Designers Lighting Forum

Lighting Control - by Others?

Moderator:
Carl Camenisch - CC&A International

Panelists:
Chuck Cameron - Stan Deutsch Associates | New York School of Interior Design
Gary Dulanski - The Dulanski Group
Shaun Fillion - New York School of Interior Design | RAB Lighting
C. Webster Marsh - HLB Lighting Design
Paula Martinez Nobles - Fisher Marantz Stone

3/18/2020

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

Learning Objectives

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

1. See that lighting is just one of the many components that must network seamlessly in Building Systems Management.

2. Cut through some of the confusion by better understanding some of the energy codes, miniaturization of sensors and network integration hardware, and advances in wireless technology.

3. Designers will learn some of the options for control driven by the rapidly growing demand for highly controllable LED lighting.

4. Though efficiency and network design may be the scope of engineers, Lighting Designers will become more confident in maintaining control of lighting quality in their scope of work.

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Lighting Controls

BY OTHERS?

1. How do we begin?
2. Dispelling misconceptions
3. Evolving control technologies
4. Specify with intent
5. Finishing strong

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Tuneable White

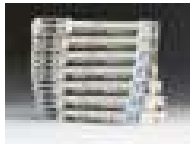
IoT

Individually Addressable

Wireless

PoE

0-10V to DMX to 0-10V



Driver-on-Board

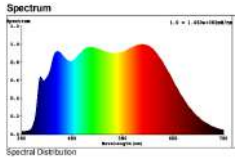
Bluetooth Mesh

In-luminaire Inverter

Microwave Sensors

Miniature Sensors

Human Centric Lighting



ZigBee

Full Spectrum

Chip Scale Package

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How do we begin?

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How do we begin?

“Begin with the end in mind.” Stephen Covey from Seven Habits

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“Rooms by the Sea” by Edward Hopper 1951

Image captured on Google Pixel camera by Carl Camenisch at Yale University Art Gallery November 30, 2019.

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Compare snapshot of the original to thumbnail pics offered as reproductions.


Rooms by the Sea, 1951 by Edward ...
edwardhopper.net


Sea Mounted Print by Edward Hop...
art.com · In stock


Rooms by the Sea - Edward Hop...
overstockart.com · In stock


Edward Hopper, Rooms by The ...
overstockart.com · In stock


Amazon.com: Edward Hoppe...
amazon.com


Amazon.com: Lilarama Edward Hopper ...
amazon.com


Audioguide und E-Book zu Edward Ho...
youtube.com


Shop Edward Hopper 'Rooms ...
overstock.com · In stock


Rooms by the sea' - Edward Hopper, ...
pinterest.com


Shop Edward Hopper 'Rooms ...
overstock.com · In stock


Sea Art Print by Edward Hopper ...
kingandmcgaw.com


Edward Hopper, Rooms by The Sea P...
overstockart.com · In stock

Sara Luzuriaga, BR '21, listens to art historian John Walsh discuss Edward Hopper's *Rooms by the Sea* (1951) on the Gallery's new app.

01/25

Yale Art Museums Appy Hour

Friday, January 25, 2019, 12:00 pm–5:00 pm

Explore the Yale University Art Gallery and the Yale Center for British Art in a fun new way! Both museums have launched mobile apps that offer visitors an in-depth guide to the architecture and collections. Join us to celebrate the app launch with refreshments and tech guidance at the Gallery (1111 Chapel Street) and the Center (1080 Chapel Street).

Open to: General Public

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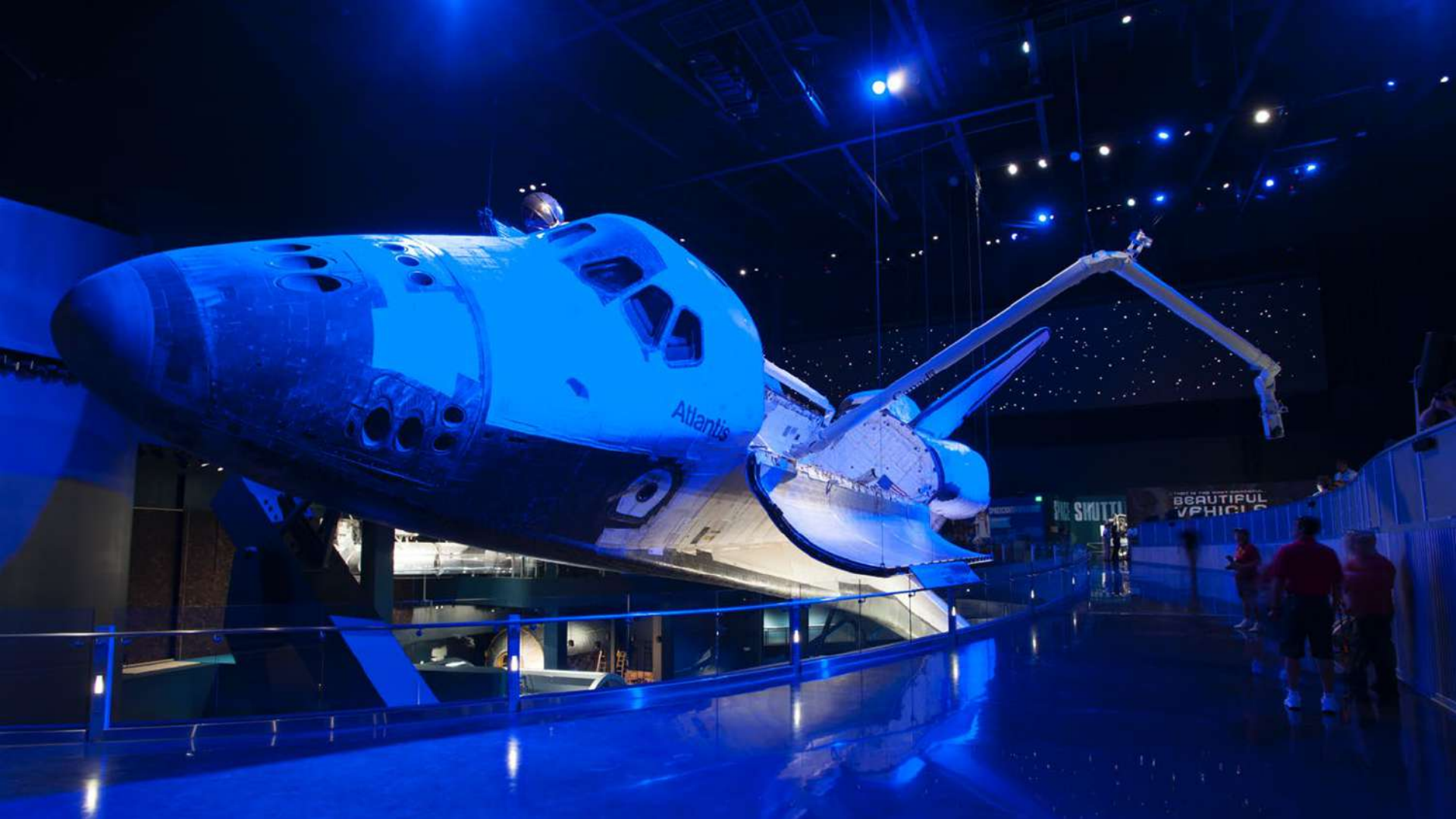
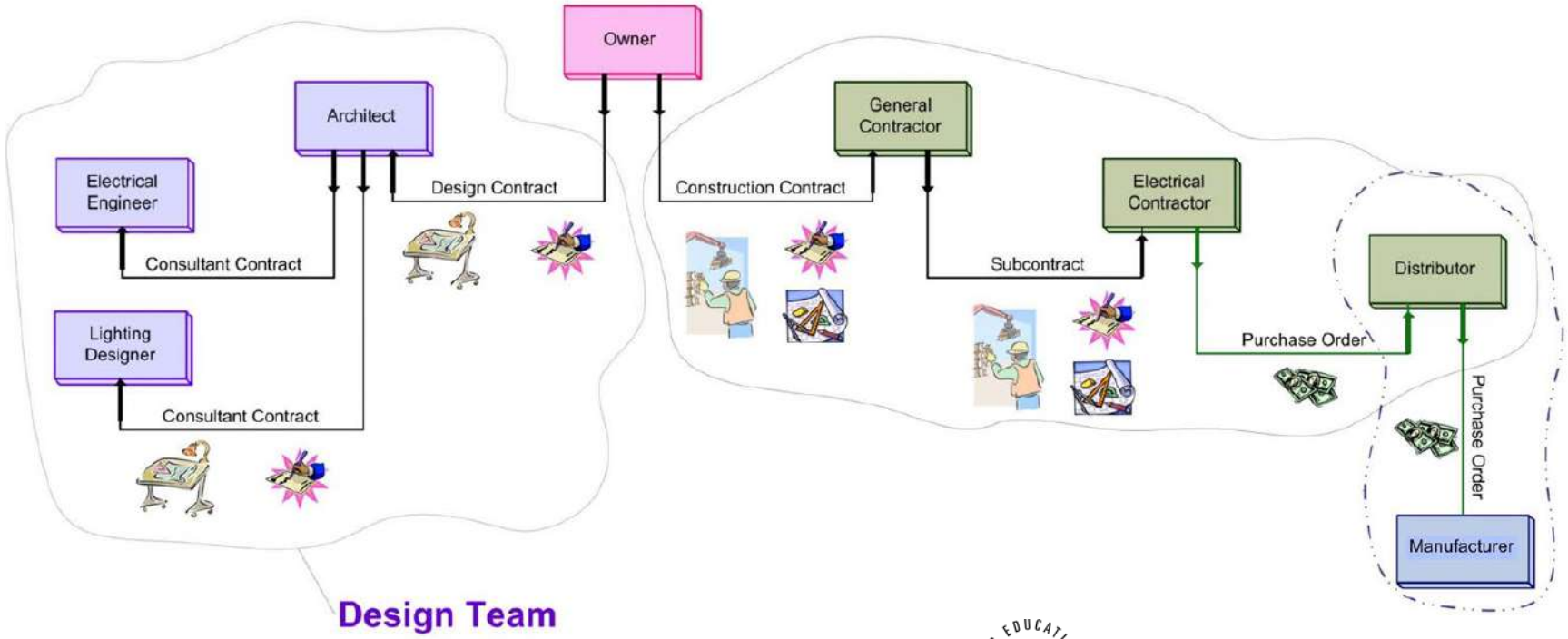

Atlantis


Atlantis

Roles & Relationships



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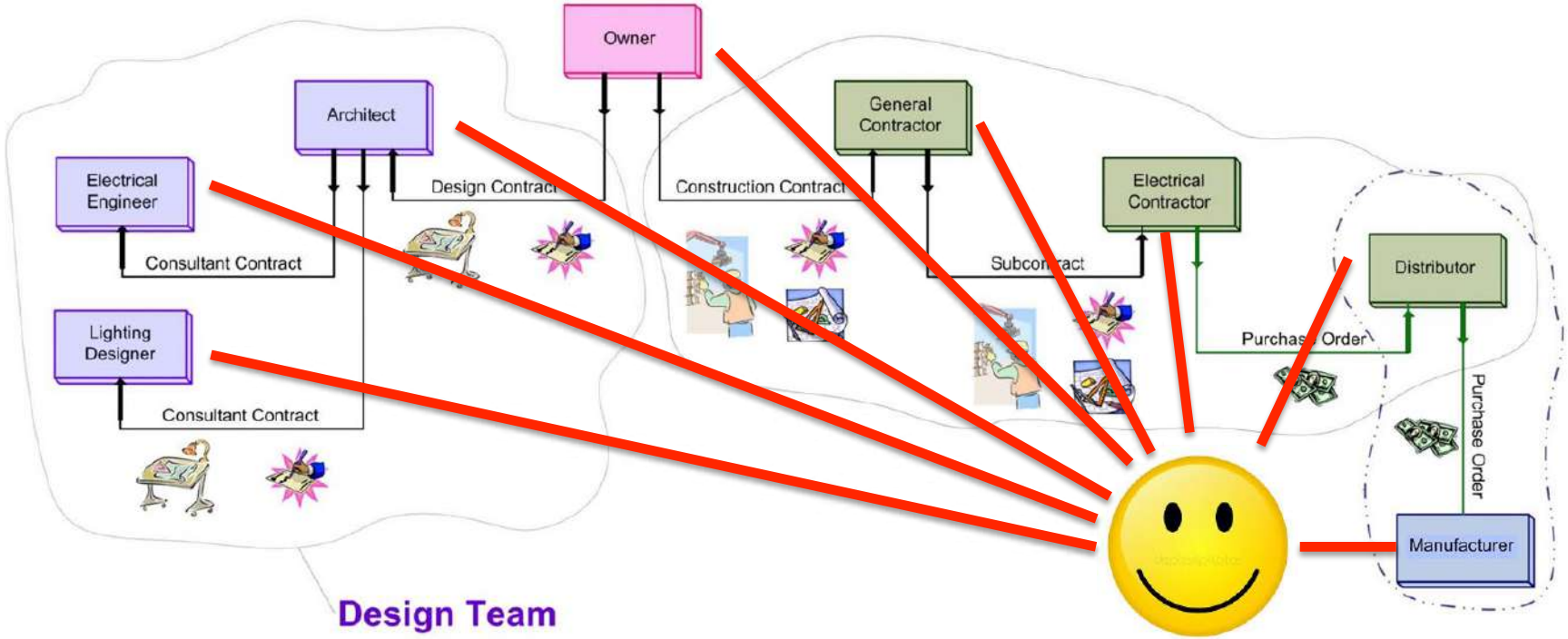
Rep Roles & Relationships



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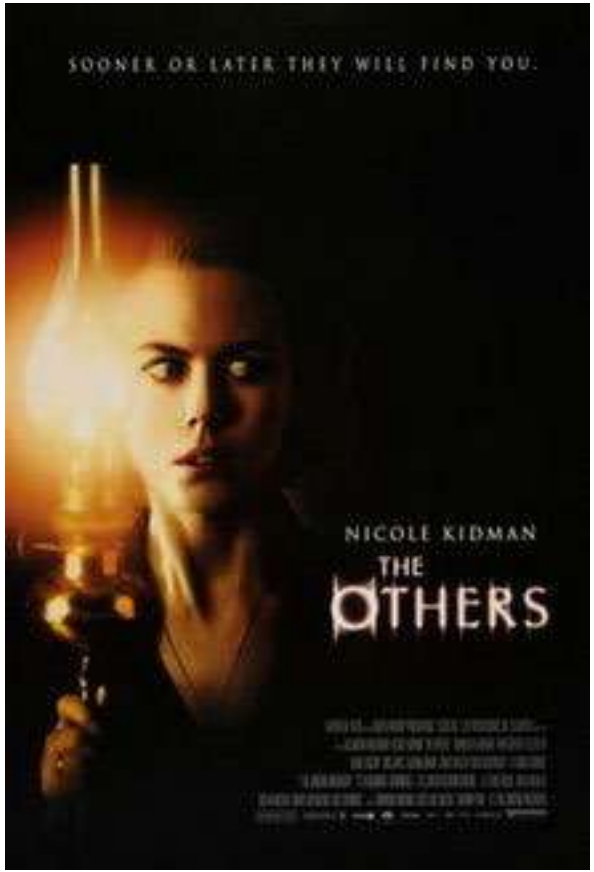
Who are “the others?”



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Who are “the others?”

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Who are “the others?”

- Representatives
-
-

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Who are “the others?”

- Representatives
- Contractors

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Who are “the others?”

- Representatives
- Contractors
- Owners

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Who are “the others?”

- Lighting Designers
- Representatives
- Contractors
- Owners

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Who are “the others?”

Nobody, just the Lighting Designers

- ~~Representatives~~
- ~~Contractors~~
- ~~Owners~~

When the Others don’t come

there are missing parts

or bad decisions are made

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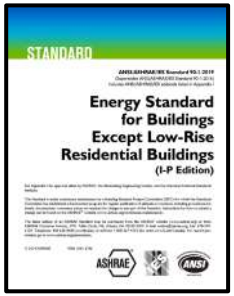
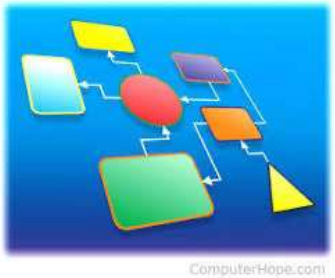
Listen to the intent.

Help identify the best solution.

Understand and communicate the limitations.

Welcome To Controls World





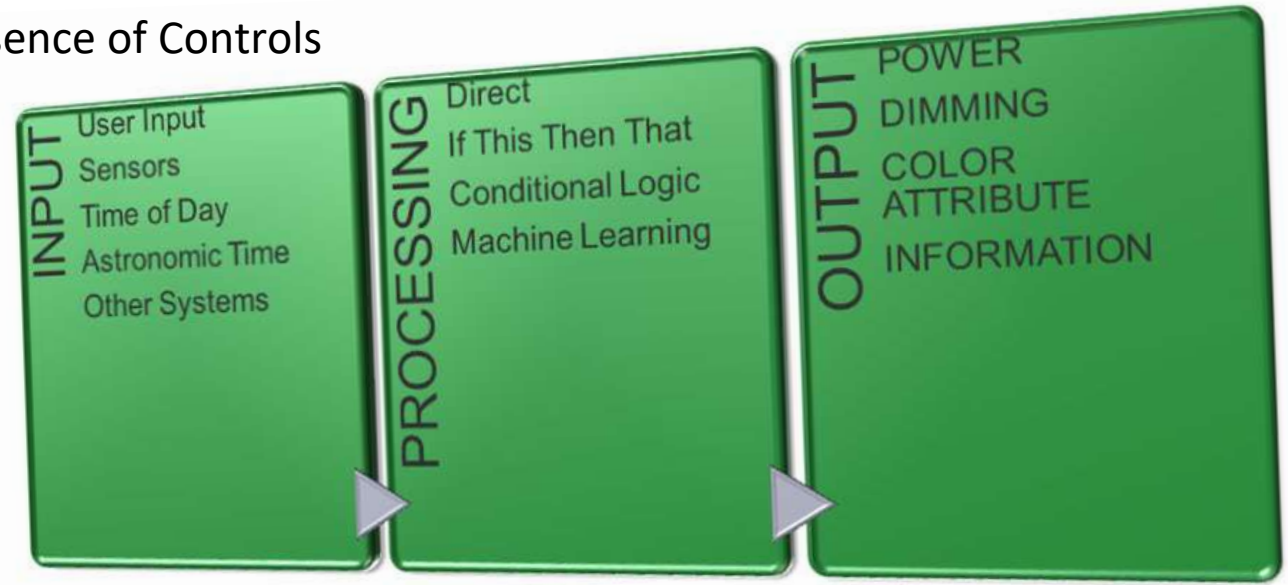
CODES TECHNOLOGY PRODUCTS OTHER BUILDING SYSTEMS DESIGN PROCESS BUILD PROCESS

Specifying Controls

Drawings

Control Narrative

The Essence of Controls



Good designers take **inputs** from clients

process within the parameters of design concepts, guidelines and code

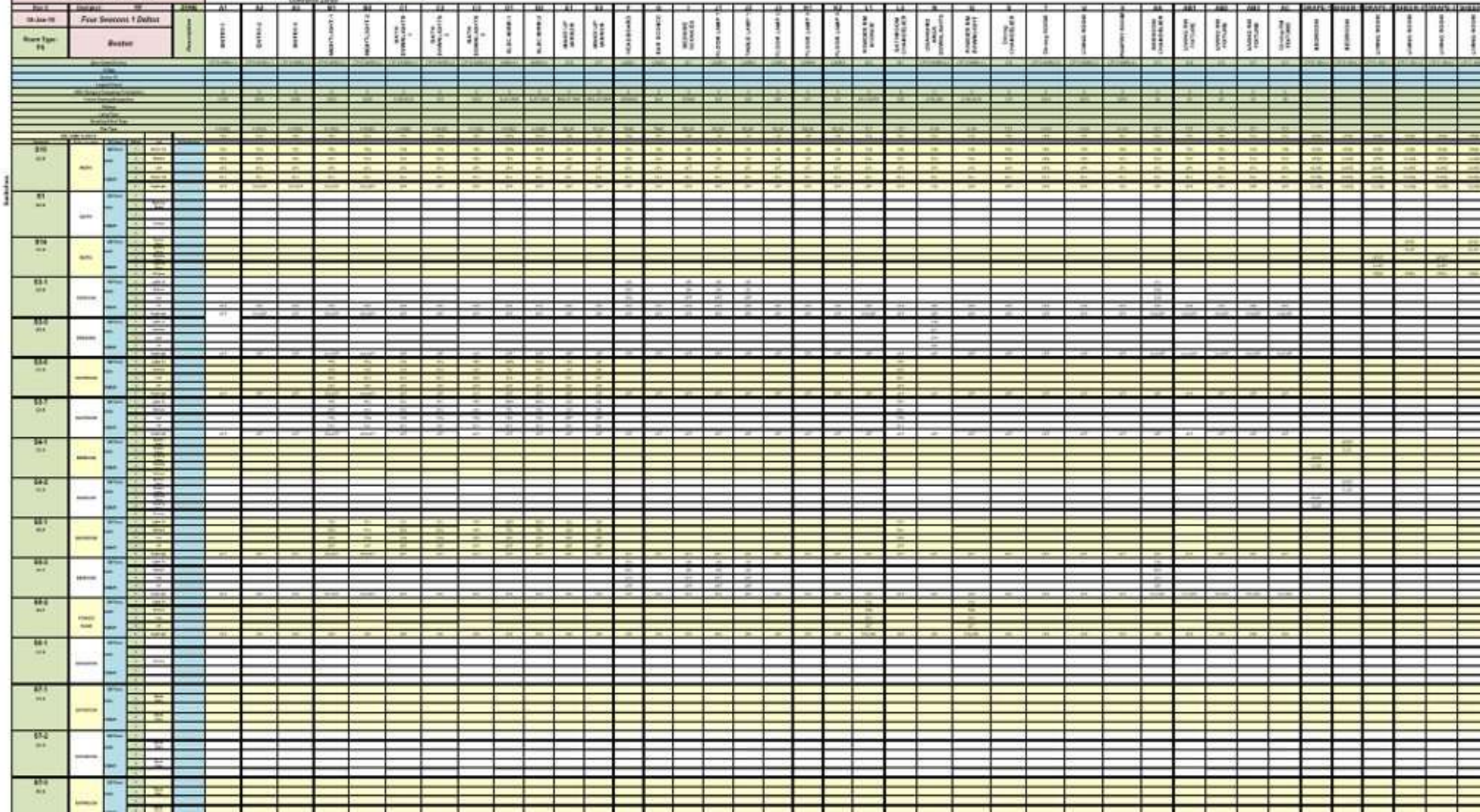
and **output** appropriate, stellar designs.

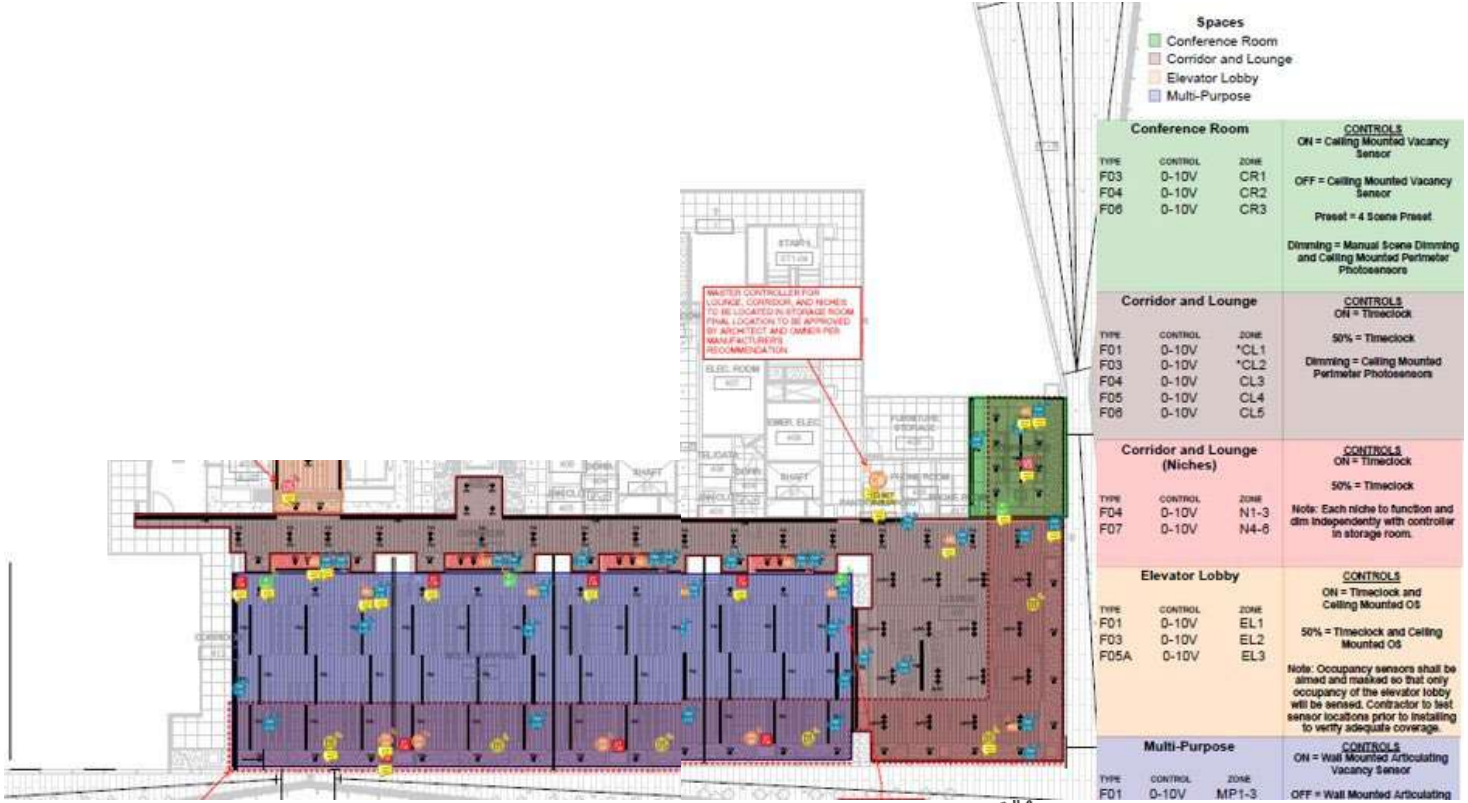
LIGHTING CONTROLS NARRATIVES (AS PER TABLE 9.6.1)

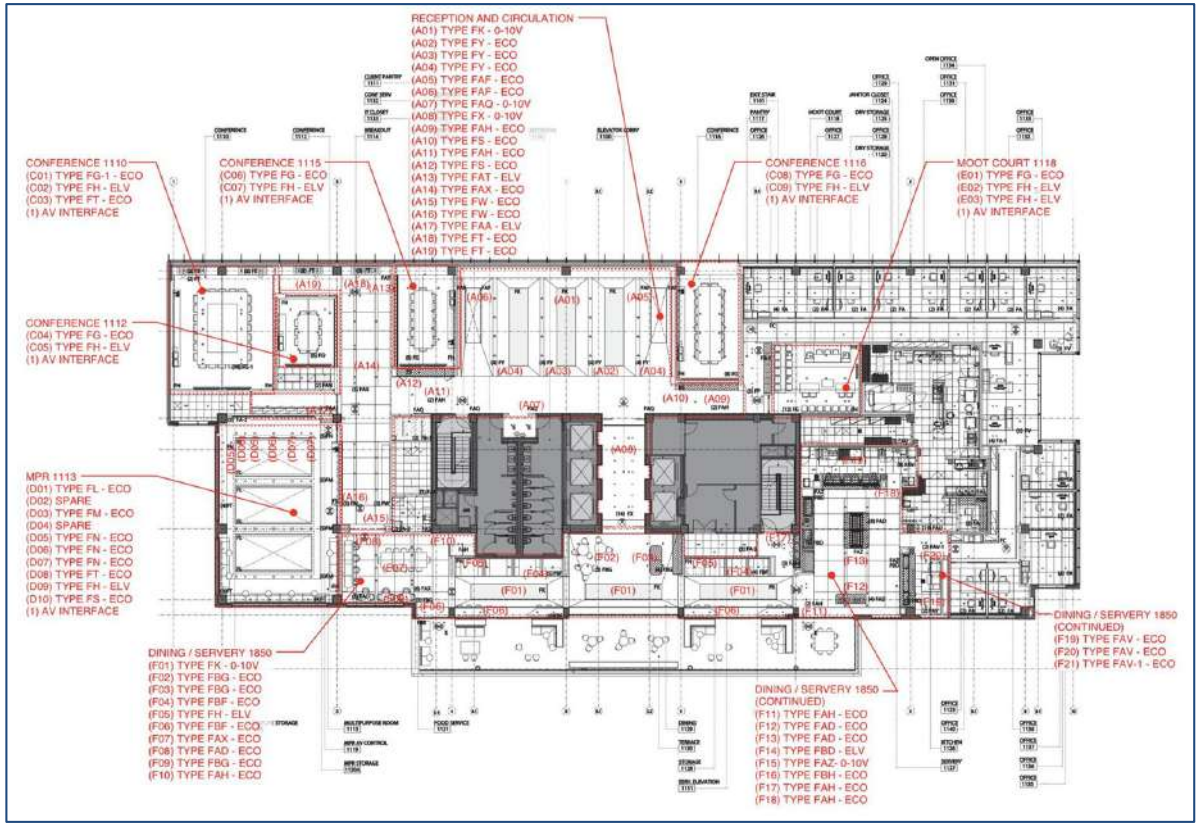
INTERIOR LIGHTING CONTROLS

ROOM TYPE	CONTROL STRATEGY AS PER TABLE 9.6.1 OF NYCECC APPENDIX CA (ASHRAE AS AMENDED)			
	MANUAL CONTROLS TO BE PROVIDED	LIGHT REDUCTION CONTROLS TO BE PROVIDED	AUTOMATIC PARTIAL–OFF CONTROLS TO BE PROVIDED	AUTOMATIC FULL–OFF CONTROLS TO BE PROVIDED
PUBLIC STAIRS (MEANS OF EGRESS)	REMOTE LOCATION (NO PUBLIC ACCESS)	REDUCE AT LEAST 50%	BI–LEVEL MOTION SENSOR	NOT REQUIRED 9.4.1.1(h) (EXCEPTIONS 2)
PUBLIC CORRIDORS (MEANS OF EGRESS)	REMOTE LOCATION (NO PUBLIC ACCESS)	OCCUPANCY SENSORS	OCCUPANCY SENSORS	NOT REQUIRED 9.4.1.1(h) (EXCEPTIONS 2)
LOBBY AREA (MEANS OF EGRESS)	REMOTE LOCATION (NO PUBLIC ACCESS)	OCCUPANCY SENSORS	OCCUPANCY SENSORS	NOT REQUIRED 9.4.1.1(h) (EXCEPTIONS 2)
ELEV./MECHANICAL/ELEC/TEL ROOMS	LOCAL SWITCHES	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
TENANT STORAGE	LOCAL SWITCHES	OCCUPANCY SENSOR	OCCUPANCY SENSOR	OCCUPANCY SENSOR
COMMON RESTROOMS	LOCAL SWITCHES	VACANCY SENSOR	VACANCY SENSOR	VACANCY SENSOR
PARKING GARAGES (INDOOR)	REMOTE LOCATION (NO PUBLIC ACCESS)	OCCUPANCY SENSOR	OCCUPANCY SENSOR	NOT REQUIRED 9.4.1.1(i) (EXCEPTIONS 3)
DWELLING UNITS	LOCAL SWITCHES	NOT REQUIRED	NOT REQUIRED	NOT REQUIRED
DAYLIGHT ZONES[1] (PUBLIC / RETAIL)	LOCAL SWITCHES/CONTROL PANELS	DAYLIGHT PHOTO SENSOR	DAYLIGHT PHOTO SENSOR	DAYLIGHT PHOTO SENSOR
DAYLIGHT ZONES[1] (AMENITY SPACE)	LOCAL SWITCHES/CONTROL PANELS	DAYLIGHT PHOTO SENSOR	DAYLIGHT PHOTO SENSOR	DAYLIGHT PHOTO SENSOR
AMENITY AREAS	LOCAL SWITCHES/CONTROL PANELS	OCCUPANCY SENSOR	OCCUPANCY SENSOR	OCCUPANCY SENSOR

[1] DAYLIGHT ZONES AUTOMATIC CONTROL ARE FOR TOPLIGHT AND SIDELIGHT DAYLIGHT ZONES



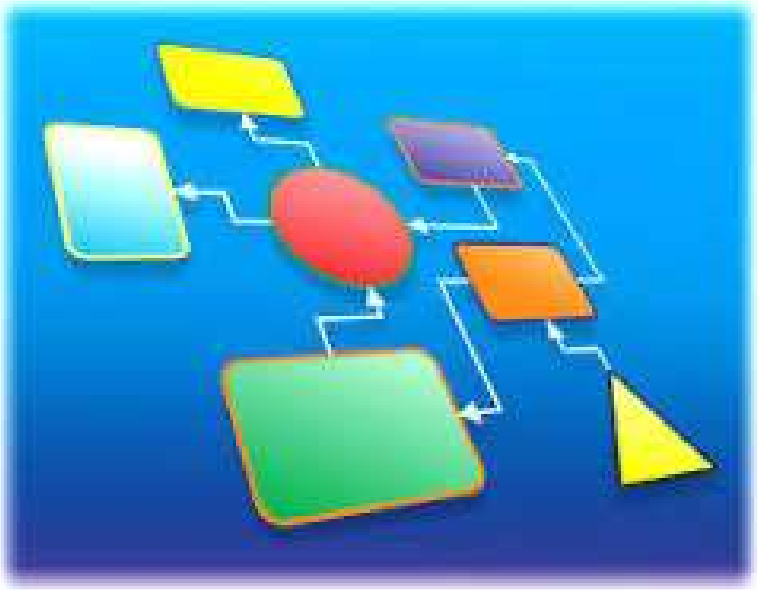

Spaces
Conference Room
Corridor and Lounge
Elevator Lobby
Multi-Purpose
Conference Room
TYPE CONTROL ZONE
F03 0-10V CR1
F04 0-10V CR2
F06 0-10V CR3
CONTROLS
ON = Ceiling Mounted Vacancy Sensor
OFF = Ceiling Mounted Vacancy Sensor
Preset = 4 Scene Preset
Dimming = Manual Scene Dimming and Ceiling Mounted Perimeter Photosensors
Corridor and Lounge
TYPE CONTROL ZONE
F01 0-10V *CL1
F03 0-10V *CL2
F04 0-10V CL3
F05 0-10V CL4
F06 0-10V CL5
CONTROLS
ON = Timeclock
50% = Timeclock
Dimming = Ceiling Mounted Perimeter Photosensors
Corridor and Lounge (Niches)
TYPE CONTROL ZONE
F04 0-10V N1-3
F07 0-10V N4-6
CONTROLS
ON = Timeclock
50% = Timeclock
Note: Each niche to function and dim independently with controller in storage room.
Elevator Lobby
TYPE CONTROL ZONE
F01 0-10V EL1
F03 0-10V EL2
F05A 0-10V EL3
CONTROLS
ON = Timeclock and Ceiling Mounted OS
50% = Timeclock and Ceiling Mounted OS
Note: Occupancy sensors shall be aimed and masked so that only occupancy of the elevator lobby will be sensed. Contractor to test sensor locations prior to installing to verify adequate coverage.
Multi-Purpose
TYPE CONTROL ZONE
F01 0-10V MP1-3
CONTROLS
ON = Wall Mounted Articulating Vacancy Sensor
OFF = Wall Mounted Articulating


RECEPTION AND CIRCULATION
(A01) TYPE FK - 0-10V
(A02) TYPE FY - ECO
(A03) TYPE FY - ECO
(A04) TYPE FY - ECO
(A05) TYPE FAF - ECO
(A06) TYPE FAF - ECO
(A07) TYPE FAQ - 0-10V
(A08) TYPE FX - 0-10V
(A09) TYPE FAH - ECO
(A10) TYPE FS - ECO
(A11) TYPE FAH - ECO
(A12) TYPE FS - ECO
(A13) TYPE FAT - ELV
(A14) TYPE FAX - ECO
(A15) TYPE FW - ECO
(A16) TYPE FW - ECO
(A17) TYPE FAA - ELV
(A18) TYPE FT - ECO
(A19) TYPE FT - ECO
CONFERENCE 1110
(C01) TYPE FG-1 - ECO
(C02) TYPE FH - ELV
(C03) TYPE FT - ECO
(1) AV INTERFACE
CONFERENCE 1115
(C06) TYPE FG - ECO
(C07) TYPE FH - ELV
(1) AV INTERFACE
CONFERENCE 1116
(C08) TYPE FG - ECO
(C09) TYPE FH - ELV
(1) AV INTERFACE
MOOT COURT 1118
(E01) TYPE FG - ECO
(E02) TYPE FH - ELV
(E03) TYPE FH - ELV
(1) AV INTERFACE
CONFERENCE 1112
(C04) TYPE FG - ECO
(C05) TYPE FH - ELV
(1) AV INTERFACE
MPR 1113
(D01) TYPE FL - ECO
(D02) SPARE
(D03) TYPE FM - ECO
(D04) SPARE
(D05) TYPE FN - ECO
(D06) TYPE FN - ECO
(D07) TYPE FN - ECO
(D08) TYPE FT - ECO
(D09) TYPE FH - ELV
(D10) TYPE FS - ECO
(1) AV INTERFACE
DINING / SERVERY 1850
(F01) TYPE FK - 0-10V
(F02) TYPE FBG - ECO
(F03) TYPE FBG - ECO
(F04) TYPE FBF - ECO
(F05) TYPE FH - ELV
(F06) TYPE FBF - ECO
(F07) TYPE FAX - ECO
(F08) TYPE FAD - ECO
(F09) TYPE FBG - ECO
(F10) TYPE FAH - ECO
DINING / SERVERY 1850
(CONTINUED)
(F11) TYPE FAH - ECO
(F12) TYPE FAD - ECO
(F13) TYPE FAD - ECO
(F14) TYPE FBD - ELV
(F15) TYPE FAZ- 0-10V
(F16) TYPE FBH - ECO
(F17) TYPE FAH - ECO
(F18) TYPE FAH - ECO
DINING / SERVERY 1850
(CONTINUED)
(F19) TYPE FAV - ECO
(F20) TYPE FAV - ECO
(F21) TYPE FAV-1 - ECO

One Line Diagram

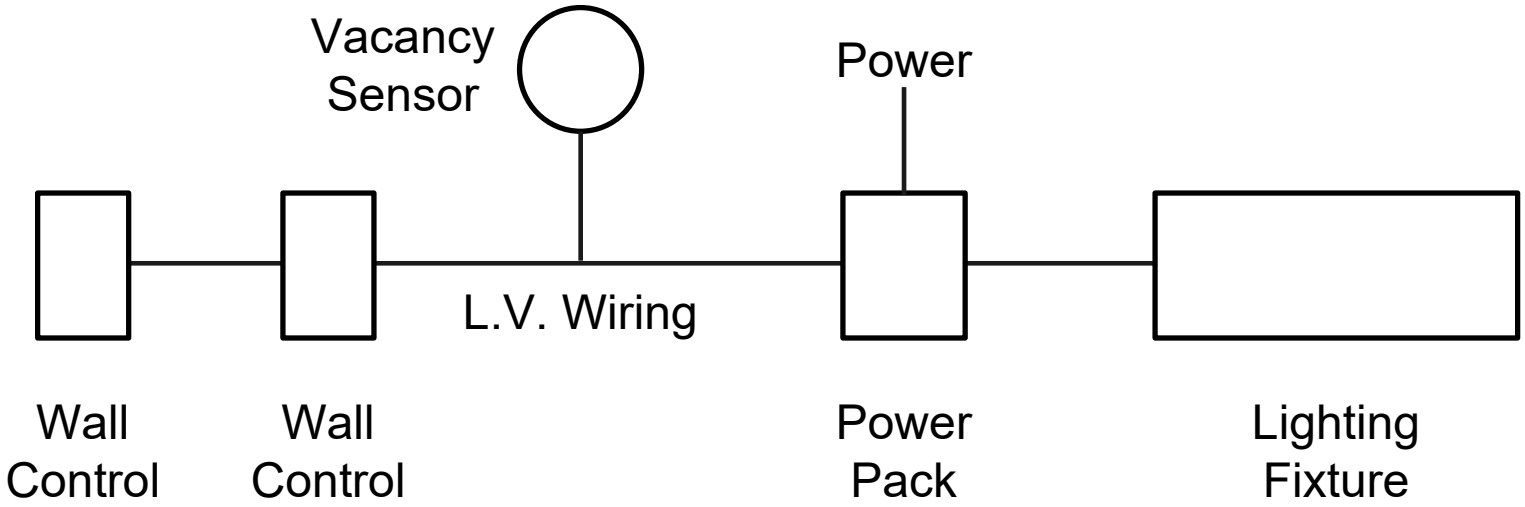
NOT a Wiring Diagram

NOT a Riser

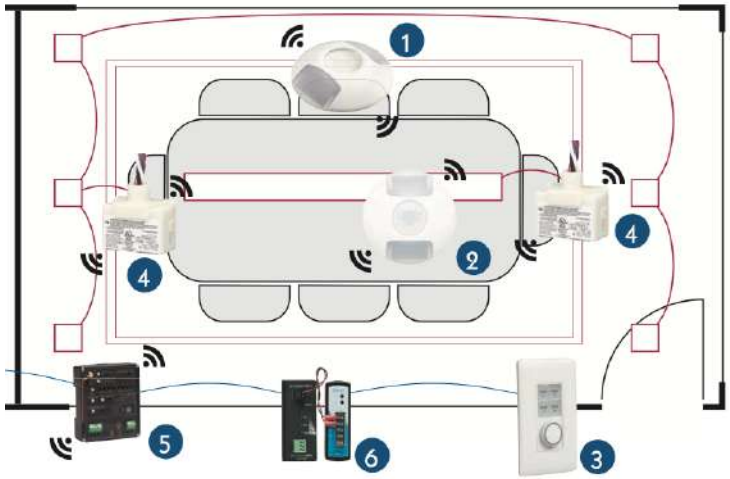


"For concept only - refer to shop drawings and manufacturer's installation instructions for exact wiring requirements."

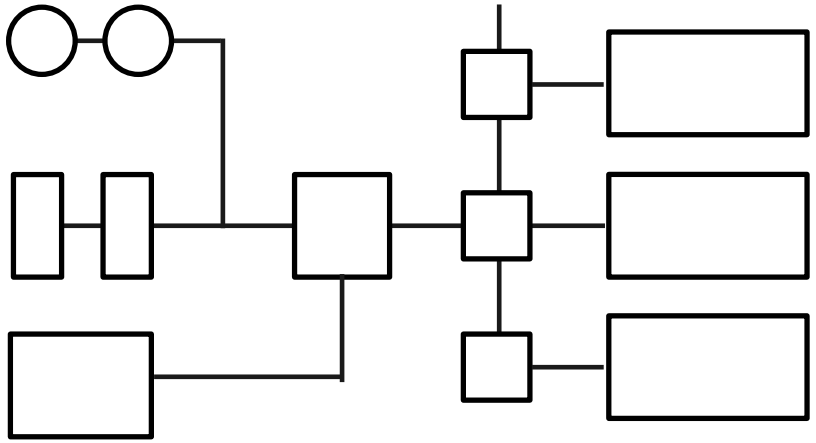
Simple Controls



Medium Controls



Concept - Physical



One Line Diagram

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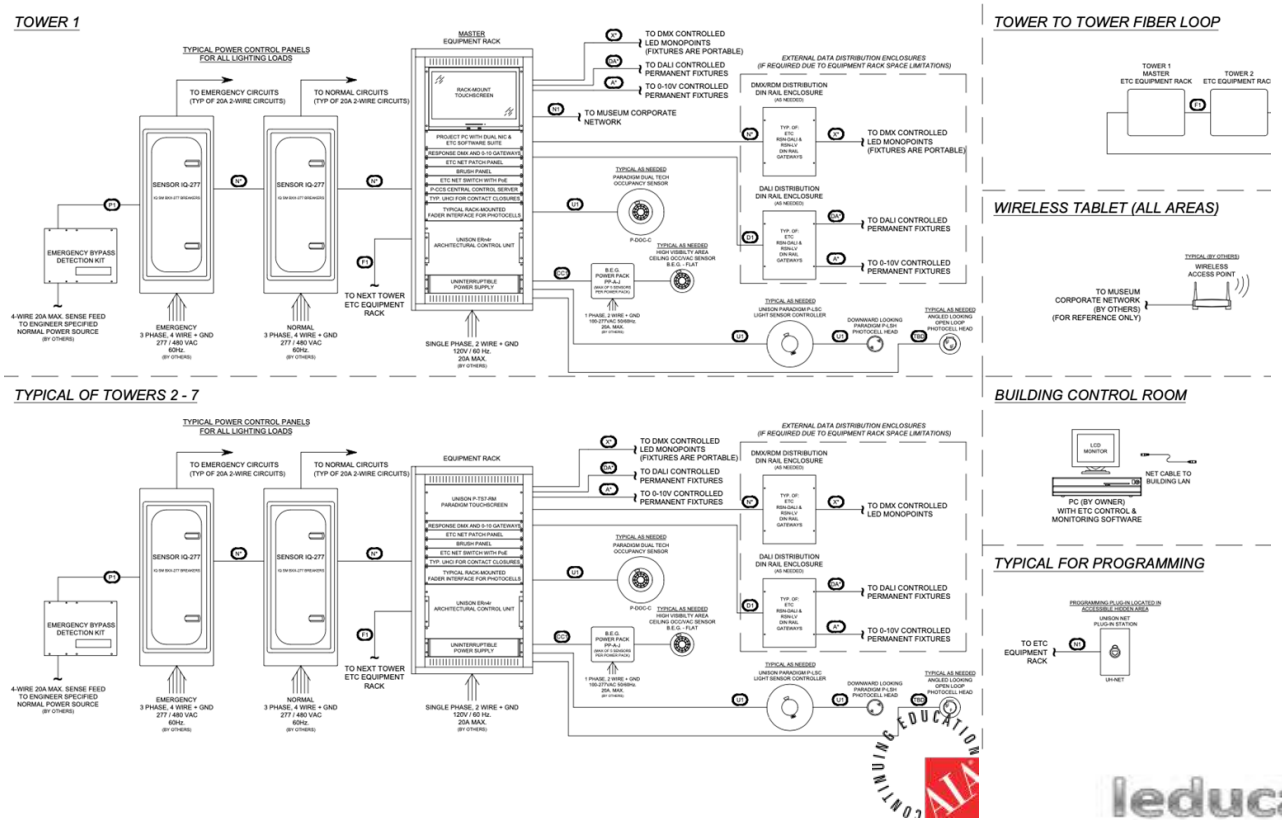
Large Systems



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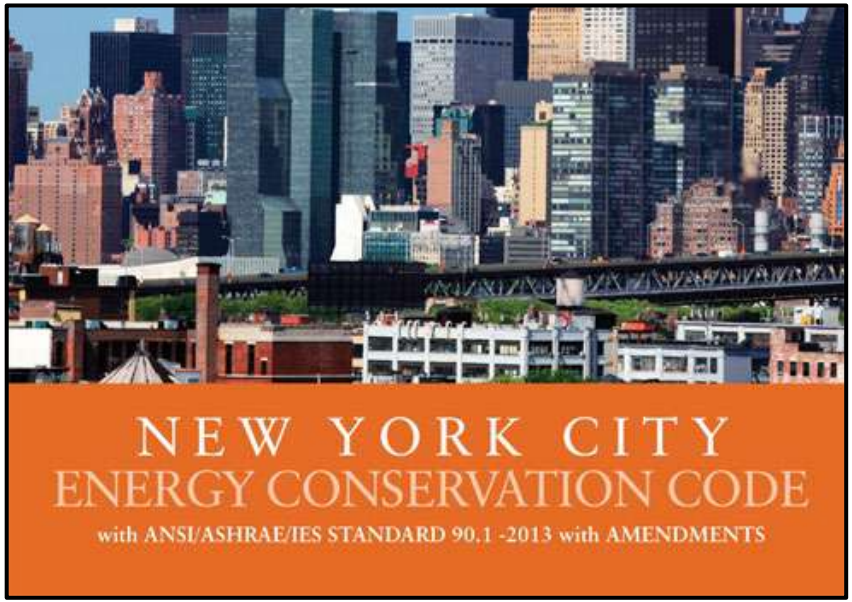

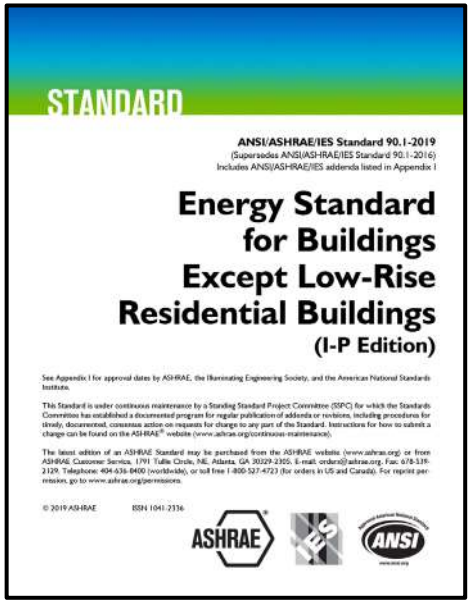

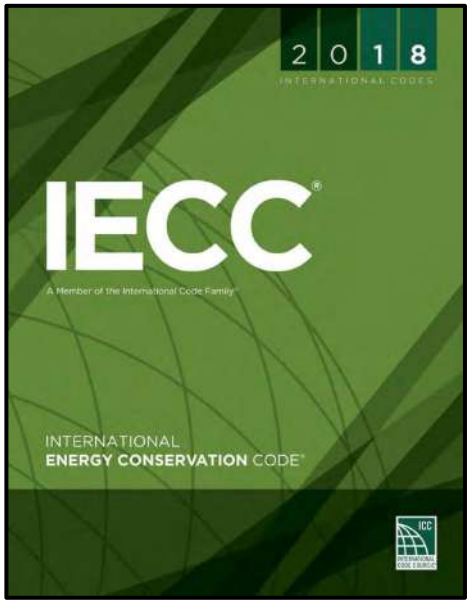

Energy code compliance is a requirement, not a design goal.
Design controls to enhance the occupant experience!
“Controls are your friend”

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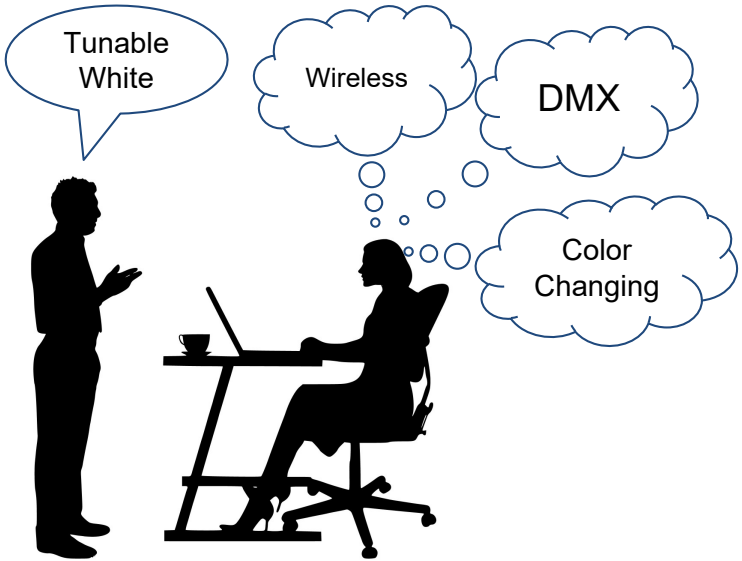
Control Implementation Challenges

Recent Panel Discussion at DOE Lighting R&D Workshop on Connected Lighting System Complexity:

In a Pacific NW study, 5% of projects had controls designed, 85% were by contractor.

- Who specifies the controls?
- Who interprets the specifications?
- Who verifies the compatibility?
- Who is responsible for proper installation?
- Who knows if it's working properly?
- Who fixes it if it isn't?

Dispelling Misconceptions



- Clients aren't living in a vacuum
- Clients may have pre-conceptions
- Not all pre-conceptions are accurate

Dispelling Misconceptions

- As experts we need to help educate
- But also be understanding
- Guide the Owners through the minutiae

Dispelling Misconceptions

- Thinking through the design out loud
- Asking questions regarding design intent
- Identifying what is required to meet the intent

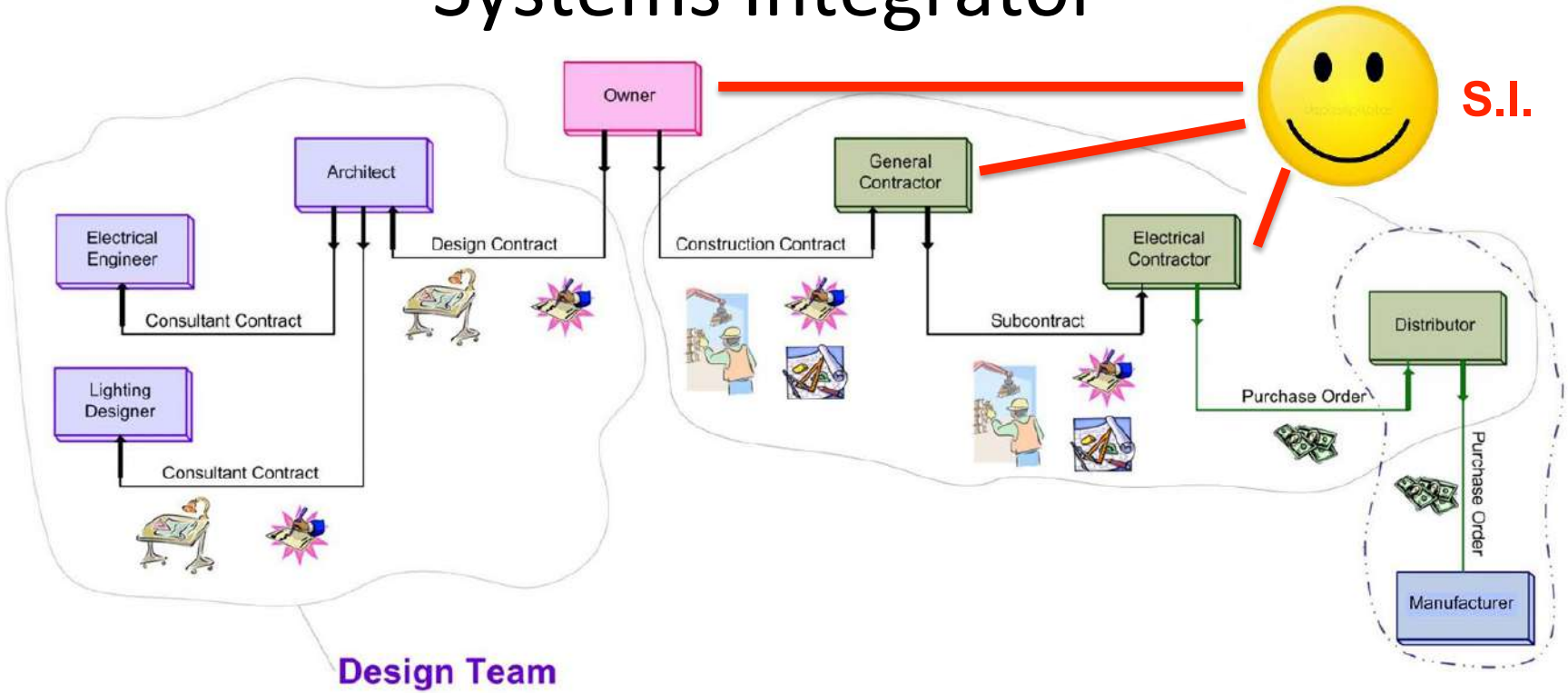
Dispelling Misconceptions

- Discuss controls alongside lighting designs
- Understand where the misconception originates
- Identify the issues that the misconception create
- Use facts to dispel the misconception

Dispelling Misconceptions

- Cost of BAS controlled luminaires = $
- Cost of DMX controlled luminaires = $$
- Cost BAS controls and commissioning = $$$
- Cost of DMX controls and commissioning = $
- BAS option = $$$$
- DMX option = $$$

Systems Integrator



Evolving Control Technologies

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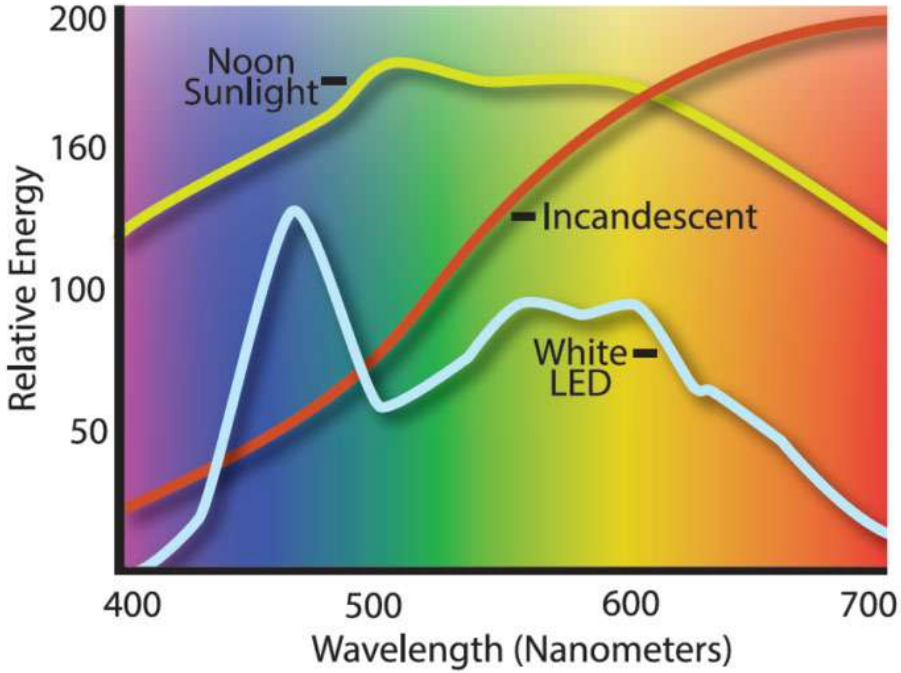
Spectra From Common Sources of Visible Light



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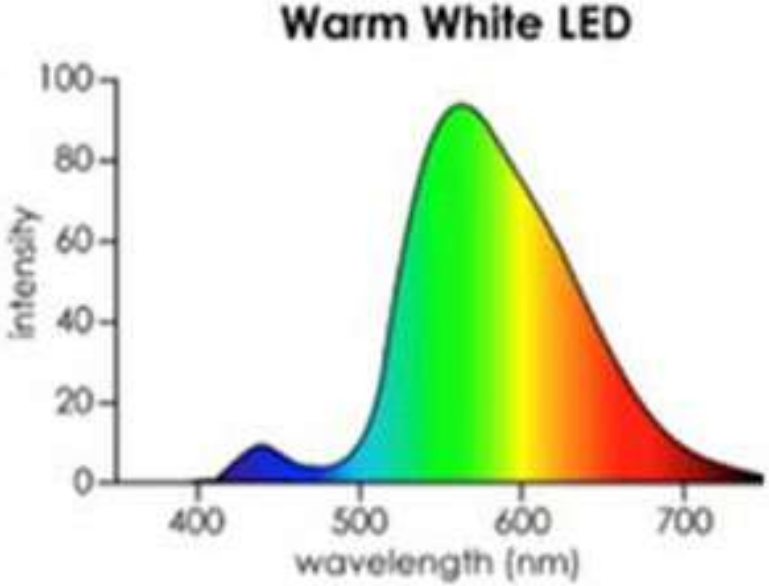
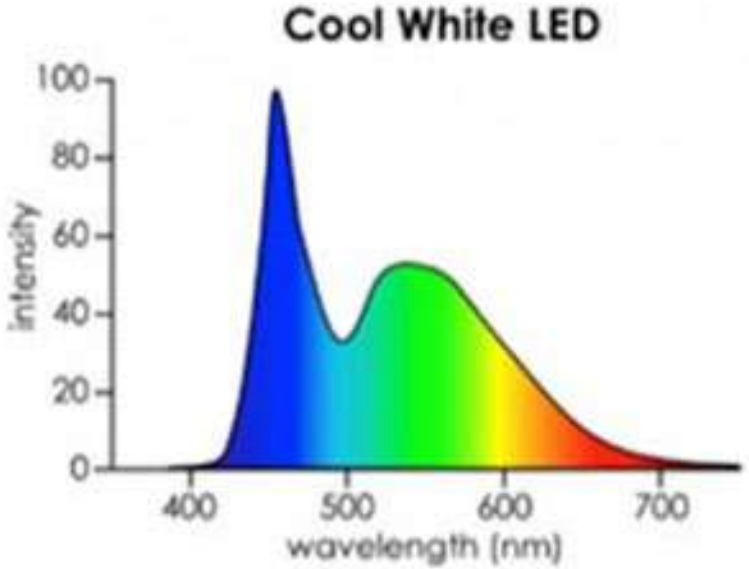
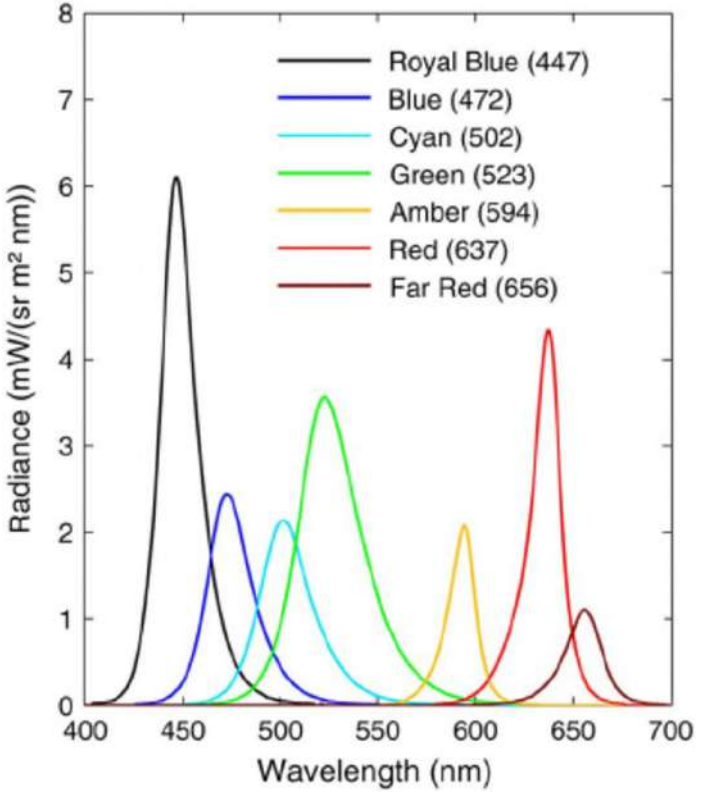

Warm White LED
100
80
60
40
20
0
intensity
400
500
600
700
wavelength (nm)


Cool White LED
100
80
60
40
20
0
intensity
400
500
600
700
wavelength (nm)

Direct Emitting Color LED examples that can be combined to make a multi-primary “white” source.



Colorimetric suggested by Michael Murdoch

$$\begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{est} = \boldsymbol{M} \begin{bmatrix} p_1 \\ p_2 \\ \vdots \\ p_n \end{bmatrix} + \begin{bmatrix} X \\ Y \\ Z \end{bmatrix}_{flare} .$$

Where P are primaries and can be in any number. When there are more than 3 then there are multiple solutions to arrive at any 3 dimensional color specification.

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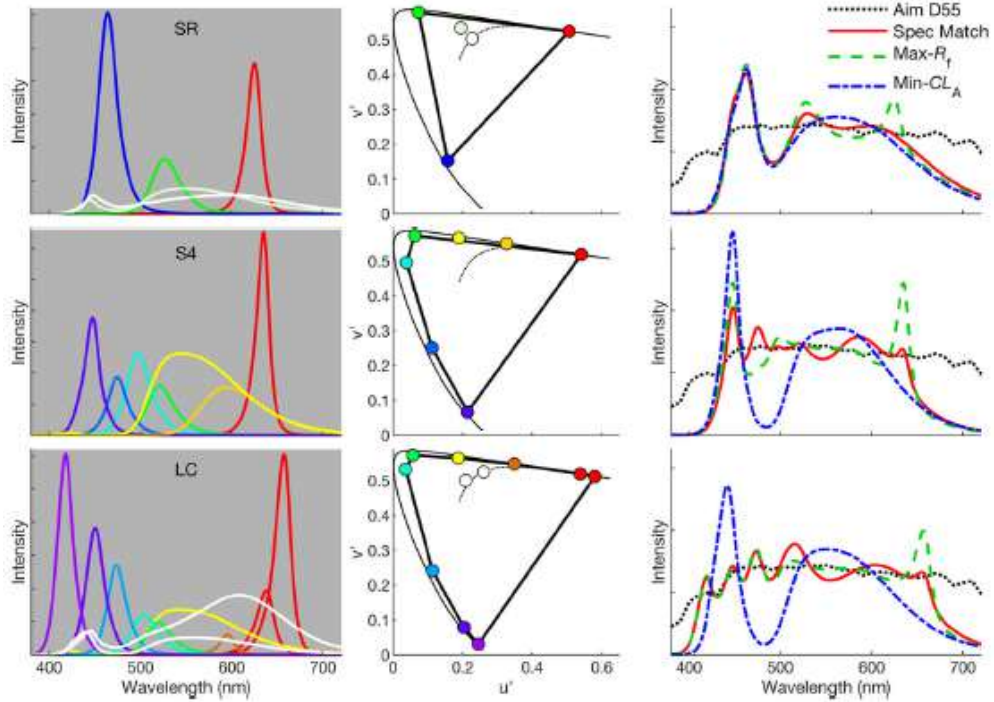
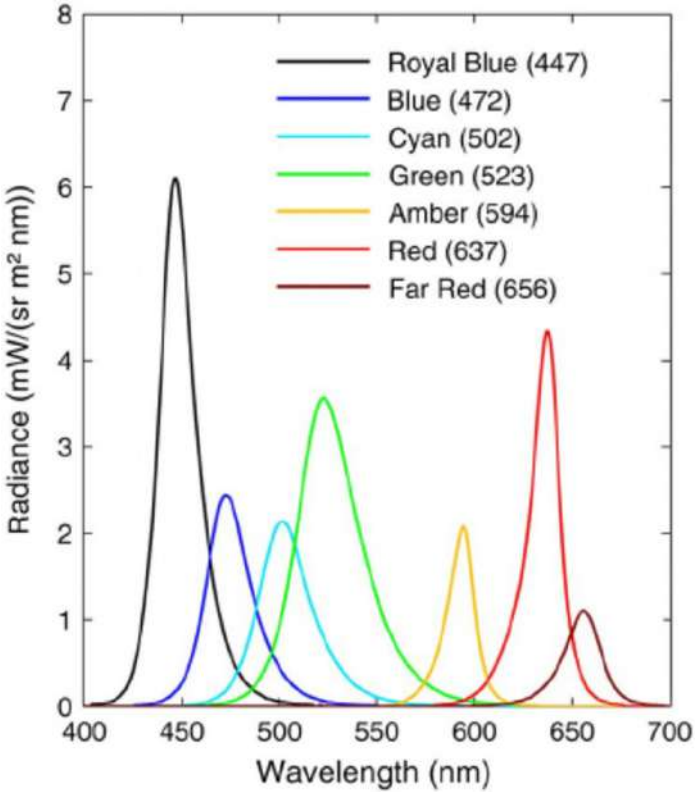
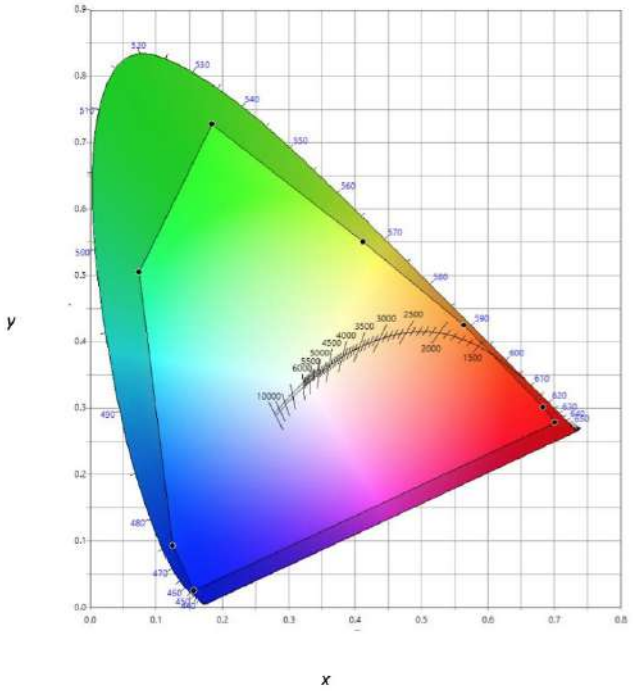
Fixed Color Example at 5500K



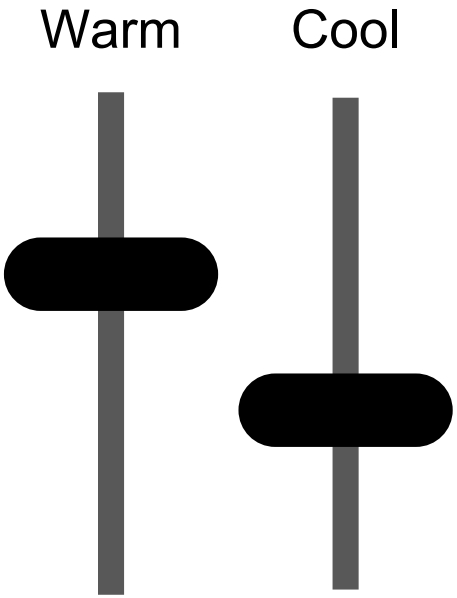
CCT Control Color





Complex Color Control

Variable White Control



CAREFUL!

Variable White Control

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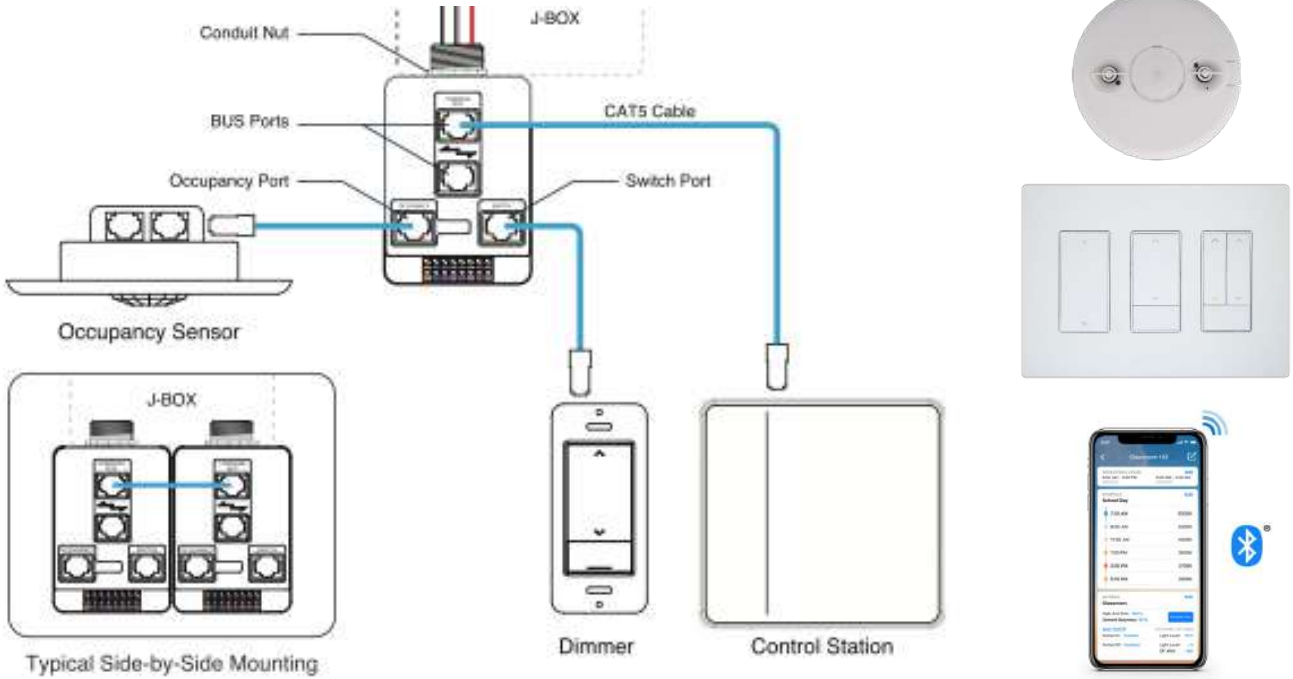
Simplified Variable White Control

Simple Controls

Crossfade
Power Limiting

0-10V
DMX



Let’s work together!

- Who specifies the controls?
- Who monitors the bid for controls?
- Who commissions the controls?
- Who adjusts and maintains the controls?

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Let’s work together!

CONTINUING EDUCATION AIA

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Let’s work together!

- DMX touchscreen control of color temperature
- Each color with a discrete channel
- Not just time of day, but weather and season

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Let’s work together!

- The Lighting Designer was the Controls Designer
- Helped maintain intent
- Followed the controls from schematic to commissioning

Let’s work together!

- The open protocol of DMX allowed flexibility
- Gave the owner complete control
- Provided a platform for customizable controls
- Wider range of fixtures to choose from

Let’s work together!

- Specify a custom user interface
- Client input for functionality during the design

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Let’s work together!

- Met the expectations of the client
- Higher client satisfaction

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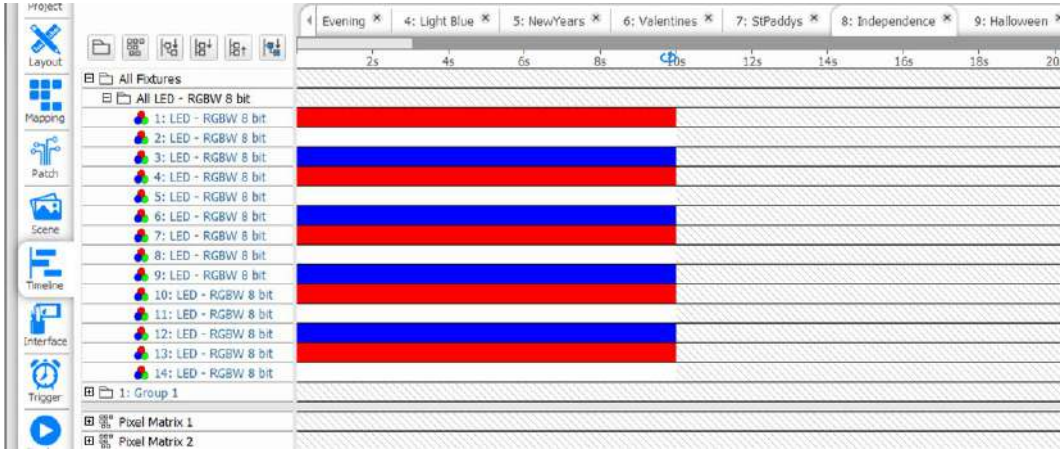
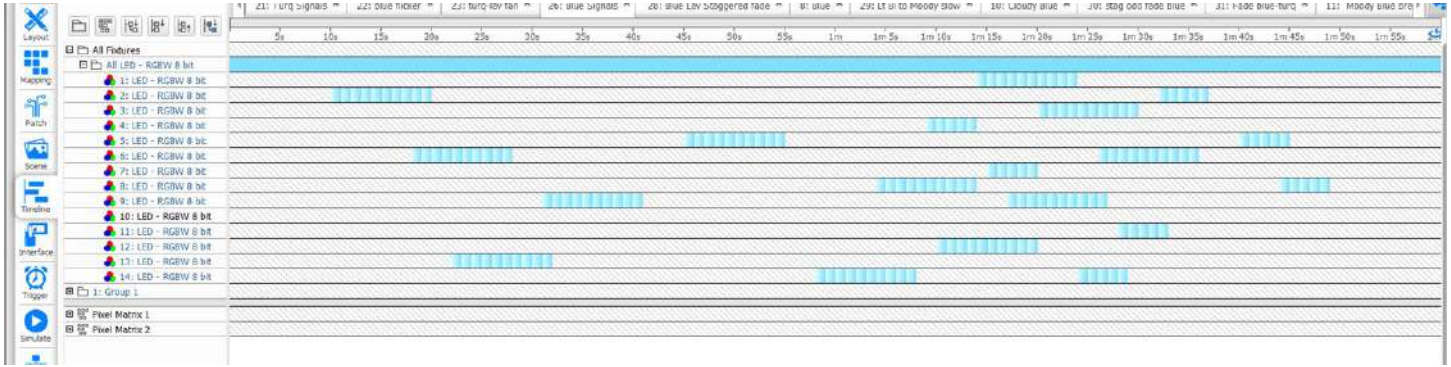
More Choices, More Communication

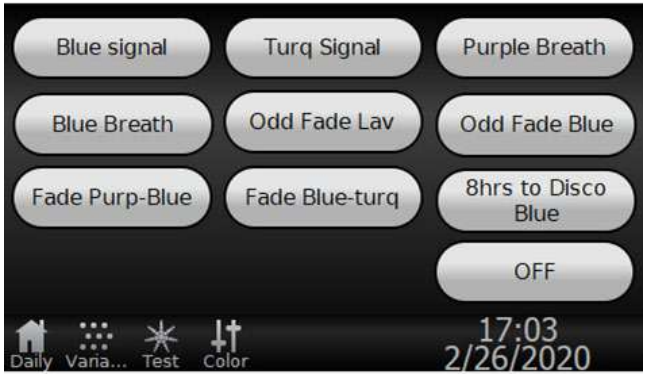
More Choices, More Communication

Initial Direction from the Building Managers



More Choices, More Communication





Alternate control strategies

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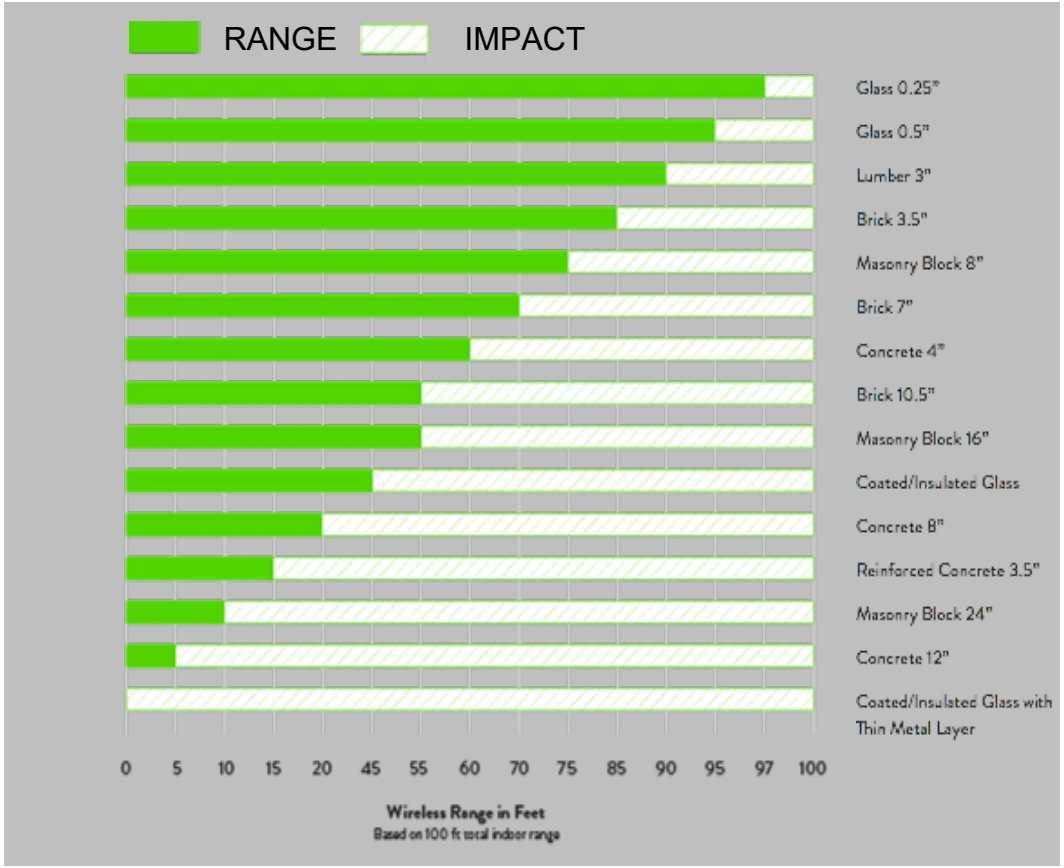
OSI Model	Wi Fi™	Z-WAVE	zigbee	Bluetooth 5.0
Application	Needs Ad-Hoc	Z-Wave	ZLL, ZHA, Other	Bluetooth
Network/Transport	TCP/UDP IP	Z-Wave	ZigBee	Bluetooth
Physical/Link	IEEE 802.11x	Z-Wave	IEEE 802.15.4	Bluetooth
Topology	Star Topology	Mesh Source	Mesh Destination	Mesh Mapped
Range	50 FT	4 hops, 50M each	10-20M	100M Line of Sight
Scalability	Can link hubs	232 nodes	65,000 nodes	Can link clusters
Interoperability	Needs Ad-Hoc	Strong, Backwards compatible.	ZLL, ZHA, Proprietary ZigBee 3.0 will consolidate	Nodes need mapping
Latency	Very Little	High	4 ms	0.4 ms
Bandwidth	100 Mbps+	9-40 Kbps	250 Kbps	2 Mbps
Power Consumed	Power-hungry	Very Low	Low	Very Low
Installation Base	PCs and Phones	35M, Smart Home	Commercial	PCs and Phones
Beacon				Proximity Sensing

Wireless lighting control will be come ubiquitous with the expectation that the LIghting Designer will know how to use this tool and train the user.

Wireless Range Through Building Materials



Slide graphics and info courtesy of RAB Lighting

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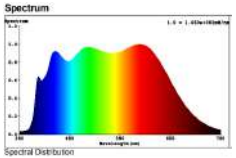
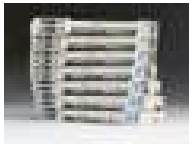
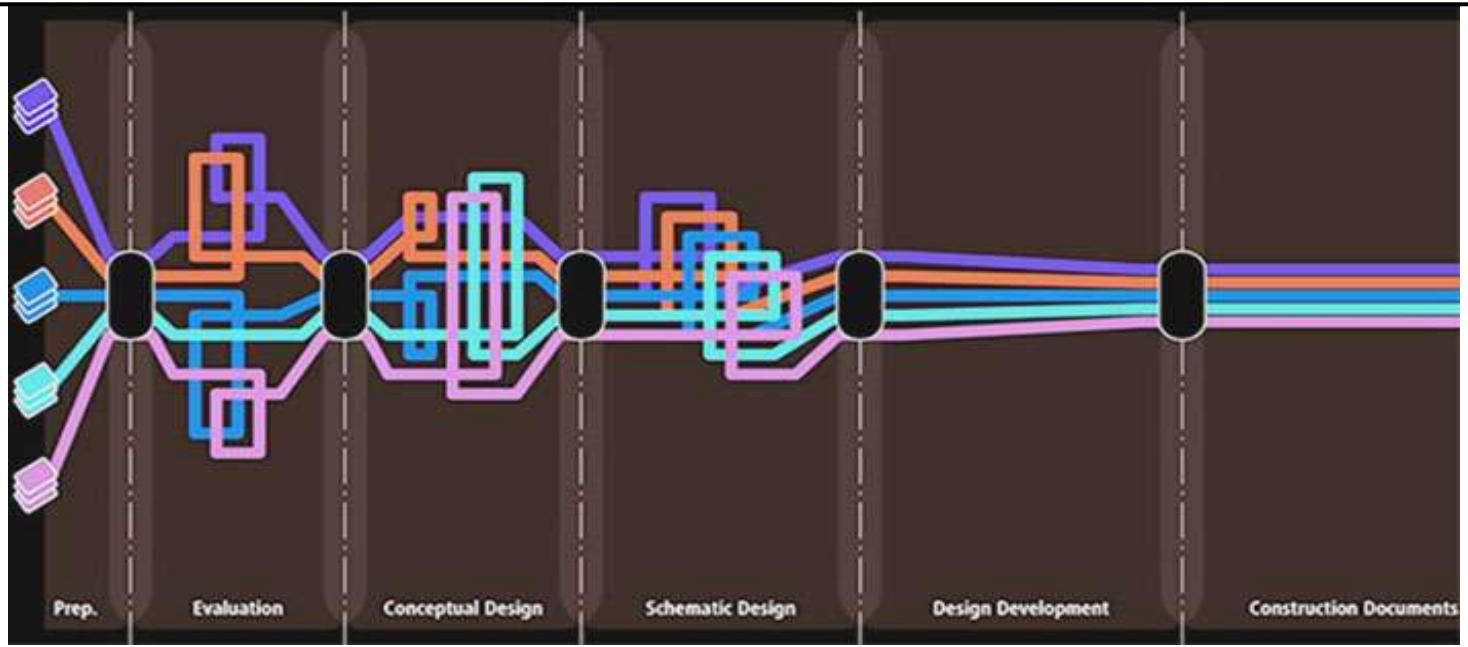
			
Tunable White	Full Spectrum LED	Chip Scale Package	0-10V to DMX to 0-10V
			
Miniature Sensors	Power Over Ethernet	Driver On Board	In-luminaire Inverter
			
Internet of Things	Human Centric Lighting	Wireless Mesh	Microwave sensors

Specify with Intent

- Owner
- Architect
- Engineer
- Lighting Designer
- Contractor



http://www.en3online.com/2017/11/09/integrated-design-and-sustainable-spaces/

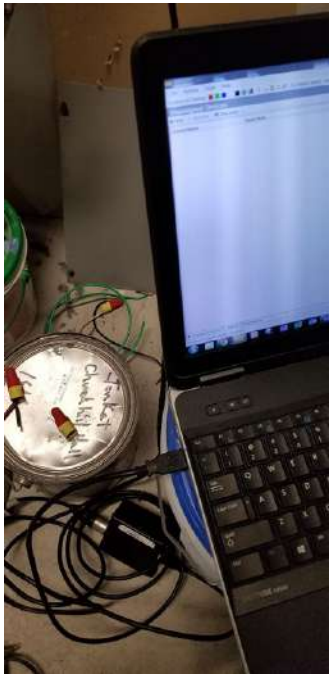
Specify with Intent

- Owner requested a system, not designed by the new designer
- System was a complex digital track lighting system
- Required 3 manufacturers

Specify with Intent

- Contractor cancelled commissioning of one Manufacturer
- Half the system was commissioned
- The other half didn't work
- The lighting behaved erratically

Specify with Intent



- System intent was unclear
- Integration needs were unclear
- Contractor was unclear
- Manufacturer was unclear

- Solution: Contact all three Manufacturers and coordinate a second commissioning visit

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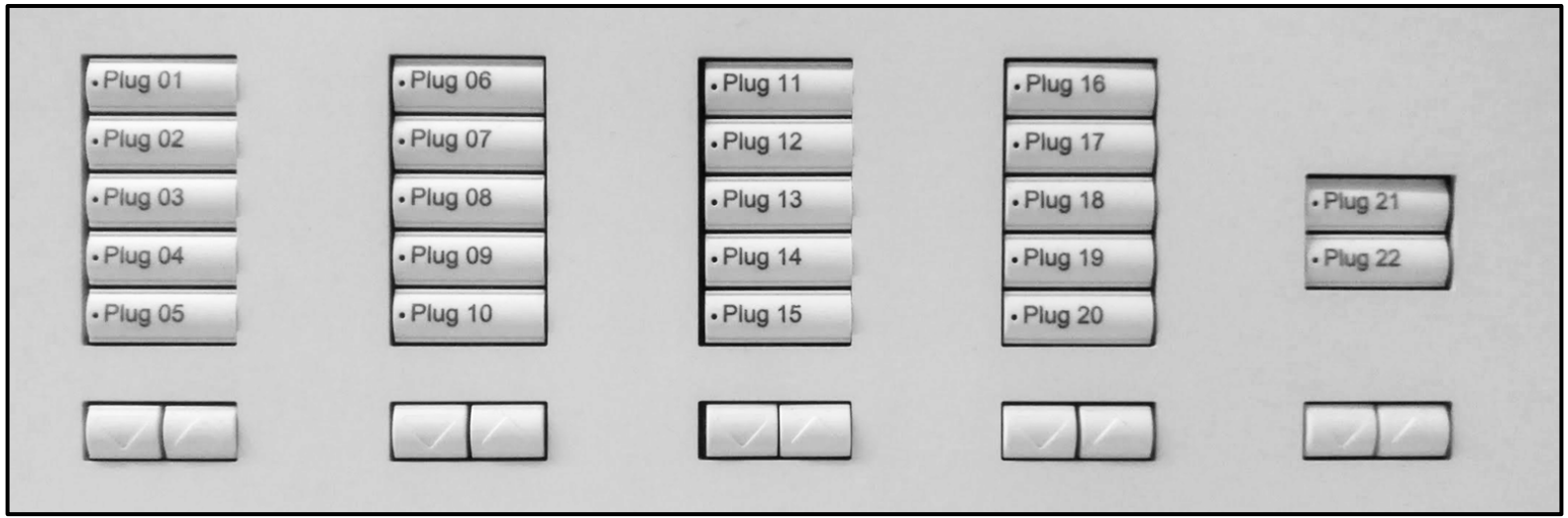
Finish Strong

Finish Strong



Finish Strong

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“No amount of skillful invention can replace the essential element of imagination.”
Edward Hopper

This concludes “Lighting Control - by Others”
The American Institute of Architects Continuing Education Systems Course

Questions & Answers

Moderator:
Carl Camenisch - CC&A International

Panelists:
Chuck Cameron - Stan Deutsch Associates | New York School of Interior Design
Gary Dulanski - The Dulanski Group
Shaun Fillion - New York School of Interior Design | RAB Lighting
C. Webster Marsh - Horton Lees Brogden Lighting Design
Paula Martinez Nobles - Fisher Marantz Stone