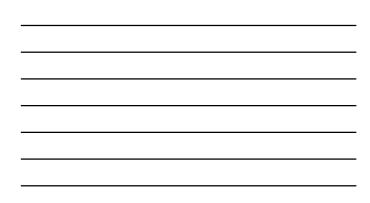


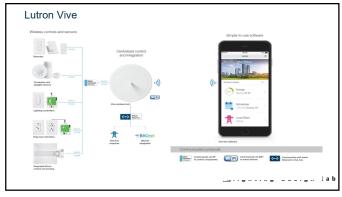
















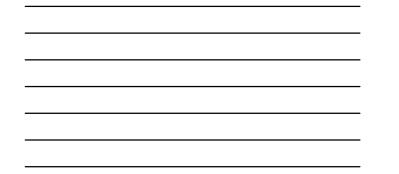






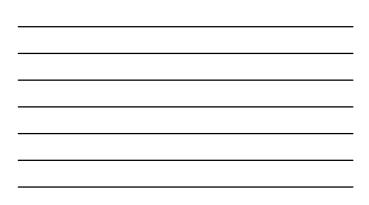




























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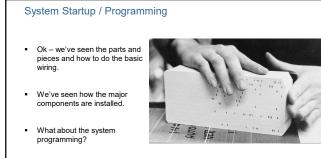
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Demonstration Boards

- When we get back to being able to meet in person
- Control boards are meant to emulate building or fixture wiring in miniature.
- Each fixture represents one of the luminaires in the example – per the photos on each.
- Each luminaire represents one control zone

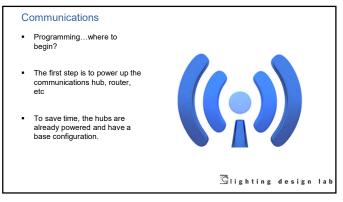


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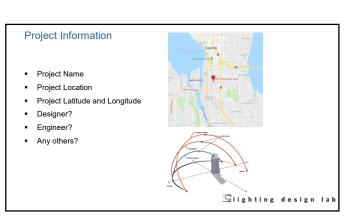




Device Discovery

- Some systems will query the local area in search of devices that may be new to the area or system.
- Some systems will require you to physically touch the devices you with to add to the system or engage in some other specific step such as scanning a QR code.
- The specific steps and order will vary so let's look at general concepts.





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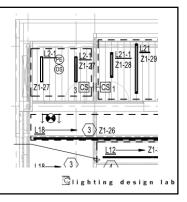
Areas / Rooms

- Define each logical physical area on the project.
- Normally this will mean rooms enclosed by full height partitions, but not always.
- Sometimes it helps to define subareas within areas to control them separately with simple systems.



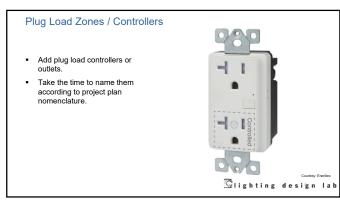
Control Zones

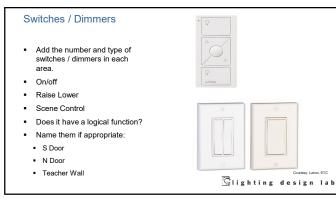
- Add control zones / load controllers for each area.
- Take the time to name them according to project plan nomenclature.
- If space, add the function as well.
- Z1-27 Office Linear L2-1



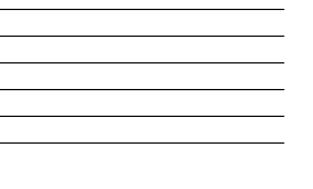


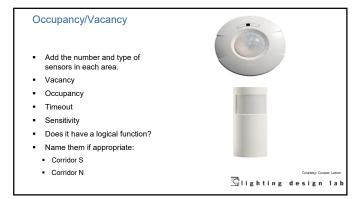
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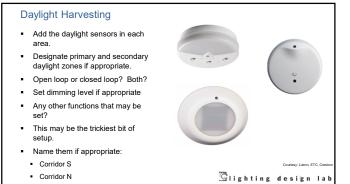
















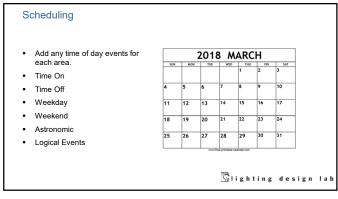




Task Tuning

- Set a high trim for the control system aligned with the target light level for the area.
- This can frequently result in as much as 30% initial energy savings in a well designed space.







Demand Response - Load Shed

- Define the control zones to be dimmed
- Define the dimming level
- Configure to accept the signal from the utility.
- Dimming wide areas by a small amount can meet the reduction target while retaining functionality.



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Future of Lighting Controls

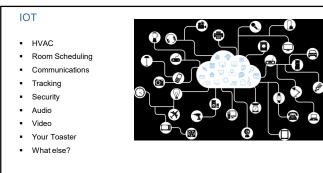
Where do we go from here?

What do YOU think?



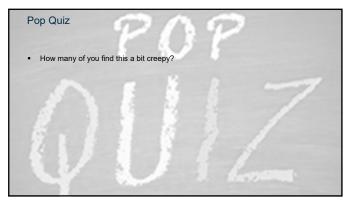
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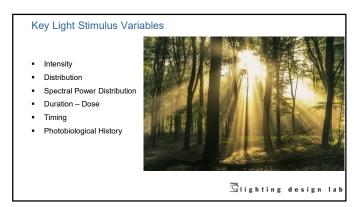
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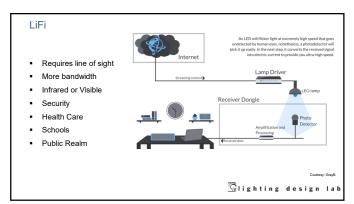


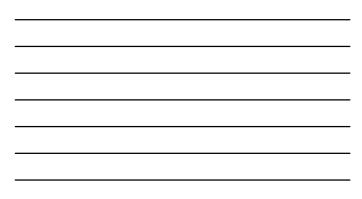
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