

DESIGNING FOR POE AUTOMATION AND LIGHTING

Best Practices and Lessons Learned from Top Design
Professionals and Subject Matter Experts on
Designing and Constructing Power Over Ethernet
Intelligent Buildings

Earn CE and GBCI Credits

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PANEL OF SPEAKERS

TOP EXPERIENCED PROFESSIONALS AND SUBJECT MATTER EXPERTS FROM THE FIELDS
OF POWER OVER ETHERNET AND INTELLIGENT BUILDINGS



SPEAKER:
LUIS SUAU
Sinclair Digital



SPEAKER:
JOSEPH HERBST
PoE Texas



MODERATOR:
TYLER ANDREWS
PoE Texas

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WHY POWER OVER ETHERNET



THERE'S NO SINGLE REASON WHY OWNERS CHOOSE PoE FOR INTELLIGENT BUILDINGS

WHY EXPERTS AND OWNERS ARE CHOOSING PoE AND INTELLIGENT BUILDINGS

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Why PoE for Building Automation?

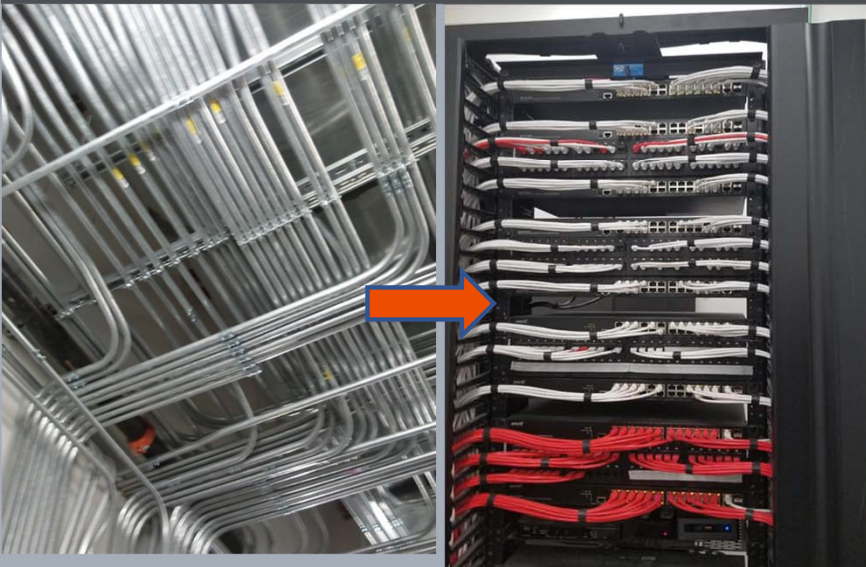
60% less Copper

100% less steel (no Conduit)

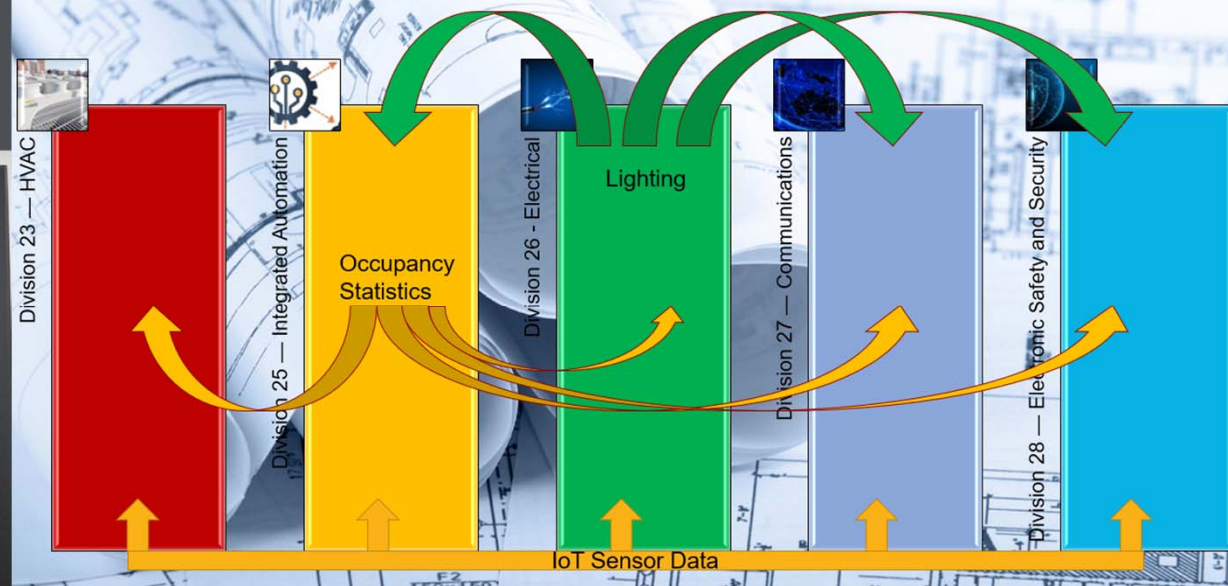
30% lower Capex

30% lower operating cost (no AC to DC Conversion)

100% more resilient to Change requests



PoE unifies M-E-P but.....it disrupts the classic model



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Courtesy of the Sinclair Marriott

Top Reasons

You May Not Expect

Safer – Class 2 Power

Globally Accepted (Hospitality/Enterprise)

Software Based

IP facilitates integration



About Me



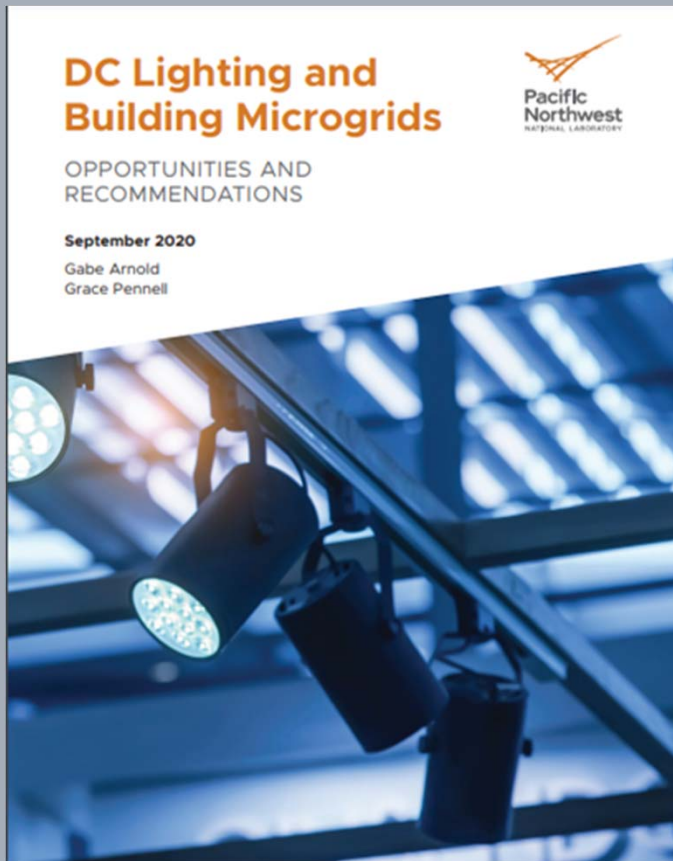
Luis Suau




Background Summary: 40 Years of IT Expertise, 26 Year Cisco veteran who played a key role in the research, development, and commercialization of the Cisco Digital Building Solution (2011-2020). Resides in Fort Lauderdale, FL

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Energy Efficiency drives Digital Infrastructure



	POE 802.3bt New
	USB-C Std 3.2 Newer
	NEC Article 726 Pending Fault Managed Power

POE

- Low Voltage Power
- Facilitates adds, moves, changes
- IP data driven

USB-C

- Low Voltage Power
- Facilitates adds, moves, changes
- Can facilitate data connectivity

Fault Managed Power

- Class 4 power
- High Voltage, Pulsed DC
- Safety Driven

Existing IP/POE Digital Building Endpoints:

A Growing List of POE Products and Manufacturers

This image displays a wide variety of digital building endpoints that can be powered over Ethernet (PoE). The products are arranged around a central 3D cutaway of a conference room. The endpoints include:

- Light Fixtures
- Laptop Chargers
- Signage (e.g., "ALL CLEAR", "LOCKDOWN Shelter in Place", "A SEVERE WEATHER", "REMAIN CALM...EXIT")
- IP Call Stations
- IP Call Tower
- Phones
- Height Adjustable Desks
- Window Blind Shade Motors
- Horns and Sirens
- POE Displays
- Shot Detection
- RFID Reader
- Access Points
- Entry Barriers And Turnstiles
- Raspberry Pi POE Hat
- Intel NUCs
- Facial Recognition Systems
- Hospital Room Patient Display
- NFC Reader
- Temp Sensor
- Ceiling Fans
- Clocks
- Badge Readers
- Environmental Sensor Hubs
- USB-C Chargers
- HVAC VAV's
- Power Meters
- Curtain Motors
- Biometric Door Locks
- Cameras
- Touchscreen PC's
- Meeting Room Nameplate

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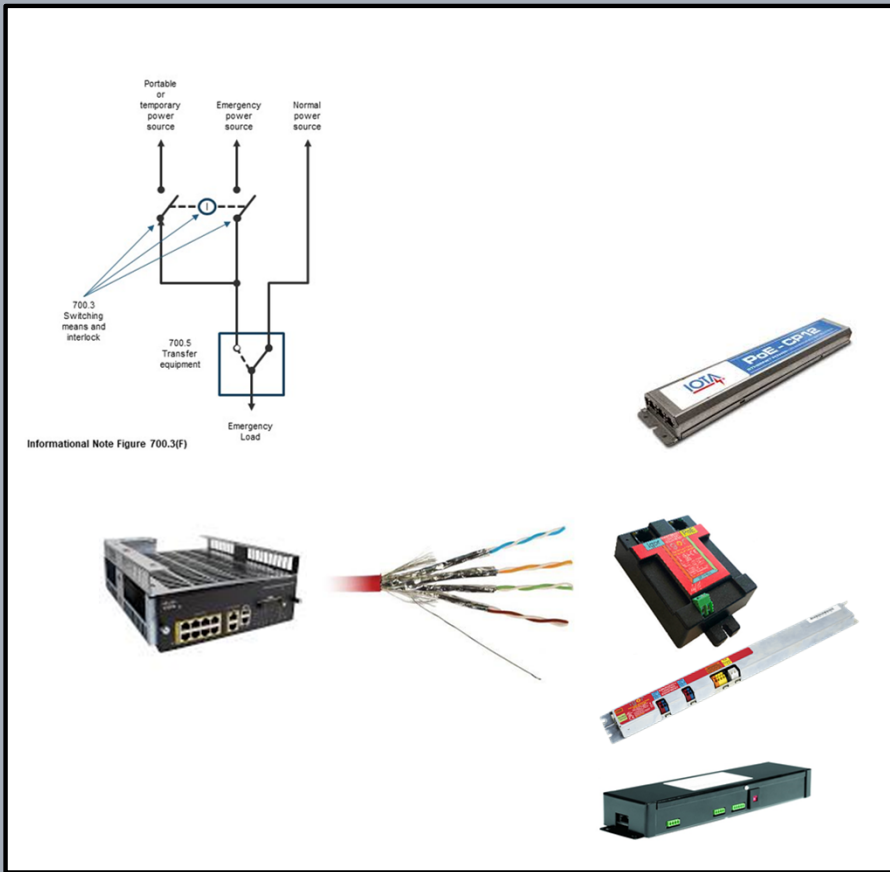
POE Code Considerations



NFPA 70– A Few Important Articles for PoE Lighting Systems

- 410 – Luminaires, Lampholders, and Lamps
- 411 – Low-Voltage Lighting
- 700 – Emergency Systems (see especially Part V. Control - Emergency Lighting Circuits, for light fixture controls and listing requirements)
- 725 – Part III. Class 2 and Class 3 Circuits
 - 725.121 for power sources
 - 725.144 for cables used for transmission of power and data, and Table 725.144 for ampacity of 4-pair twisted-pair cables
- 725 – Part IV. Listing Requirements

Article 700 - Emergency Systems



Emergency Lighting

POE Emergency Lighting has generally approved on case-by-case basis

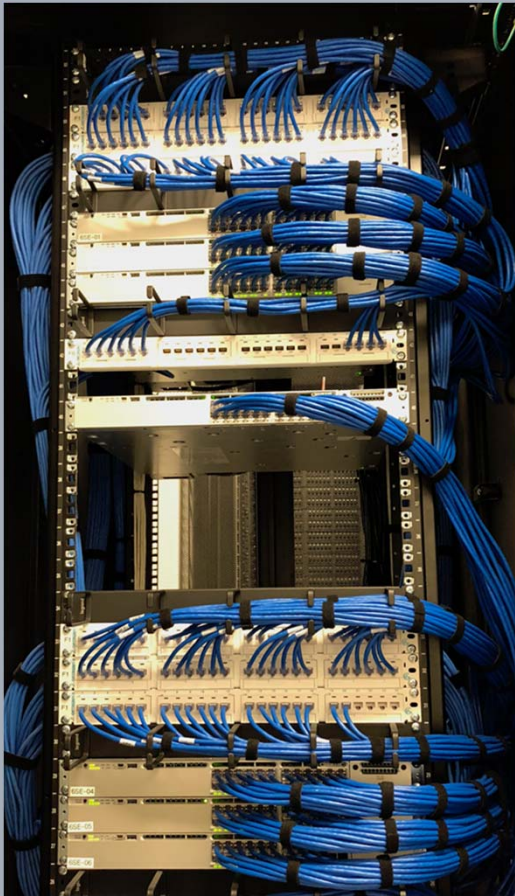
Code Elements:

- Power Source
- Power Distribution (Cabling and associated elements)
- Driver (node/gateway/endpoint)
700.2 Emergency Luminaire, Directly Controlled → [ANSI/UL-924](#)

POE Options:

- 1) **Uncontrolled Emergency Lighting (lights always on, no control)**
Requires switch power from UL-924 Listed UPS
- 2) **Controlled Emergency Lighting (UL-924 LED Driver)**
- 3) **Unit based battery pack on UL-924 light**
Dependent on POE Lighting partner. The network switch is passive just like an electrical junction box.
- 4) **Hybrid POE – Line Voltage Approach**

Article 725 Applicability



POE is a Class 2 Circuit:

Class 2 Circuit. The portion of the wiring system between the load side of a Class 2 power source and the connected equipment. Due to its power limitations, a Class 2 circuit considers safety from a fire initiation standpoint and provides acceptable protection from electric shock.

POE Benefits:

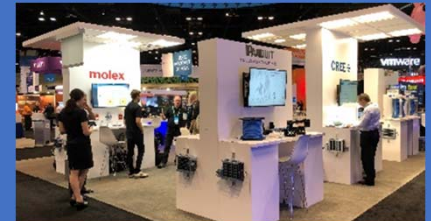
- Circuit (port) is de-energized until the source detects a proper load
- Removes power on overcurrent fault or load removal
- Is efficient:
 - Only provides the power requested
 - Protects from faults by policing power supplied relative to what the device asked for
- 725.121(A)(3): The POE switch, as Power Source Equipment (PSE) must be listed
- 725.121(C): Required Marking
- NEC 725.144(A) requires Class 2 and Class 3 cables used to transmit power and data to comply with Table 725.144 to determine code-compliant ampacities for each conductor in an installation.
- NEC 725.144(B) permits the use of Class 2-LP or Class 3-LP cables to supply power to equipment at current levels up to the marked ampere limit located immediately following the -LP suffix

Centralized vs Distributed Network



- More Cabling Required
- Must meet NEC 725.144 cable bundling requirements
- Controlled Access in IDF
- Greater IDF Cooling Requirements
- Power needed in IDF

- Less Cabling, patch cables to endpoints
- Allows for ring and daisy chain topologies
- Ceiling may be less secure, service requires ladder
- Less Cooling in IDF, lower cost switches
- Distributed Power required in ceiling



Marriott Sinclair Hotel Use Case, Ft. Worth, TX

The Sinclair Hotel Implementation:

Sinclair inspired and featured these products for the first time allowing for the first (low voltage) digital building DC Microgrid:

- Lithium Ion ESS (Life Safety Approved)
- Full Building Fault Managed Power (VoltServer Digital Electricity) Deployment for POE Switches
- Extensive use of POE for Digital Building Applications

POE Details:

- 350 Cisco 60W UPOE switches in distributed topology
- 150 POE Smart Mirrors
- 165 POE Minibars
- 1200+ Somfy Motors
- 1100+ POE Lighting Drivers
- 30 Cameras
- 180 Meraki AP's
- 165 GPON ONT's
- 8 POE Door Locks

Other Details:

- 110,000 Sq Ft
- 300 Tons of LG VRF HVAC
- Average Monthly Power Bill ~\$7K

[Video Link](#)



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Marriott Sinclair Hotel, Ft. Worth, TX



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Marcel Hotel Use Case, New Haven, CT

First Net-Zero Hotel in the USA

- Passive House design
- Dual 500 KWHr Energy Storage Systems
- Solid State Transfer switch

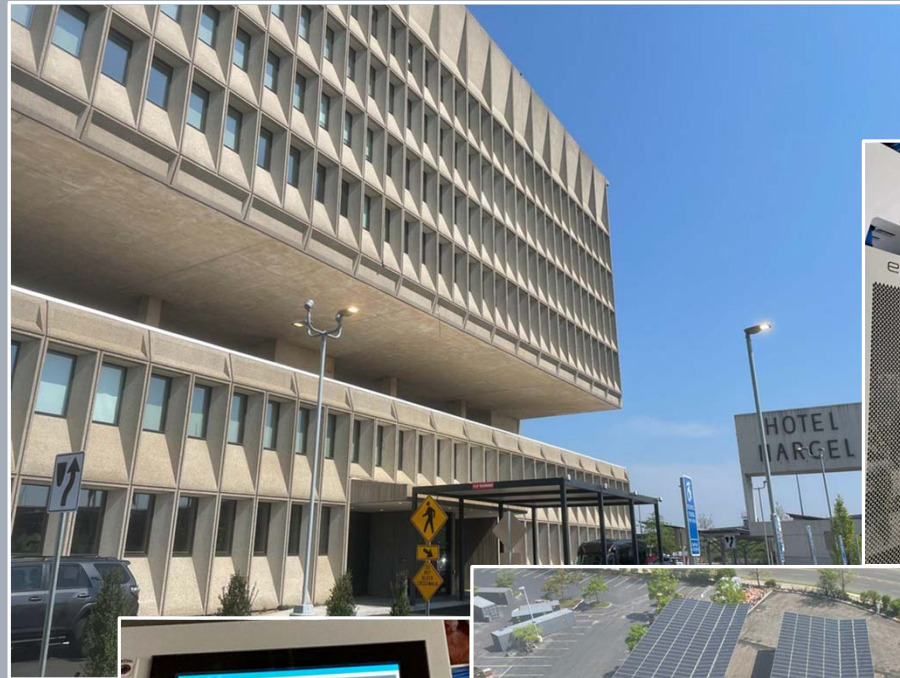
Sinclair Digital Implemented:

Sinclair Hotel inspired digital building DC Microgrid:

- Lithium Ion ESS (Life Safety Approved)
- Fault Managed Power (Digital Electricity) for Lighting POE Systems
- POE for Lighting, Window Treatments, HVAC Integration
- Integration of HVAC controls in touchscreens

POE Details:

- 48 Transition SM24TBT2DPA 24 port 802.3bt 60/90W port switches (Lighting & Shading)
- 800+ PowerShade POE Shade Motors
- 800+ POE Lighting Drivers
- 50+ Cameras
- 180 Meraki AP's
- 180 VoIP Phones



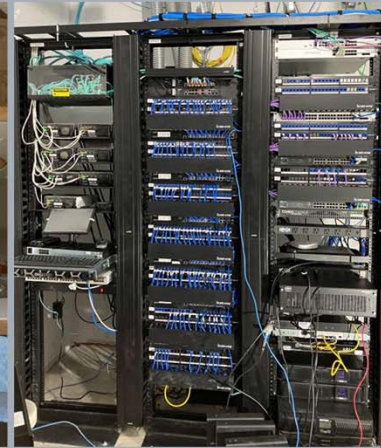
[Hotel Articles](#)



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Marcel Hotel Use Case, New Haven, CT



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IP/POE Digital Building Projects (as of 2020)

Customer	Location	Size
Georgia Pacific Headquarters (22 Floors)	Atlanta, GA	750,000 Sq Ft
Austin Airport	Austin, TX	30,000 Sq Ft
HP Data Center	Alphratta, GA	20,000 Sq Ft
HP Data Center	Swaunee, GA	20,000 Sq Ft
HP DC & Campus Offices	Houston, TX	120,000 Sq Ft
FlyRight Headquarters	Concord, NC	
Mindshift DC	Comack, NY	
Intel Headquarters (10 Floors)	India	300,000 Sq Ft
Credit Agricole		
TP ICAP - US Trading Floor	New York, NY	80,000 Sq Ft
CVS Drugstore	Fort Worth, TX	15,000 Sq Ft
Launch Fishers: Office Space	Bloomington, IN	
NSPI (Nova Scotia Power) Halifax Campus	Halifax, Nova Scotia	
GR8 Hotel Chain: 4 hotels	Netherlands	80,000 Sq Ft
Sanger Office Building	Fort Worth, TX	30,000 Sq Ft
Alliander		200,000 Sq FT
Emera - NSPI (Nova Scotia Power Inc)	Halifax	200,000 Sq Ft
Velocity Networks	Erie, PA	
Superior Essex Manufacturing	Atlanta, GA	15,000 Sq Ft
Molex: Bolingbrook Office Space	Bolingbrook, IL	
Molex: Lisle Campus	Lisle, IL	150,000 Sq Ft
Open AIS	Netherlands	
Prodrive BV	Netherlands	
Halifax (EMERA)	Quebec City	
Airport Arena, ATEA new HQ Sola	Sola, Norway	
Miami-Dade Water & Sewer	Miami, FL	15,000 Sq Ft
Molex: Technology Center	Freemont, CA	110,000 Sq Ft
Cisco Canada Headquarters	Toronto, Ontario	120,000 Sq Ft
BAA Aviation Headquarters	Lake Nona, FL	80,000 Sq Ft
Waldinger Corporation		
Dynniq	Belgium	
Bush Brothers Corporate headquarters:	Knoxville, TN	

Customer	Location	Size
Miami-Dade County Public Schools	Miami, FL	30,000 Sq Ft
Kansas City Public School	Kansas City, MS	30,000 Sq Ft
University of Tampa	Tampa, FL	60,000 Sq Ft
Clemson University		80,000 Sq Ft
Universitat Technische Eindhoven	Netherlands	
Skyview Elementary	Seattle, WA	
Ft. Payne Elementary	Ft. Payne, IN	
Alexandria Real Estate	Pasadena, CA	80,000 Sq Ft
Pinebridge	NYC, NY	100,000 Sq Ft
Marriott Sinclair Hotel	Ft. Worth, TX	150,000 Sq Ft
Nystec	Rome, NY	20,000 Sq Ft
Conoco Phillips	Alaska	80,000 Sq Ft
Fresenius Medical	Waltham, MA	80,000 Sq Ft
BICSI Headquarters	Tampa, FL	20,000 Sq Ft
Superior Essex Manufacturing	Atlanta, GA	15,000 Sq Ft
Legal Firm	NYC, NY	650,000 Sq Ft
Diageo	Stamford, CT	600,000 Sq Ft
Financial Investment Firm	NYC, NY	380,000 Sq Ft
1 Police Plaza	NYC, NY	80,000 Sq Ft
Legal Firm	NYC, NY	300,000 Sq Ft
Pharmaceutical	NYC, NY	1,000,000 Sq Ft
Deloitte (Edge Amsterdam)	Amsterdam, Netherlands	120,000 Sq Ft
CABR (China Academy of Building Research)	Beijing, China	
Deloitte	Milan, Italy	
Alberslund	Copenhagen, Denmark	30,000 Sq Ft
Alpiq	Switzerland	
CIPCO	Des Moines, IA	30,000 Sq Ft
Volvo R&D	Sunnyvale, CA	30,000 Sq Ft
Quest	Sacramento, CA	
Intel	Santa Clara, CA	
Mobile County Public Schools	Mobile, AL	10,000 Sq Ft
Compucom Headquarters	Raleigh, NC	200,000 Sq Ft

Expect more pervasive use of Digital Building infrastructure and tenant systems in the future!

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THANK YOU



ABOUT ME

Executive Entrepreneur with High Tech background with strong customer focus, Joe has worked extensively in networking, lighting, & consumer markets holding 16 patents. His passion is solving problems for customers.

Joe has successfully founded 4 companies and now brings his expertise to PoE Texas

Joseph Herbst MSEE, MBA

Chief Technical Officer
PoE Texas





PoE connects initiatives toward better living

Daylighting

Thermal Zoning

Circadian Lighting

Dynamic Solar Shading

Daylight Harvesting

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Real World Examples

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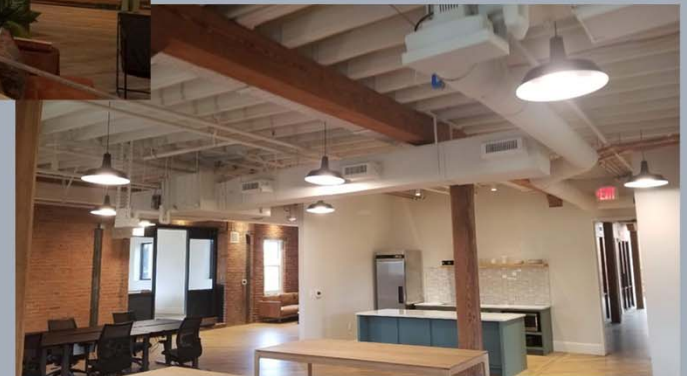
Continental Gin - TX

Historic Building

Controllers, drivers live in Cable Tray

Every fixture individually controllable

Lighting costs < \$30/day for 50kft²



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The Hanger - UT

Hanger Retrofit
Dynamic CCT High Bays
Wireless temp/RH/light sensors



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1776 By David Burk

High End Restaurant
RGBW, ambiance control
AWG 18-5 wiring to lights



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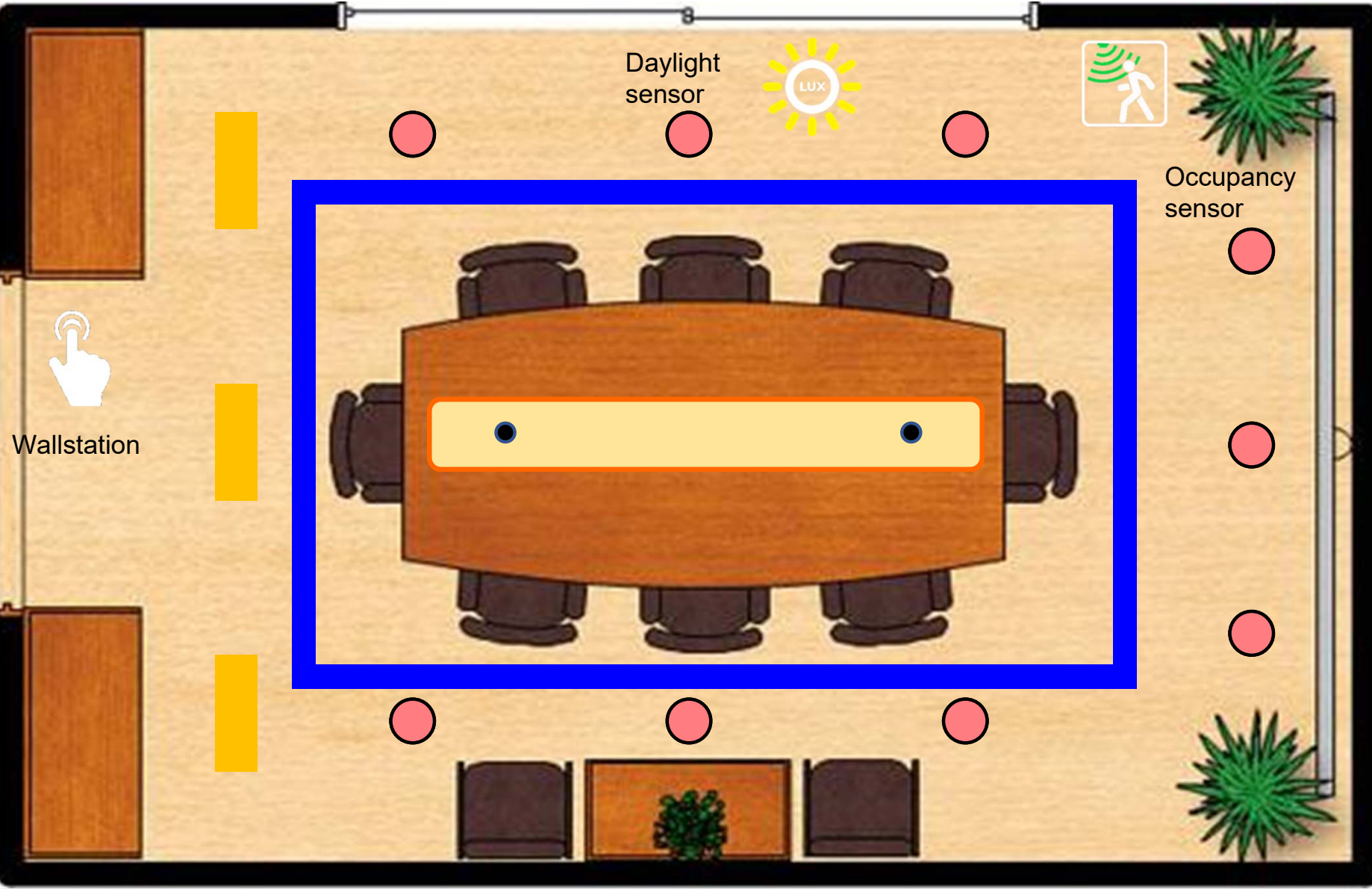


Designing a Conference Room

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Conference room application



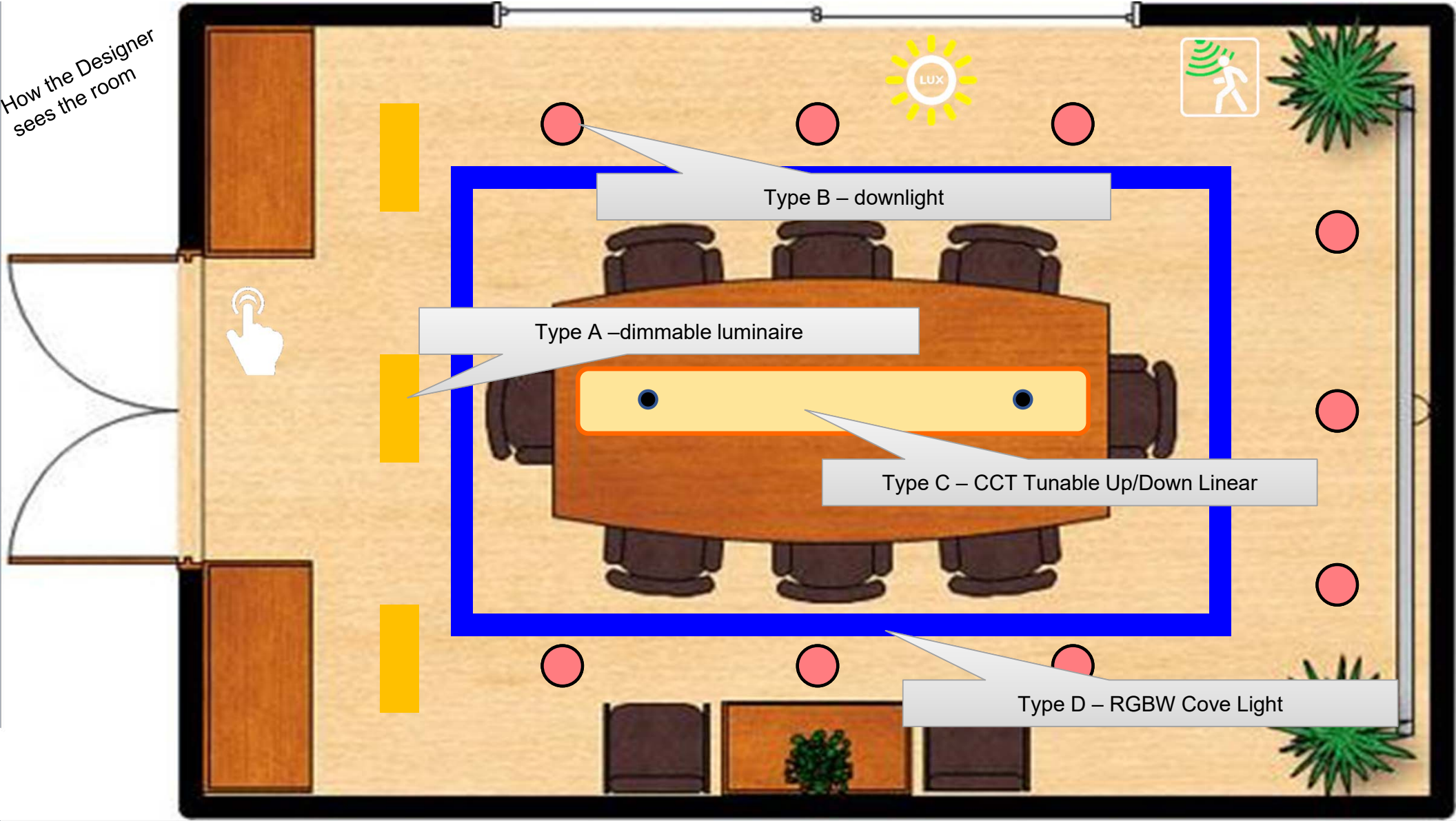
Wallstation

Daylight sensor

Occupancy sensor



How the Designer sees the room



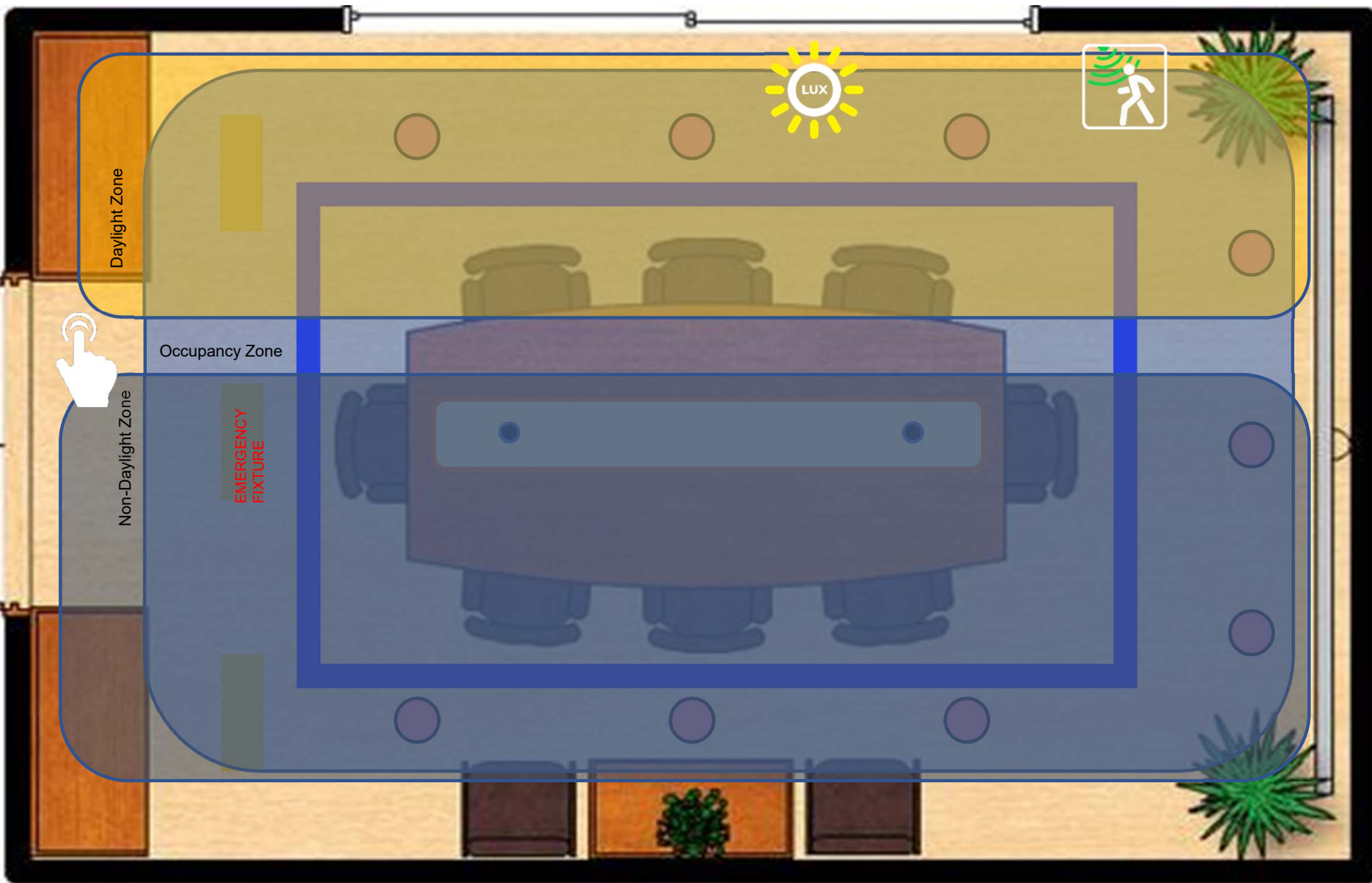
Type B – downlight

Type A – dimmable luminaire

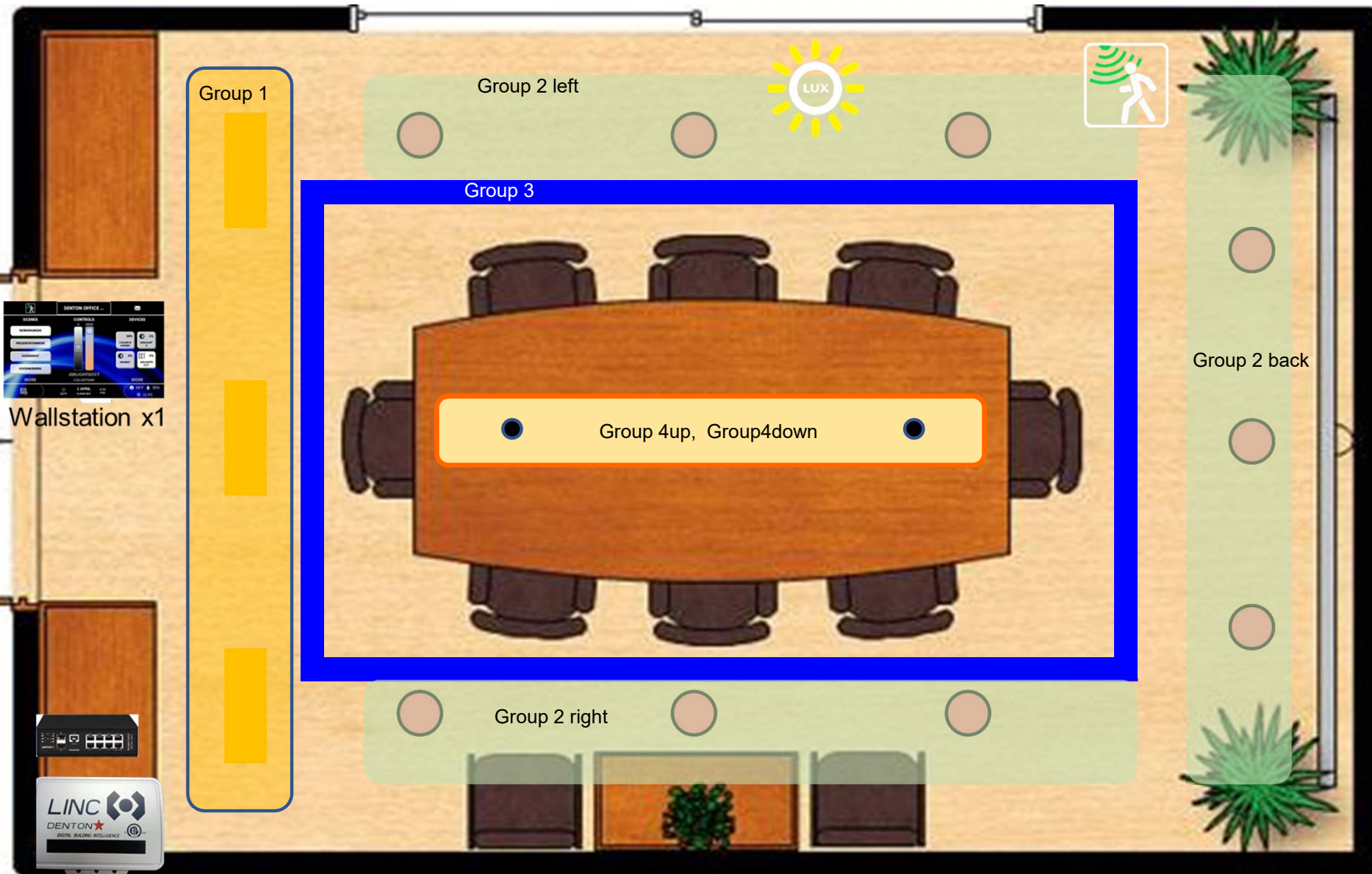
Type C – CCT Tunable Up/Down Linear

Type D – RGBW Cove Light

How Code official
sees the room



How users see the room



1 per building

Pitfalls to avoid

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Examples of good documentation

MAC Address	IDF	SW#	SW IP	SW/Port	Gateway	Output1	Output2	Output3	Output4
A0:22:4E:10:03:B4	IDF1	1	10.9.0.11	1	#N/A	#N/A	#N/A	Outside_3_03B4	0
A0:22:4E:10:03:F1	IDF1	1	10.9.0.11	2	#N/A	Z226_1_03EB			
A0:22:4E:10:03:F8	IDF1	1	10.9.0.11	3	dent-cortap-31	Z226_1_03EB			
A0:22:4E:10:03:F0	IDF1	1	10.9.0.11	4	dent-cortap-31	Z226_1_03EB			
A0:22:4E:10:03:D0	IDF1	1	10.9.0.11	6	dent-cortap-31	Z222_1_03C7			
A0:22:4E:10:04:02	IDF1	1	10.9.0.11	8	dent-cortap-31	ZXXXX_2_03FC			Z240_3_03FC
A0:22:4E:10:03:F2	IDF1	1	10.9.0.11	9	dent-cortap-31	Z226_1_03EB			
A0:22:4E:10:04:01	IDF1	1	10.9.0.11	10	dent-cortap-31	ZXXXX_2_03FC			Z240_3_03FC
A0:22:4E:10:03:D1	IDF1	1	10.9.0.11	11	dent-cortap-31	Z222_1_03C7			
A0:22:4E:10:03:F9	IDF1	1	10.9.0.11	12	dent-cortap-31	Z226_1_03EB			
A0:22:4E:10:03:FF	IDF1	1	10.9.0.11	13	dent-cortap-31	ZXXXX_2_03FC			Z240_3_03FC
A0:22:4E:10:03:FE	IDF1	1	10.9.0.11	14	dent-cortap-31	ZXXXX_2_03FC			Z240_3_03FC
A0:22:4E:10:04:00	IDF1	1	10.9.0.11	15	dent-cortap-31	ZXXXX_2_03FC			Z240_3_03FC
A0:22:4E:10:03:AF	IDF1	1	10.9.0.11	16	dent-cortap-31	Z217_1_03AD			
A0:22:4E:10:03:CA	IDF1	1	10.9.0.11	17	dent-cortap-31	Z222_1_03C7			
A0:22:4E:10:03:9A	IDF1	1	10.9.0.11	18	dent-cortap-31	Z287_1_0397			
A0:22:4E:10:03:61	IDF1	1	10.9.0.11	19	dent-cortap-31		Z258_1_035F		
A0:22:4E:10:03:B6	IDF1	1	10.9.0.11	20	dent-cortap-31	Zxxxx_1_03B5			
A0:22:4E:10:03:80	IDF1	1	10.9.0.11	21	dent-cortap-31	Z264_1_037D			
A0:22:4E:10:03:5C	IDF1	1	10.9.0.11	22	dent-cortap-31	Z222_1_035A			
A0:22:4E:10:02:A7	IDF1	1	10.9.0.11	23	dent-cortap-28	Z340C_1_02A6	Z301D_2_02A6		
A0:22:4E:10:03:F6	IDF1	2	10.9.0.12	1	dent-cortap-31	Z226_1_03EB			WS340C_3_02A6 WS340C_4_02A6
A0:22:4E:10:04:11	IDF1	2	10.9.0.12	2	dent-cortap-31	Z282_1_040F			
A0:22:4E:10:04:27	IDF1	2	10.9.0.12	3	dent-cortap-31	Z240_1_0426			
A0:22:4E:10:04:20	IDF1	2	10.9.0.12	4	dent-cortap-31	Z219A_1_0413			
A0:22:4E:10:04:1D	IDF1	2	10.9.0.12	5	dent-cortap-31	Z219A_1_0413			
A0:22:4E:10:04:19	IDF1	2	10.9.0.12	6	dent-cortap-31	Z219A_1_0413			
A0:22:4E:10:04:2B	IDF1	2	10.9.0.12	7	dent-cortap-31	Z240_1_0426			
A0:22:4E:10:04:2A	IDF1	2	10.9.0.12	9	dent-cortap-31	Z240_1_0426			
A0:22:4E:10:04:1A	IDF1	2	10.9.0.12	10	dent-cortap-31	Z219A_1_0413			
A0:22:4E:10:04:1C	IDF1	2	10.9.0.12	11	dent-cortap-31	Z219A_1_0413			
A0:22:4E:10:04:10	IDF1	2	10.9.0.12	12	dent-cortap-31	Z282_1_040F			
A0:22:4E:10:03:F4	IDF1	2	10.9.0.12	13	dent-cortap-31	Z226_1_03EB			

Zone #	FIXTURETYPE	DESCRIPTION	Load type	ID	Dimmer Type	Panel #:Ckt#
ZR2-3	LT-08	LED tape light at entry art wall	MLV	050DC265	ERC6D-AU-120	1:1
	LT-08	LED tape light at counter front	MLV			
ZR4	L1	track light at kitchen entry	INC	050DC29D	ERC6D-AU-120	1:2
ZR5	LT-08	LED tape at wall uplight	MLV	050DBFD6	ERC6D-AU-120	1:3
ZR6	L4A	downlight at main entry	0-10V	5073428	E9X-DUV-10VTP-FX	1:4
ZR7	L1	track light at pizza station	INC	050DC268	ERC6D-AU-120	1:5
ZR8	LT-01	pendant at pizza station	INC	050DA6AD	ERC6D-AU-120	1:6
ZR9-10	L1	track light at Bar1	INC	050D4CED	ERC6D-AU-120	1:7
	L1	track light at main dining area TV	INC			
ZR11	LT-08	tape light at booth dining area	MLV	050D4E4C	ERC6D-AU-120	2:1
ZR12A	LT-02	PENDANT FIXTURES	INC	050D849B	ERC6D-AU-120	2:2
ZR12B	LT-02	PENDANT FIXTURES	INC	050D7757	ERC6D-AU-120	2:3
ZR12C	LT-03	booth mounted fixture dining area 2	INC	050D8497	ERC6D-AU-120	2:4
ZR13-15	LT-01	pendant at bar 1	INC	050D4E96	ERC6D-AU-120	2:5
	LT-06	Pendant dining area 2	INC			
	LT-04	Pendant dining area 3	INC			
ZR19	LT-07	Pendant dining area 4	INC	050DB49E	ERC6D-AU-120	2:6
ZR20-21	LT-14	Sconce at Men's Restroom	INC	50665F3	E9X-DUV-10VTP-FX	2:7
	L4A	downlight at mens restroom	0-10V			
ZR22	L4A	downlight at hallway	0-10V	5081D36	E9X-DUV-10VTP-FX	2:8
ZR16	L1	Track light at dining area 3	INC	050D83E8	ERC6D-AU-120	3:1
ZR17	LT-05	Wall mount fixture dining area 3	INC	050D84A3	ERC6D-AU-120	3:2
ZR23-24	LT-14	Socne at Womens Restroom	0-10V	50814C4	E9X-DUV-10VTP-FX	3:3
	L4A	downlight at Womens restroom	0-10V			
ZB9-10	L6	back lit panel at bar 1	0-10V	5081D7B	E9X-DUV-10VTP-FX	3:4
	L6	back lit panel at bar 2	0-10V			

	WS258_1_035F	WS258_2_035F		
	WS218_1_03B5	WS218_2_03B5		
			WS340C_3_02A6	WS340C_4_02A6
	WS282_1_040F	WS282_2_040F		
	WS219B_1_0413	WS219B_2_0413		
	WS219B_1_0413	WS219B_2_0413		
	WS219B_1_0413	WS219B_2_0413		
	WS219B_1_0413	WS219B_2_0413		
	WS219B_1_0413	WS219B_2_0413		
	WS282_1_040F	WS282_2_040F		

1.3 Led strip x2
 1.4 hallway ~~NOT DONE~~ ✖
 1.5 pizza track 1/2
 1.6 pizza pendant
 1.7 bar track - TRACK
 —
 2.2 Big round
 2.3 Big round
 2.4 4 lights
 2.5 pendant x3, bar, logs ○
 2.6 vest lights
 2.7, 2.8, 3.3 bathroom hallway ✖○
 3.1 wall sconce ○
 3.4 ball m bar back ○ \$10
 3.5 wall sconce ○
 3.6 bar track
 3.7 ball m bar led ○
 5.1 outside ✖
 5.5 track
 5.6 big led ✖ star lights
 5.7 entrance track
 EXTRA 5.3 ? ✖

BATHROOMS &
 SCONES

~~#2 jump to panel 5
 for light 5.6~~

Example of BAD documentation



Label EVERY fixture
(and make sure it stays on)



Finding and climbing ladders
takes time & \$\$



<RoomNumber>_<
WireNumber>_<MA
CAddress>



Maximize the
number of these
< 1% failure rate



USE PoE Tester on
these!

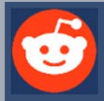
Three high ROI tools for Installation Process

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