



Fun!! w/ Lighting Controls

Avraham Mor, IALD, LEED AP, MIES

Partner, Lightswitch Architectural



Avraham Mendall Mor, IALD, LEED AP, MIES



- Graduate of the University of Kansas.
- Lightswitch since 2004, Partner 2009
- Past experience as a project manager for specialty distributor
- Been a Lighting Designer for 10+ years
- One of the youngest designers to become a professional member of the IALD
- Spoken around the country about LEDs and Lighting Design 20+ times



- Multidisciplinary Lighting & Visual Design Practice
- Serving a diverse range of clients since 1993
- Large Team of Designers, Associates, and Support Staff
- Wide Coverage
 - Chicago
 - New York
 - San Francisco
 - Los Angeles
 - Orlando
 - Hong Kong (Fall 2010)



LIGHTSWITCH ARCHITECTURAL™

Two Divisions



- Architecture
- Museums

Hidden Wires



- Entertainment
- Environments
- Events
- Museums

Visible Wires



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Learning Objectives

- Where should lighting controls be used
 - Good Design
 - ASHRAE 90.1
 - LEED
- What to know when specifying lighting controls
- Commissioning





Common Issues

- “It costs too much”
- Too many components
- “Black Box” syndrome
- Lack of information from the manufactures
- Uneducated installers
- Complicated specification requirements
- Dreadful drawings/specifications





Where should we be using lighting controls?





ASHRAE 90.1-2004

- 9.4.1.1 – Automatic Shutoff
- 9.4.1.2 – Space Control
- 9.4.1.3 – Exterior Lighting Control
- 9.4.1.4 – Additional Control





LEED-NC 2.2

- EA-P1 – Commissioning
- EA-P2 – Minimum Energy Performance
- EA-1 – Optimize Energy Performance
- EA-3 – Enhanced Commissioning
- EA-5 – Measurement & Verification
- EQ-6.1 – Controllability of Systems: Lighting
- EQ-6.2 – Controllability of Systems:
Thermal Comfort
- ID – Innovation in Design



Control System Flow

- » Source
- » Source Interface
- » Power System
- » Controller
- » User Interface
- » Commissioning





Types of Control

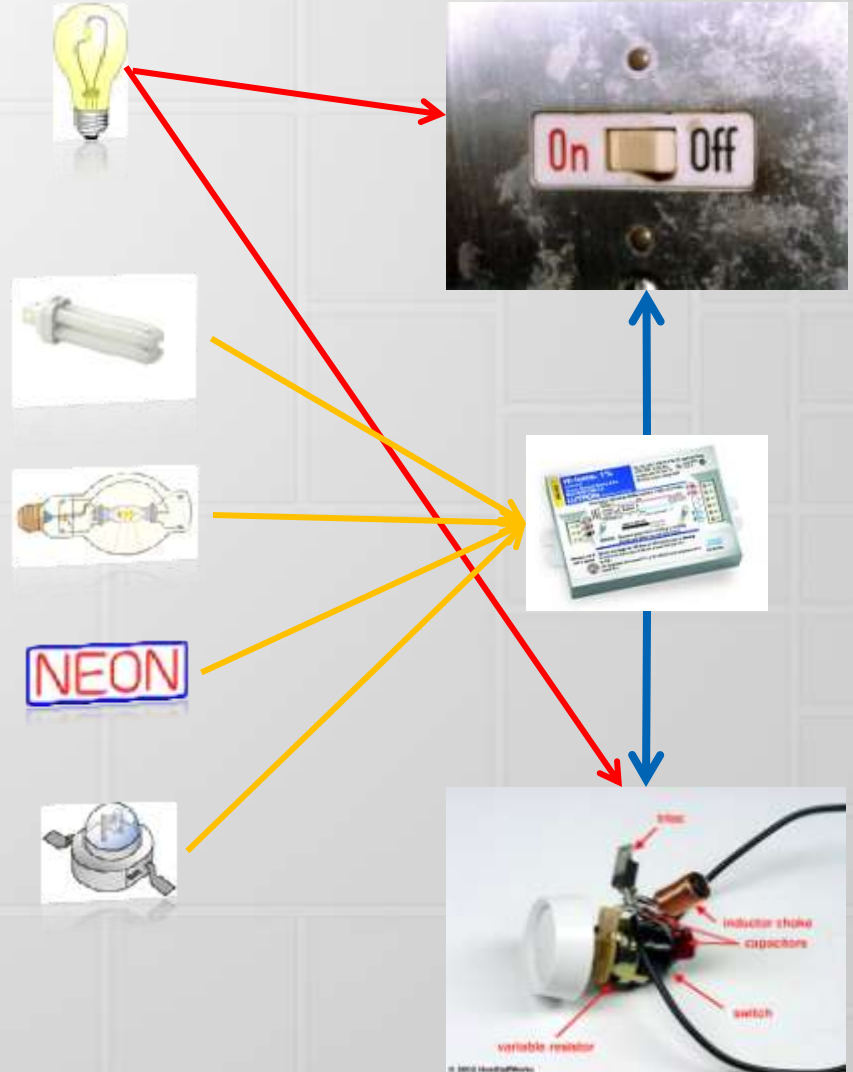
- Switching
 - Manual
 - Relay
- Dimming
 - Line Voltage
 - Low Voltage (Transformers)
 - Ballasts & Drivers





Sources

- Incandescent
- Fluorescent
- Arc Source
- Gas-discharge
- Light emitting diodes (LEDs)





Source Interfaces

- Transformers
 - Electronic
 - Magnetic
- Ballasts & Drivers
 - 120v Control (2-wire)
 - Phase Control (3-wire)
 - 0-10v Control + Relay
 - DALI





DALI

- Digital Addressable Lighting Interface
- Source interface is the dimmer or switch
- Reduced failure points
- Less installation costs
- Little wasted capacity
- DALI with proprietary features
 - ROVR
 - EcoSystem
 - Simply5





Power Systems



- Local (wall box)
- Central & Distributed Panels
- Hybrid



Local “Wall Box”

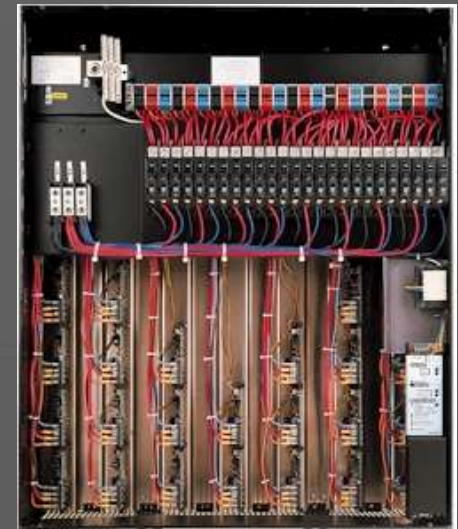
- Expensive control
- Plenty of terminations
- Wall Gack
- “Scenes” not always the same
- Great for retrofit
- Difficult for large loads





Central & Distributed

- Panels typically wire to 120/208 3-phase power
- Only switching, only dimming, or combo panels
- Wasted capacity?
- Location & Access
- One point of heat
- Can load types be changed onsite?
- Separate EM panels typically required
- Long runs of wire, voltage drop
- One point of failure





Shades

- Automated vs. Manual
- Low Voltage vs. Line Voltage
- Controls
- Fabric Choices
- Light Seal
- Who's specifying them?





Controller - Automated

- Almost no user interaction
 - Stations still required per ASHRAE
- Maximum building control
- Sophisticated control intent required in specifications
- Master control of all or separate systems
 - Look of this on a building
- Modifications to programming



Controller - Manual

- Effect on the look of the building
- Not so sustainable
- Easier to specify (typically 1:1 relationship)
- Less costly
- Daylight savings time???
- Almost a “lack” of control





User Interfaces

- Sensors
- Preset
- Fader
- Digital
- Analog
- Wireless
- Desktop
- Hybrid





User Interface - Sensors

- Scheduling
 - Predictable
 - Unpredictable
- Task Tuning
- Lumen Maintenance
- Daylight Harvesting
- Load Shed/Demand Reductions



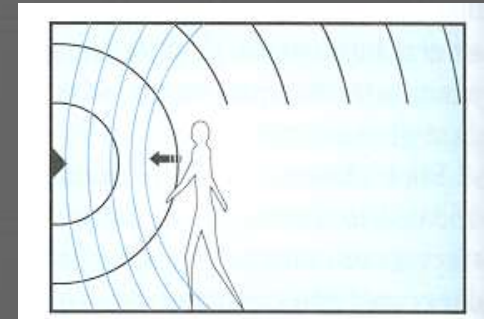


Occupancy Sensors

- Two Main Technologies:

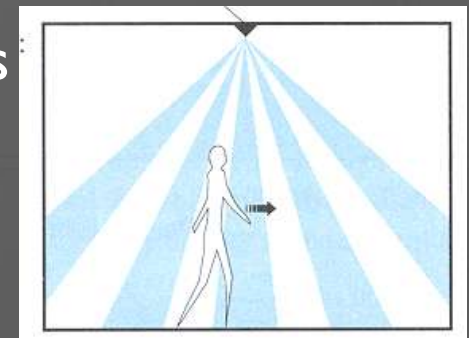
1. Ultrasonic

- Receives the reflected signal
- Detect motion through a shift in frequency
- Good at detecting small movements
- Can detect movement behind partitions



2. Passive Infrared

- Detects movement of heat source across
- Requires line-of-sight
- Good for large motions
(walking or fork lifts)





Sensors – Keep In Mind

- What is the end goal?
- What is the sensor looking at?
- What does it look like?
- False reaction
- Connection to the system “*Black Box*”
- Commissioning!!!

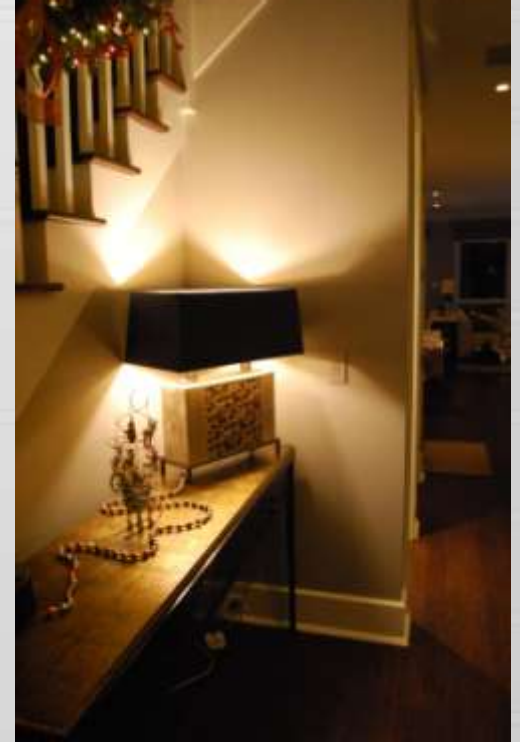


Black Box Envy

- DMX
- Sensor Power
- 0-10v Interface
- 3-wire ballast
- Power Booster
- DALI Interface
- BMS Interface
- Low Voltage Dim Interface
- EM Interface
- RS-232 Send/Receive
- Contact Closure
- Station Interface
- Control Interface
- Ethernet Interface
- LED Interface
- Protocol Converters



Honore Residence





A Conference Room

L-23 – 2-32w CFL

Downlight

L-25 – 32w CFL

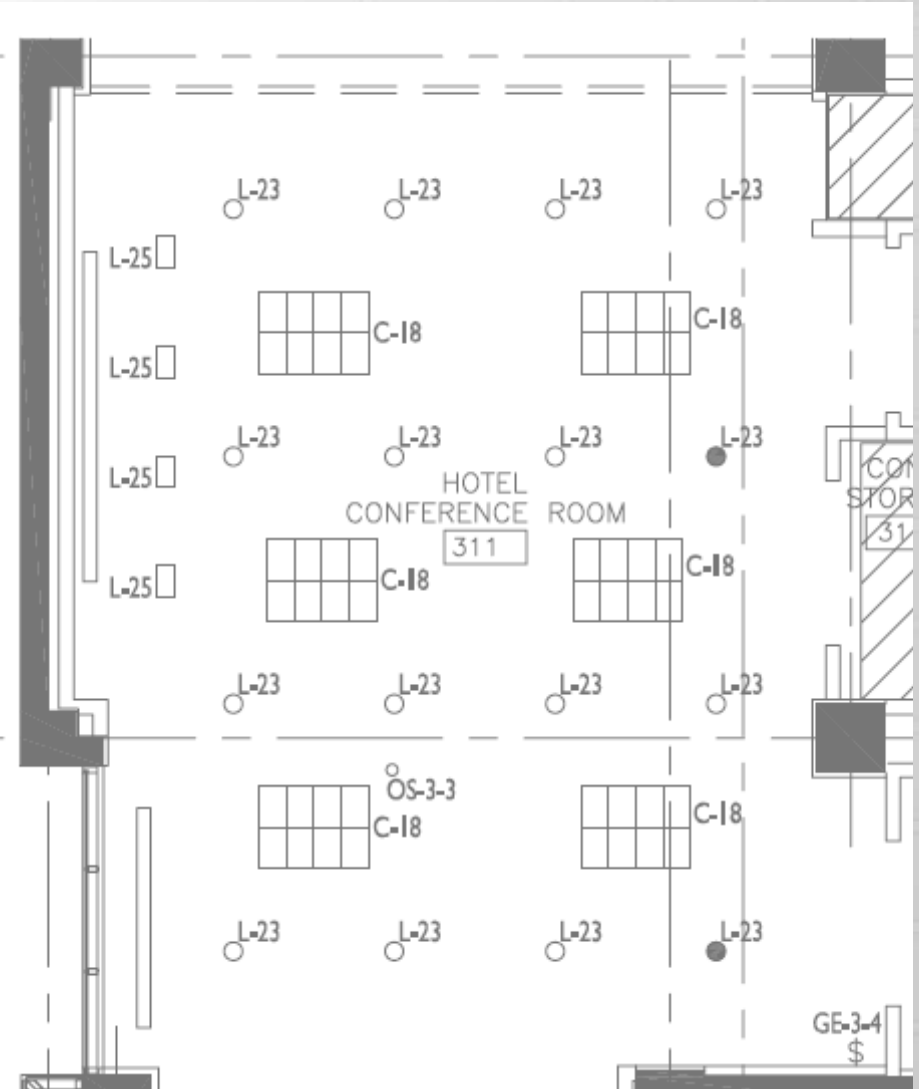
Wall Washer

C-18 – 4-32w T8

Pendant

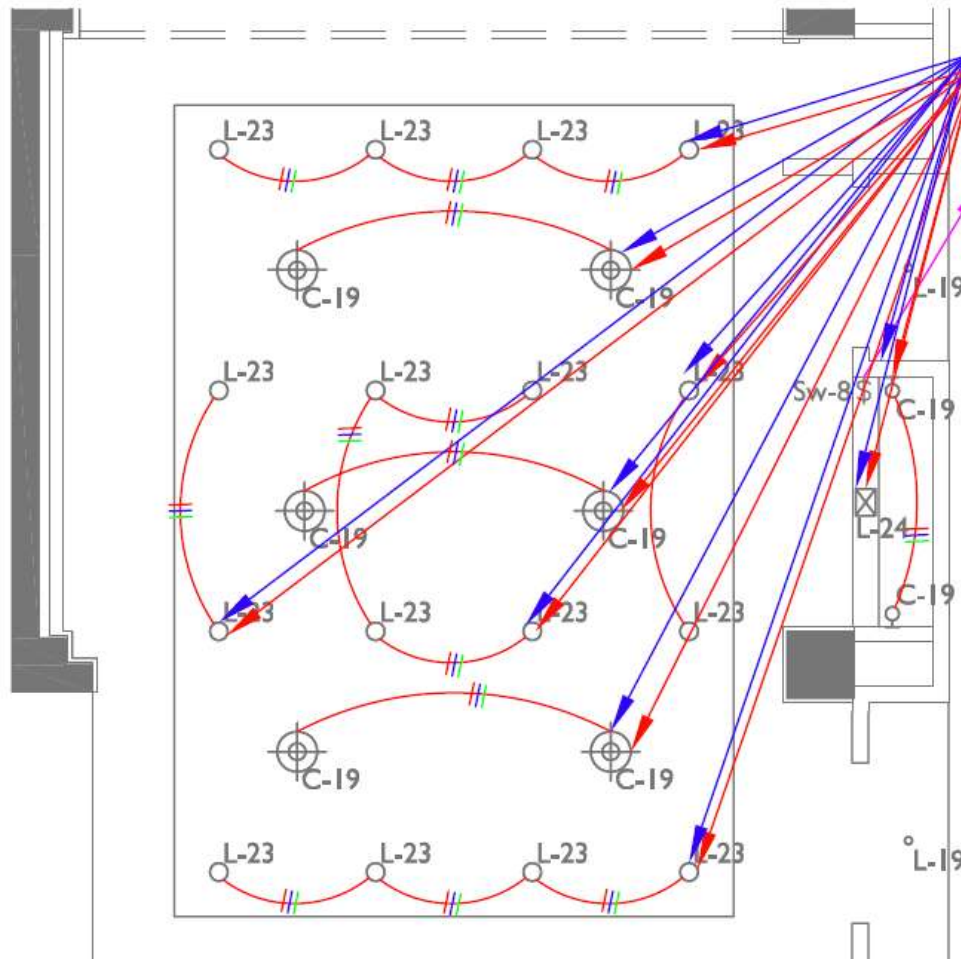
OS – Occupant Sensor

GE/SW – User Control





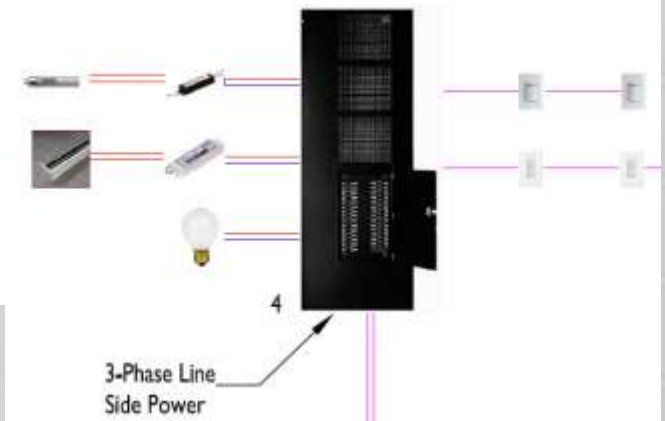
Traditional Dimming



To Dimmer Rack
8-Hot
8-Neutral

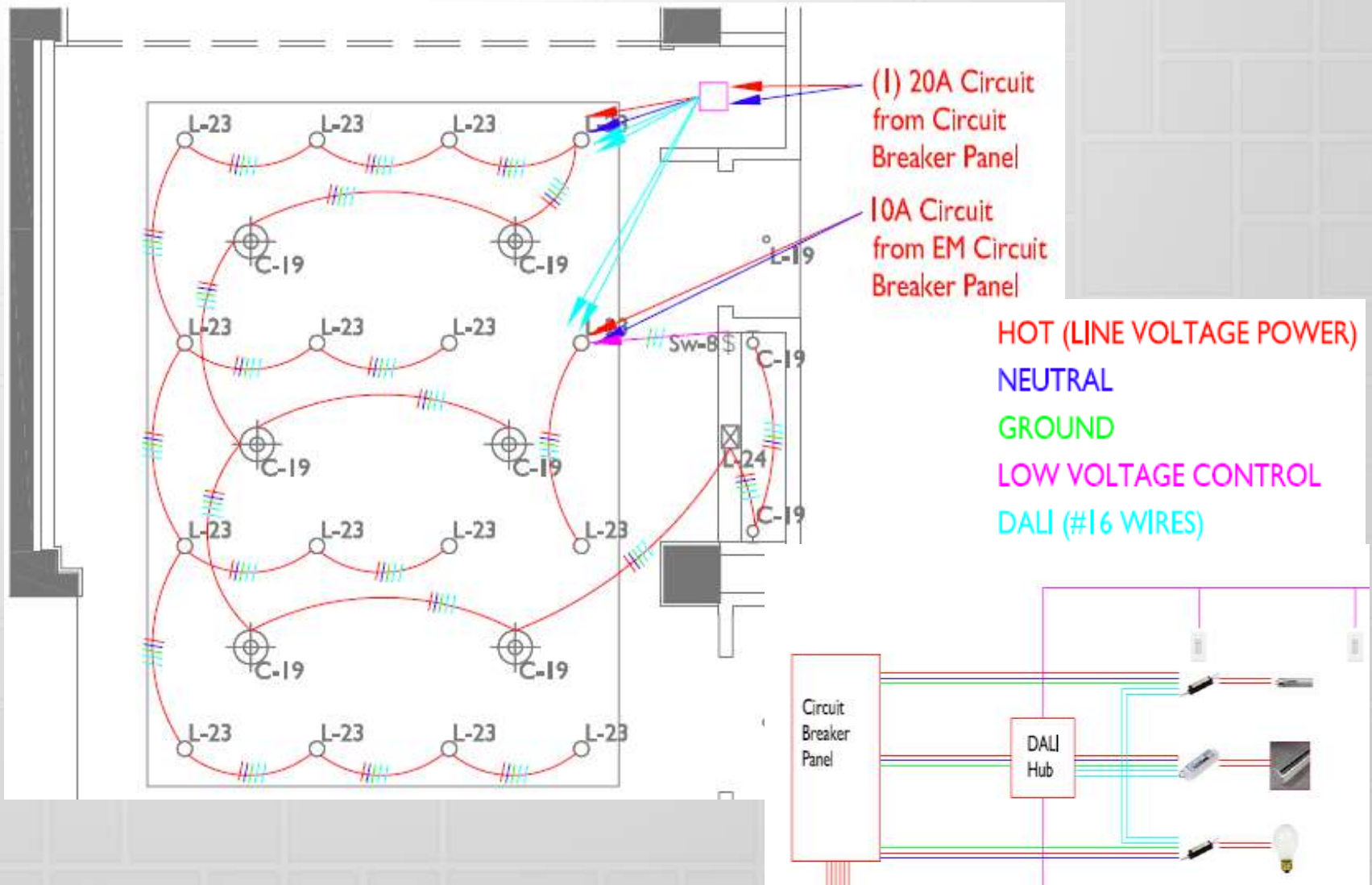
Low Voltage Control
Wire to Next station
or Dimmer Rack

HOT (LINE VOLTAGE POWER)
NEUTRAL
GROUND
LOW VOLTAGE CONTROL
DALI (#16 WIRES)



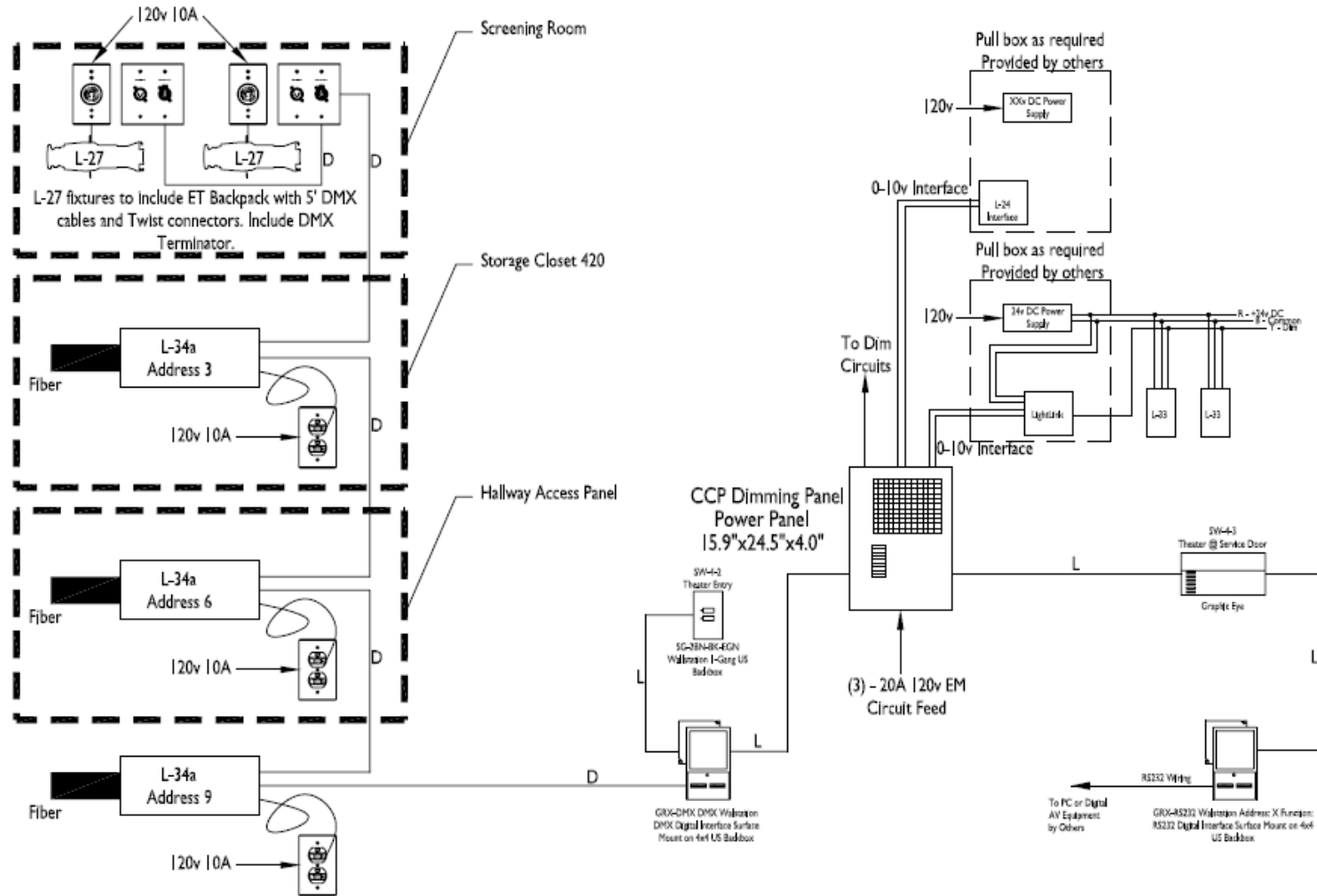


Integrated Dimming





theWit Hotel



4th Floor Theater Single Line (Storage 417)

N.T.S.



Morse Theater Offices

- **Control Intent:**
 - **General Office:** One level of ambient illumination will produce one preset light level in the office. A lower ambient light level will produce a preset light level of greater illumination in the space. There will be additional on/off control from a local button station.
 - **Exterior:** When daylight illumination drops below a determined light level within a certain time of day associated with an astronomical time-clock, exterior lighting will switch on.
 - **Restrooms:** Inoccupancy of the space will produce one preset light level. A person entering the space will produce a preset light level of greater illumination in the space. After a determined time period of no occupancy, light level will return to the original preset level.



Commissioning

- Commissioning is different from System Turn-on
- It works vs. it functions
- Long term benefits
- HVAC uses VAV controls for small areas; the lighting should match
- Linking lighting and HVAC is a sensible approach since they are functionally linked
- User controls at workstation
- System feedback to owner
- Future Modifications as Client's needs change



Quiz Time...

- Why do we use Lighting Controls?
- What are some specification issues?
- Where are we required to use them?





Avraham M. Mor, IALD,
LEED AP, IESNA
Partner , Lightswitch Architectural

amor@lightswitch.net
312.288.8777 x101

architecture.lightswitch.net
avisblog.architecture.lightswitch.net

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