

Designers Lighting Forum

Emergency Lighting is Not One-Size-Fits-All –
How to Design and Deploy Emergency Lighting
for Each Project

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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 this course, participants will:

1. Be familiar with updated UL 924-requirements – emergency lighting must actively monitor normal power to ensure emergency lighting is deployed within 10 seconds of power loss.
2. Identify the four primary methods of implementing emergency lighting solutions: Standalone fixtures, general purpose fixture with emergency backup, zone-level ALCR and BCELTS, and centralized control.
3. Understand the emergency system architecture, your options, and how to select the appropriate solution for the application and the desired performance.
4. Recognize each project may have unique requirements that should be identified early in project discussions to optimize the required emergency lighting solution.



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Senior Systems Application Engineer





Agenda

- Emergency Lighting Requirements
 - Codes vs. Standards
 - UL 924 vs. UL 1008
- How to Satisfy the Requirements
- Emergency Systems Architecture
 - Standalone Emergency Fixtures
 - General Purpose Fixture with Emergency Backup
 - Zone Level ALCR and BCELTS (Distributed Sensing)
 - Centralized Emergency Sensing
- Summary



Emergency Lighting Requirements

Codes and Standards



Summary of Emergency Codes



NFPA 70 (NEC)	NFPA 101 & IBC	NFPA 99	NFPA 110
EM systems related to safety of human life	Egress – exit paths	Health Care facilities code	Power equipment
<ul style="list-style-type: none"> Separation of Normal and EM Power EM Power must be available in 10 seconds 	<ul style="list-style-type: none"> Minimum and average light levels Length of time for EM lights Where lights are required 	<ul style="list-style-type: none"> Life safety branch (“EM”) Critical branch (“EM”+ no override) Equipment branch (“Normal”) 	<ul style="list-style-type: none"> Eg. backup generators, transfer equipment Where is the power coming from, and how is it getting there



Building Codes vs. Product Standards



- NFPA 70, 99, 101, 110, and IBC all apply to building requirements, not products
- Products may need to meet UL standards if the project spec calls for it; building codes may also cite specific UL standards

- What is UL?



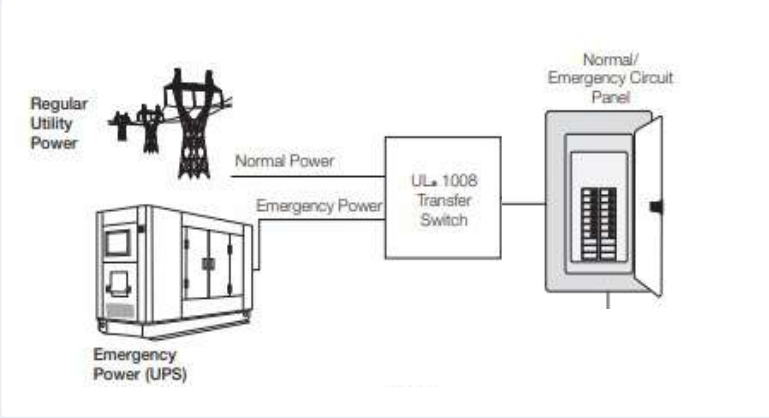
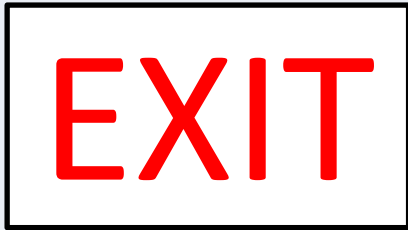

- Develops standards that guide safety, performance and sustainability of products and services worldwide
 - Other standards may exist in different regions
 - Can conduct testing, verification, certification, and training against those standards
- Does UL have to do the testing?
 - No. An NRTL – Nationally Recognized Testing Lab (such as Intertek) – can test to UL standards





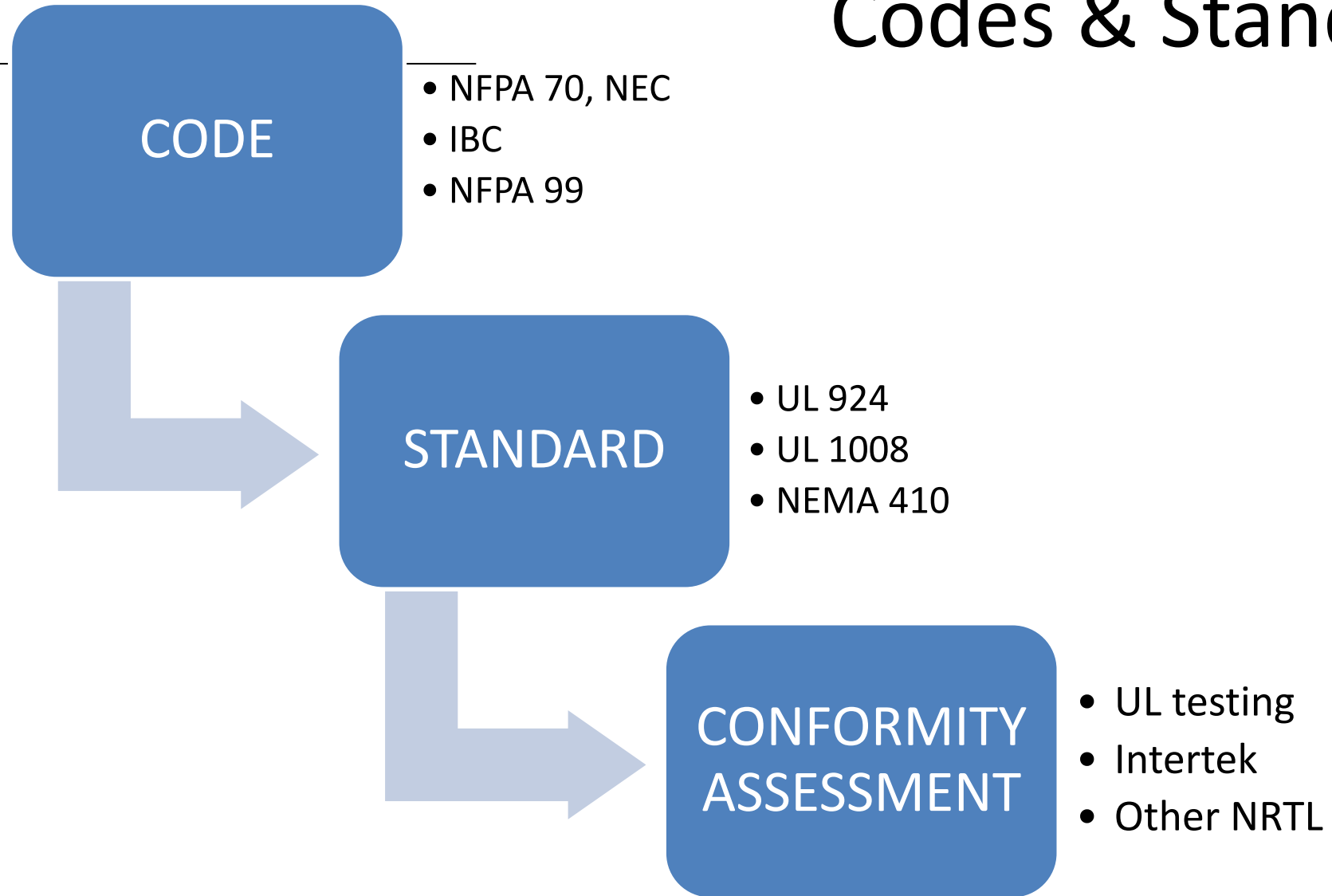
UL 1008 vs UL 924



UL 1008	UL 924
Transfer switch equipment	Devices downstream of the transfer equipment that are part of the emergency lighting system
<p>Switches feed power between “normal” and “emergency” sources</p> 	<p>EXIT signs, battery backup fixtures, and automatic load control relays (ALCRs)</p>  

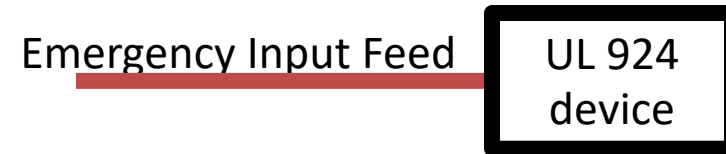


Relationship Between Codes & Standards



UL 924 Changed!

- Prior to April 2022
 - A loss of normal power could be implied by a brief interruption of the normal power to a device.
- After April 2022
 - Normal power must be explicitly sensed at each device that is UL 924 listed; cannot be “assumed” by power interruption.



EM Requirements in Action

ALCR Device Demo



Emergency Demonstration

How to Satisfy the Requirements

Options for Emergency Lighting



-
- Despite all these codes and standards, the approval of an emergency system falls to the inspector or Authority Having Jurisdiction (AHJ)
 - They could have requirements that are above and beyond the code!
 - Electrical Engineers are the people who should be designing Emergency Lighting Systems.



Emergency System Architecture



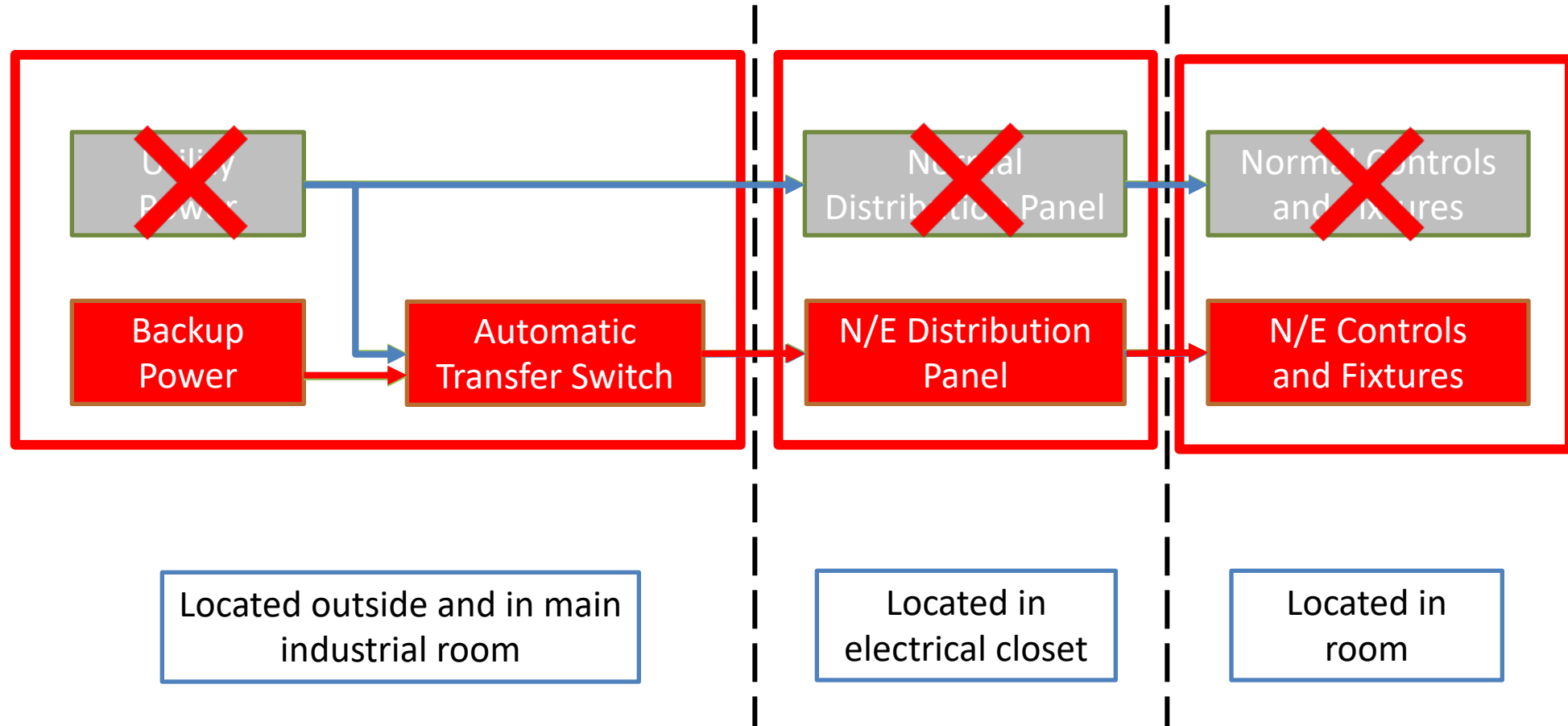
Emergency Backup Power

Two general ways that backup power is provided:

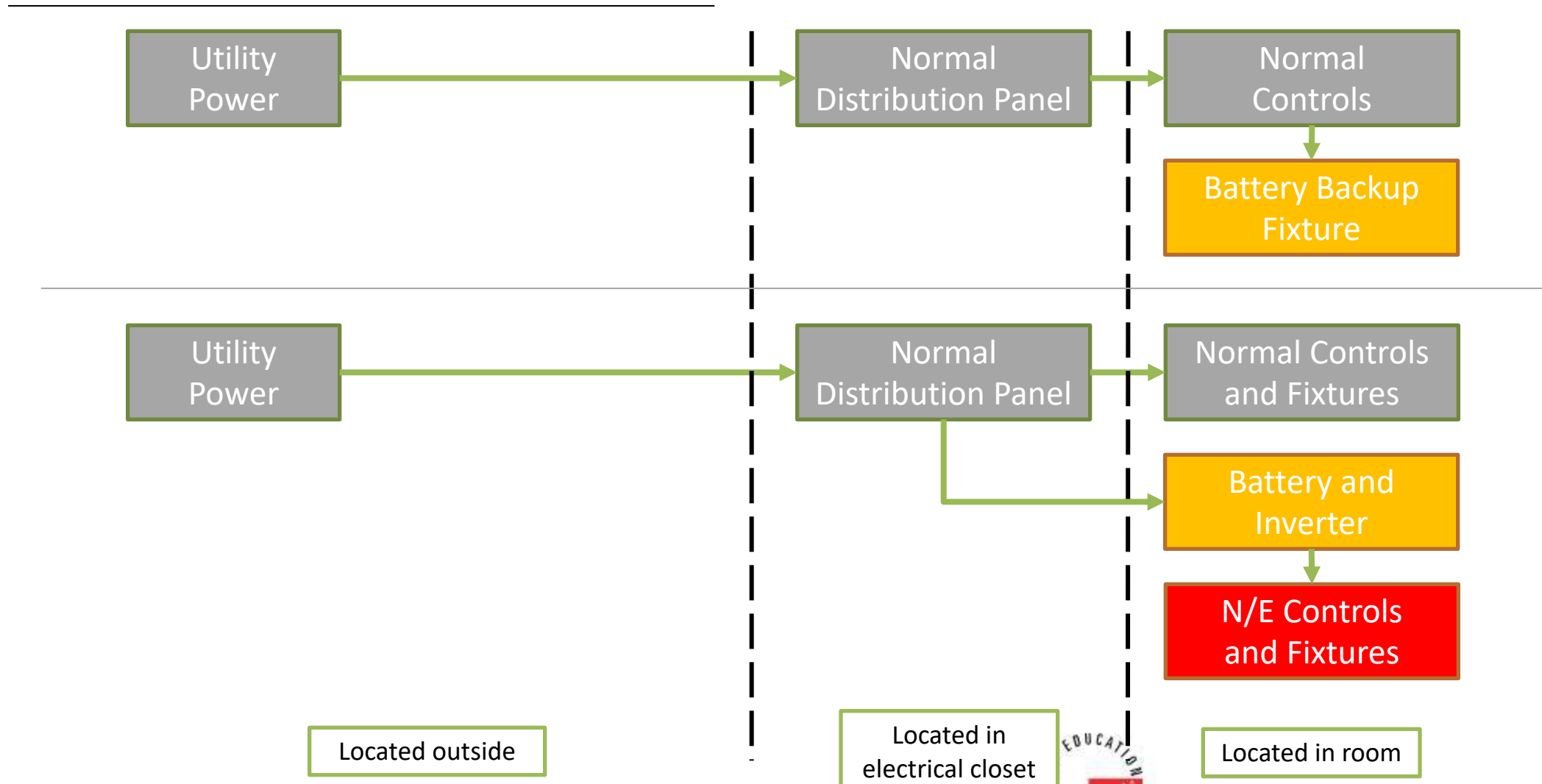
- Centralized backup source
 - Generators or battery bank with inverter
 - Harder to retrofit but can be easier to maintain
- Distributed backup source
 - Small batteries and inverters located in fixture or room
 - Easier to retrofit but harder to maintain



Emergency Backup Power — Centralized



Emergency Backup Power — Distributed



Standalone Emergency Fixtures

24/7 Lighting Fixtures

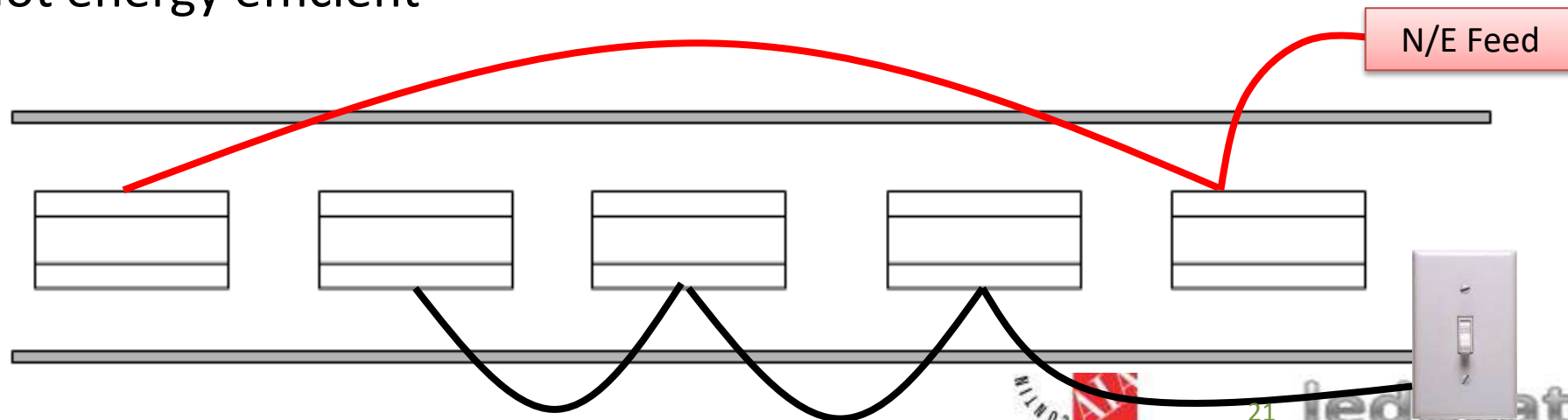
EM Only Fixtures

Battery Backup Fixtures



Emergency fixtures are always turned on (for example, every 4th fixture is on 24/7 for dedicated emergency lighting)

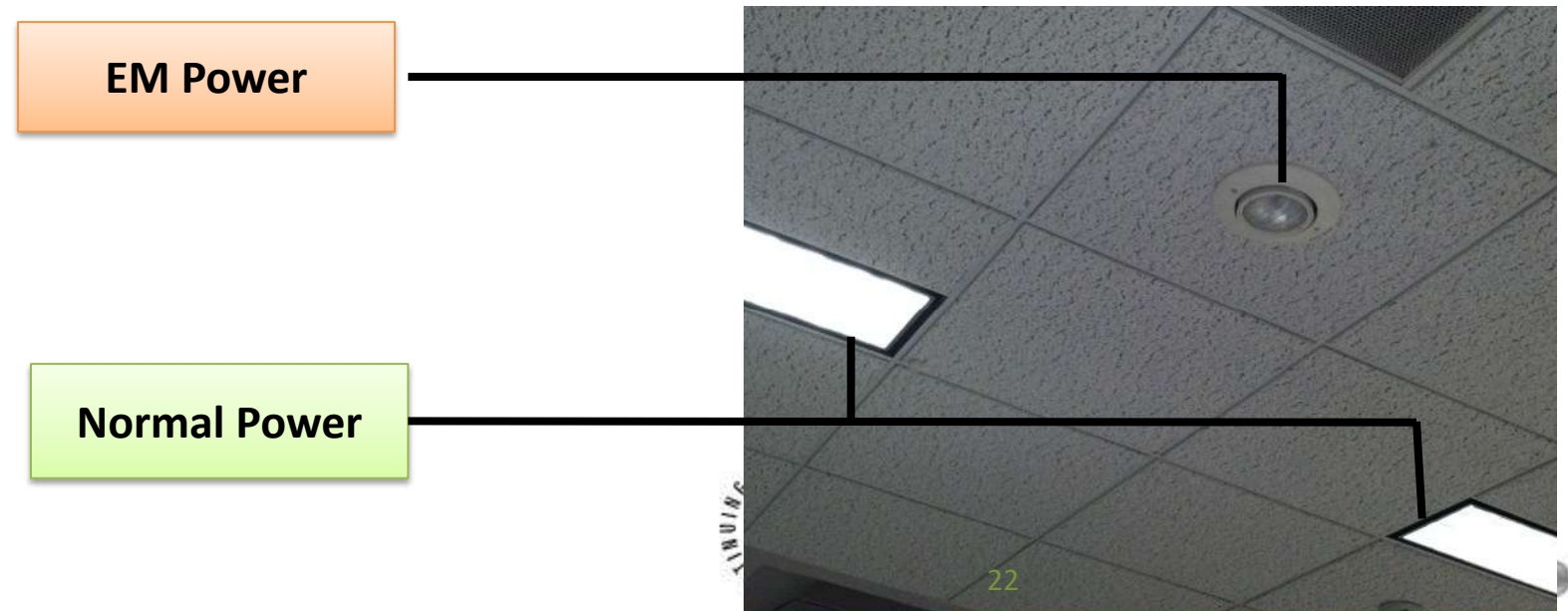
- Drawbacks:
 - No local control for fixtures
 - Poor aesthetics and light uniformity
 - Not energy efficient



EM Lighting Only – EM Only Fixtures

Fixture only illuminates when normal power is **lost**, and emergency backup is switched on

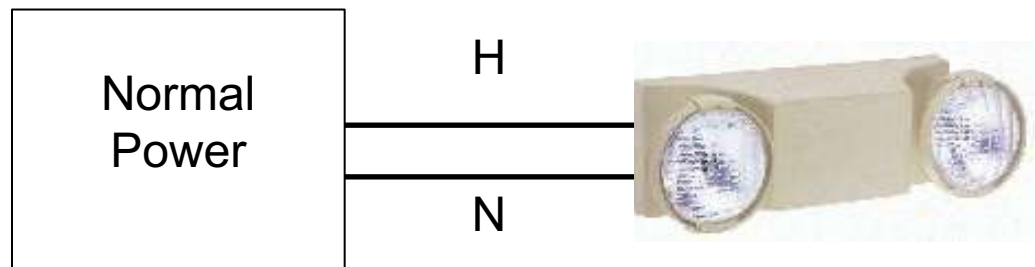
- Drawbacks:
 - No local control for fixtures
 - Poor aesthetics



EM Lighting Only – Battery Backup Fixtures

Fixture contains a battery that charges when normal power is present. When normal power is lost, the fixture runs on stored battery power.

- Drawbacks:
 - No local control of fixture
 - Poor aesthetics
 - Fixture (battery) maintenance



General Purpose Fixture with Emergency Backup

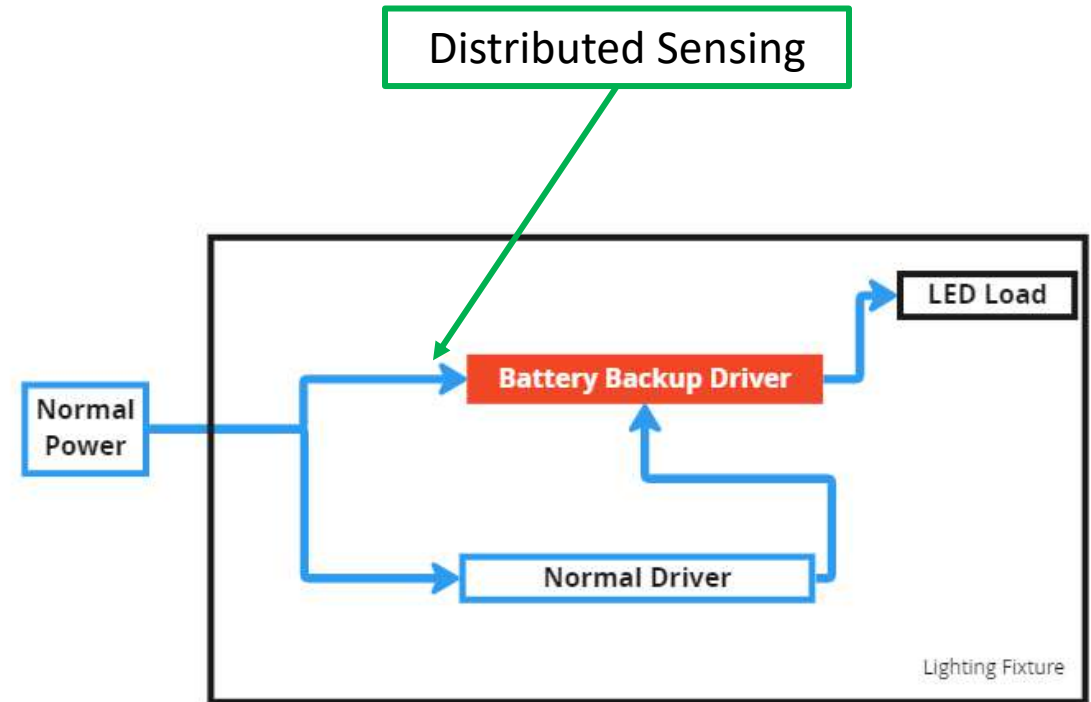
Emergency Drivers



Distributed Power, Distributed Sensing

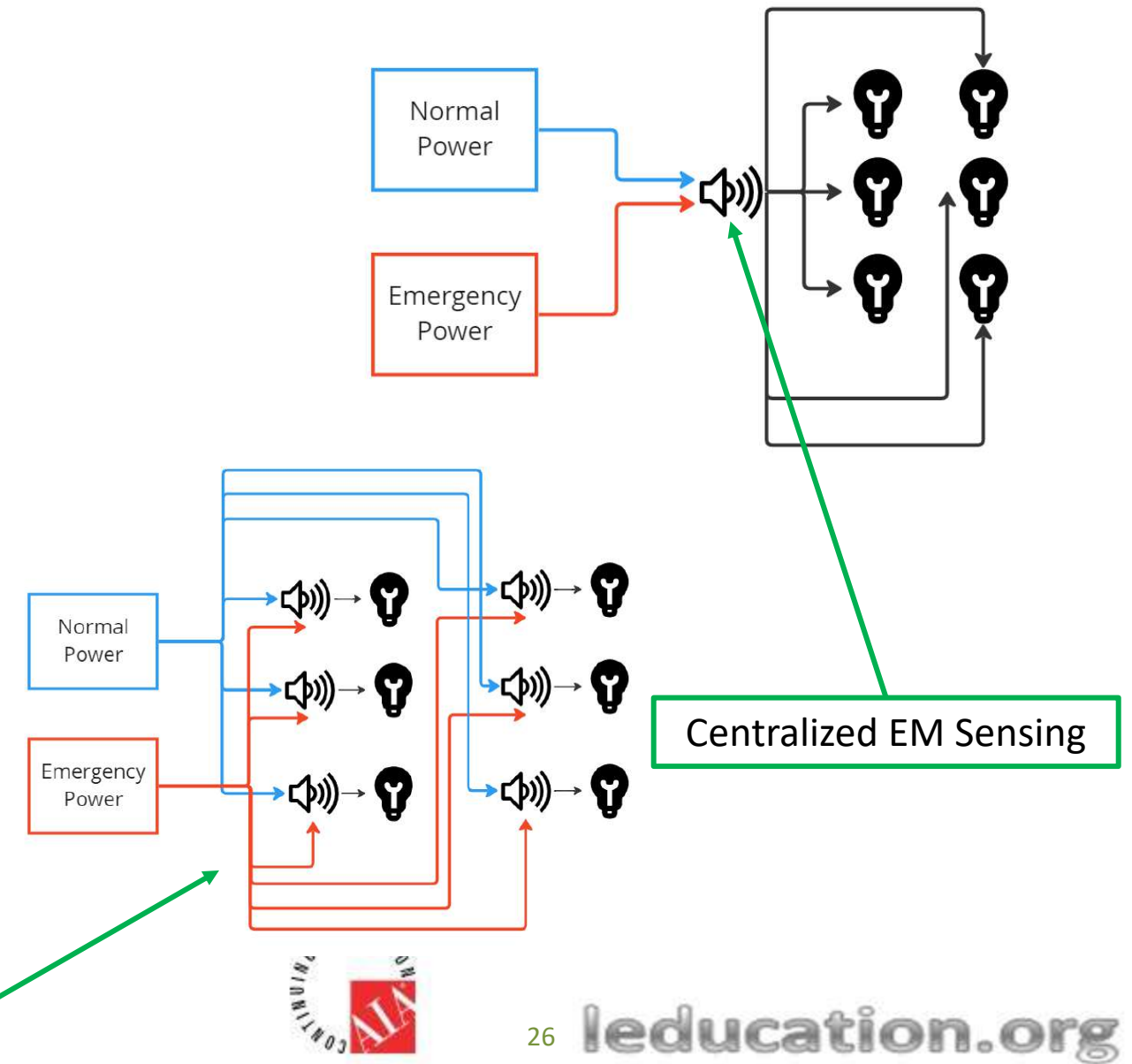
Emergency Drivers

- Similar to “bug eye” fixtures, but allow for normal control of an emergency fixture
- Convenient for retrofit or when EM power is not available
- Models available for many LED drivers, regardless of control type (switching, 2-wire, digital, 0-10V, etc.)



Centralized vs. Distributed Sensing

- Centralized
 - One device senses loss of normal power and provides a loss of power signal (low voltage wiring, wireless, or already existing wires) to multiple devices
 - May minimize installation complexity
- Distributed
 - Each control has a device that senses loss of normal power
 - Normal line voltage must be run to each “sensing” device



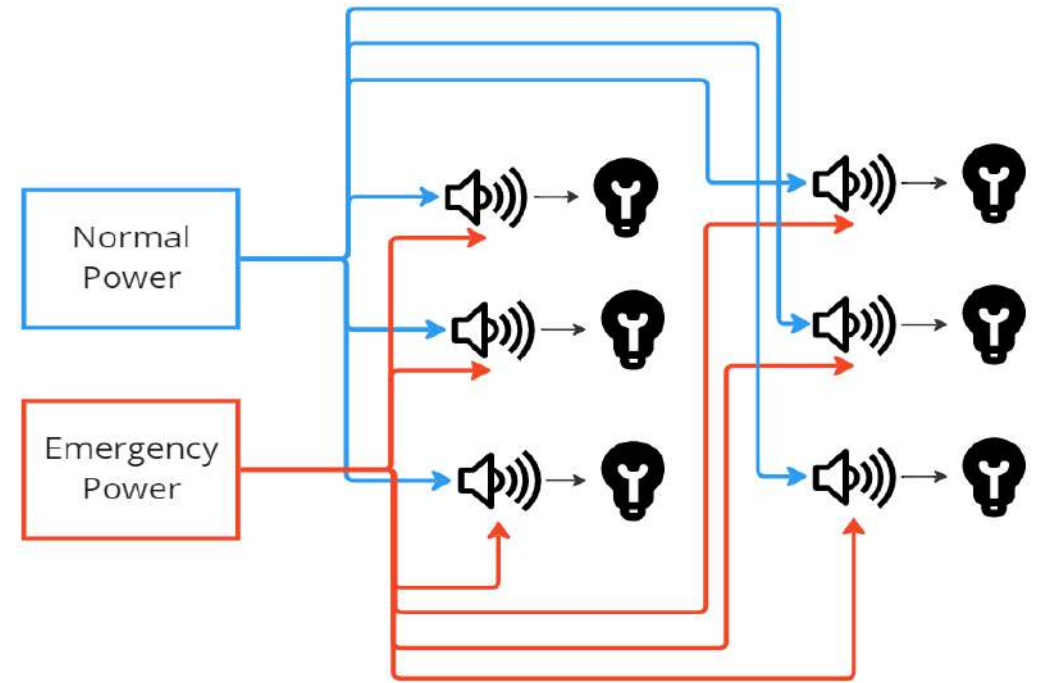
Distributed EM Sensing

Centralized EM Sensing

Zone Level ALCR and BCELTS (Distributed Sensing)

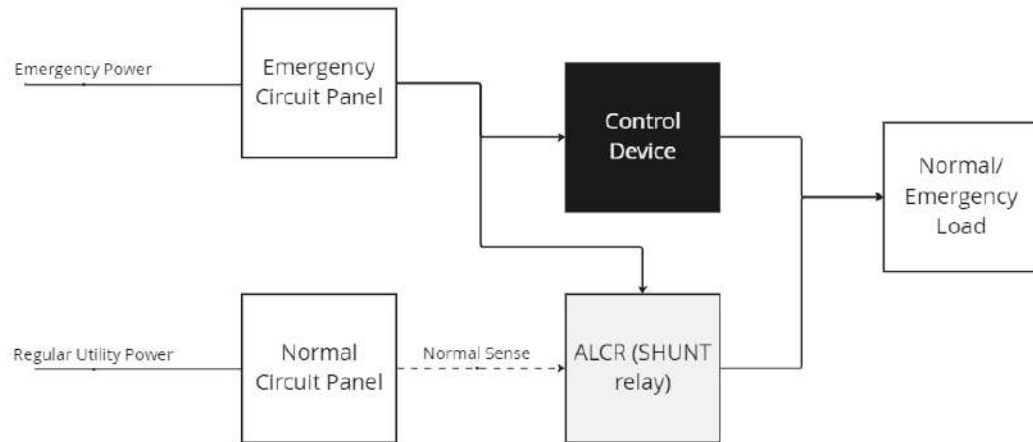
ALCR = Automatic Load Control Relay

BCELTS = Branch Circuit Emergency Lighting Transfer Switch

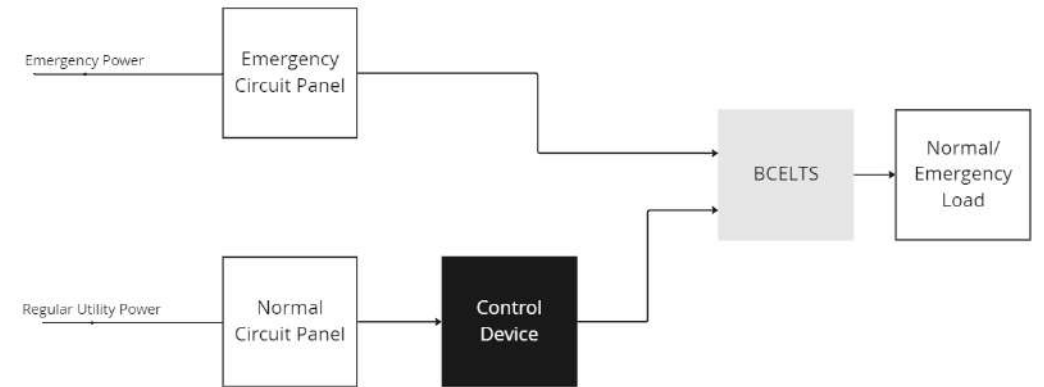


Which Device Do I Need?

ALCR (UL 924)

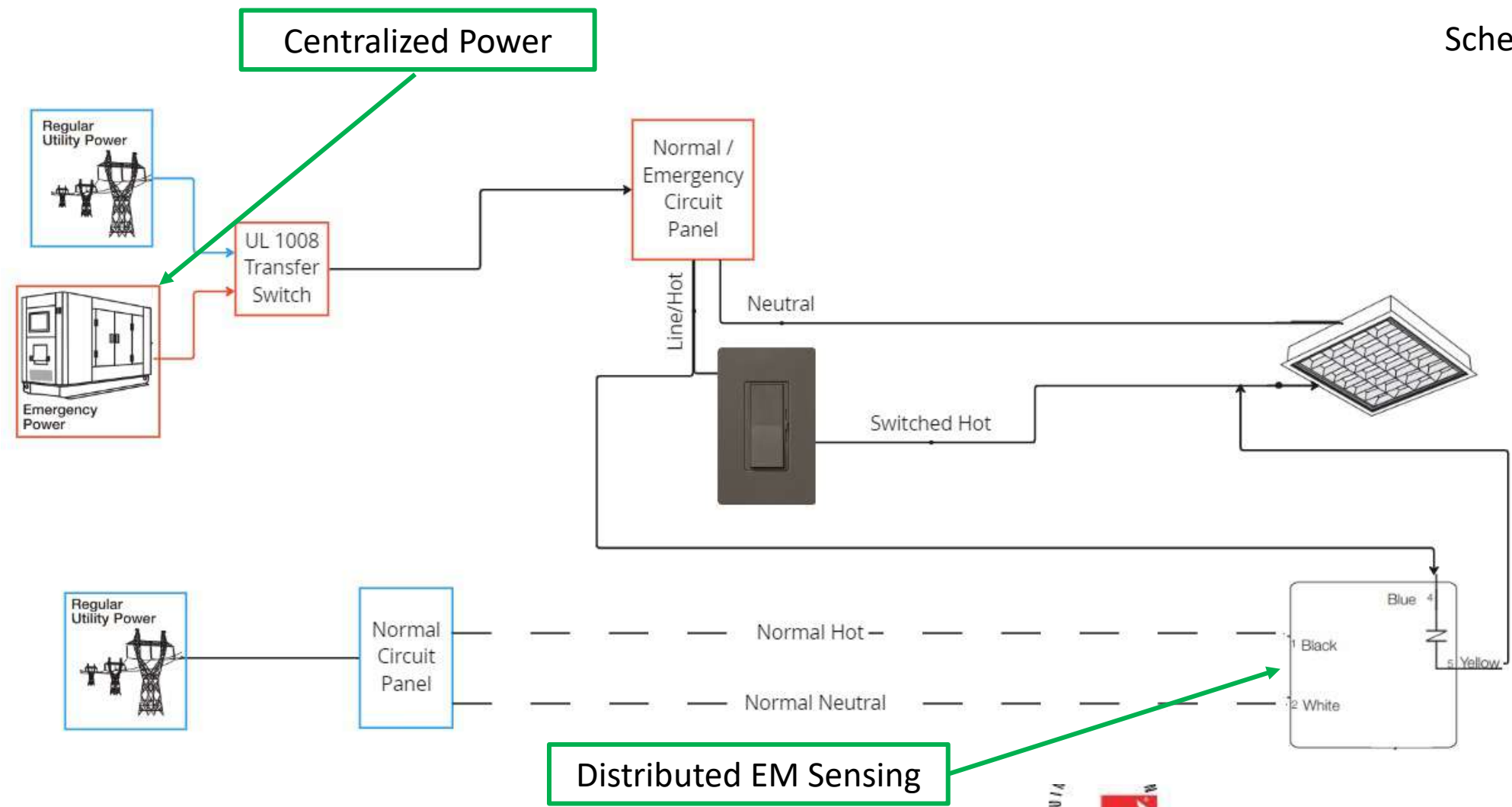
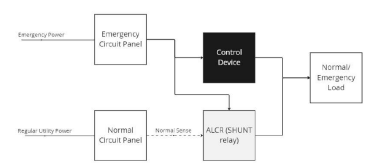


BCELTs (UL 1008)

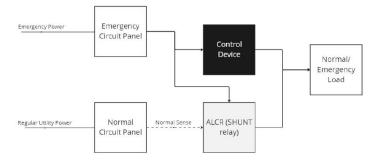


ALCR Centralized Power, Distributed EM Sensing

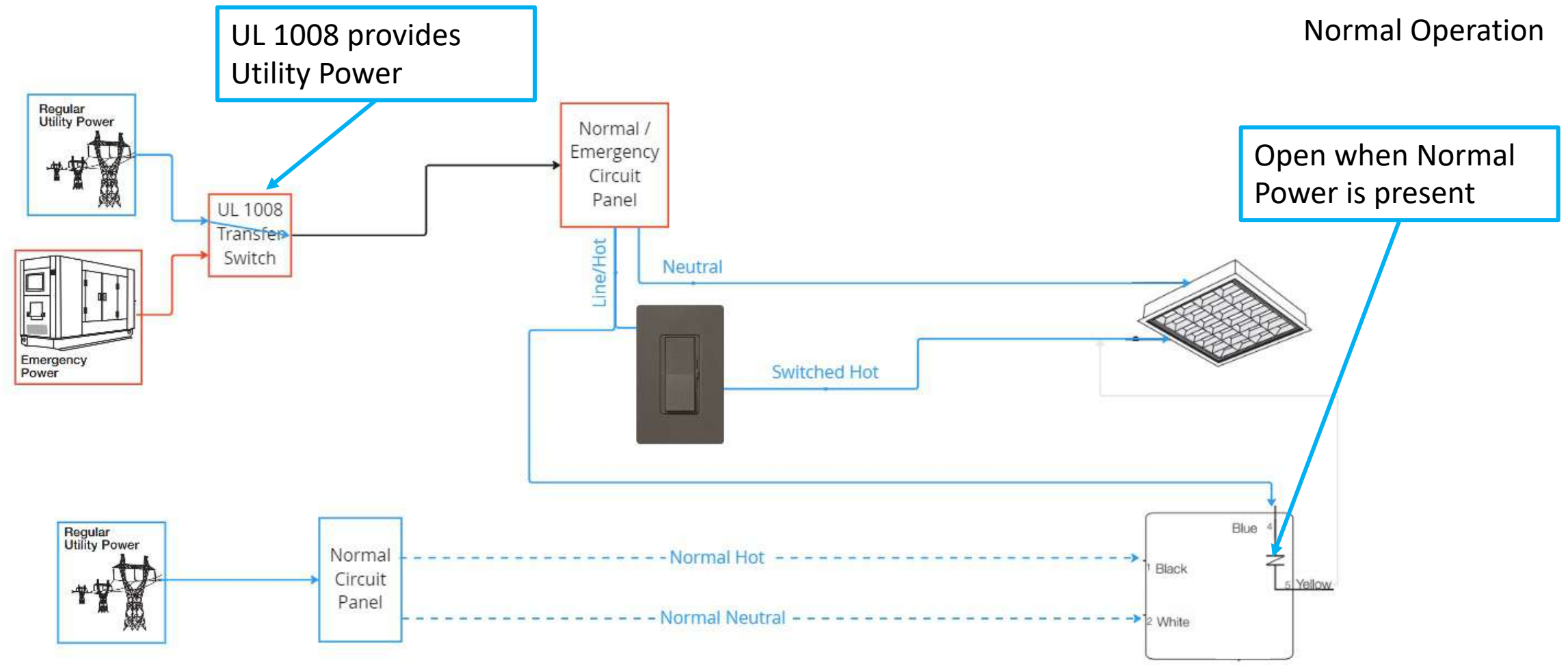
Schematic Diagram



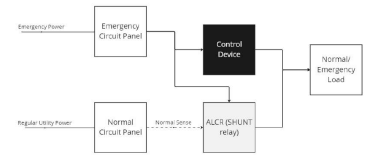
ALCR Centralized Power, Distributed EM Sensing



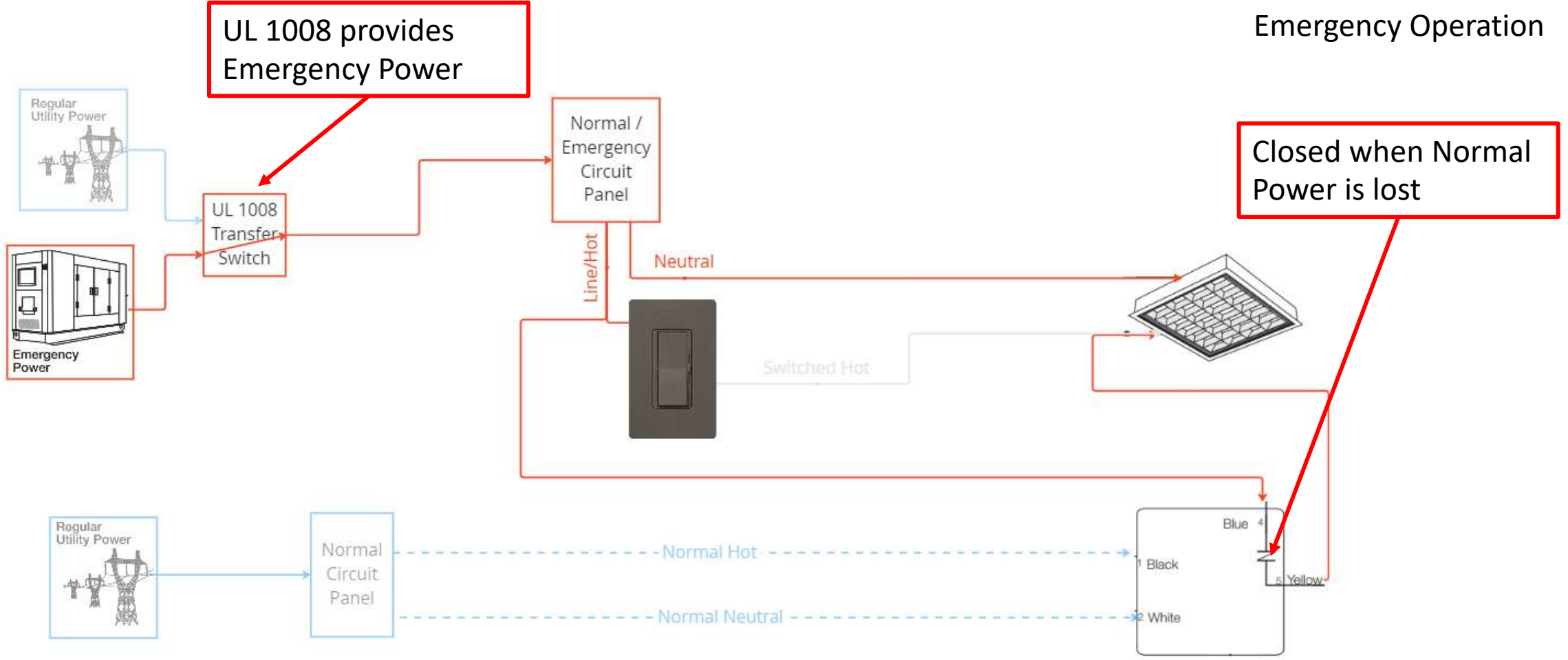
Normal Operation

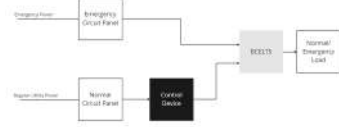


ALCR Centralized Power, Distributed EM Sensing



Emergency Operation

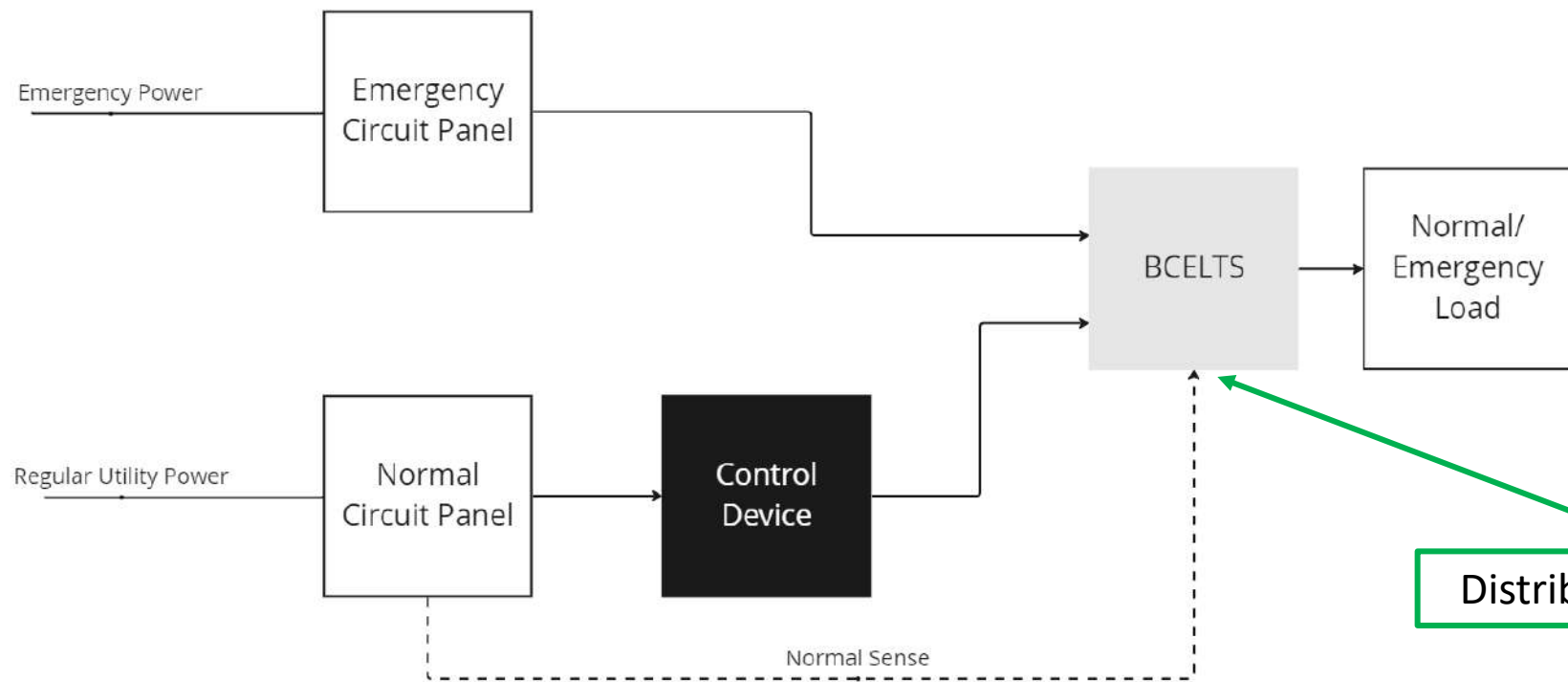




BCELTS Centralized Power, Distributed EM Sensing

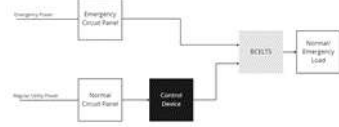
Schematic Diagram

Centralized Power



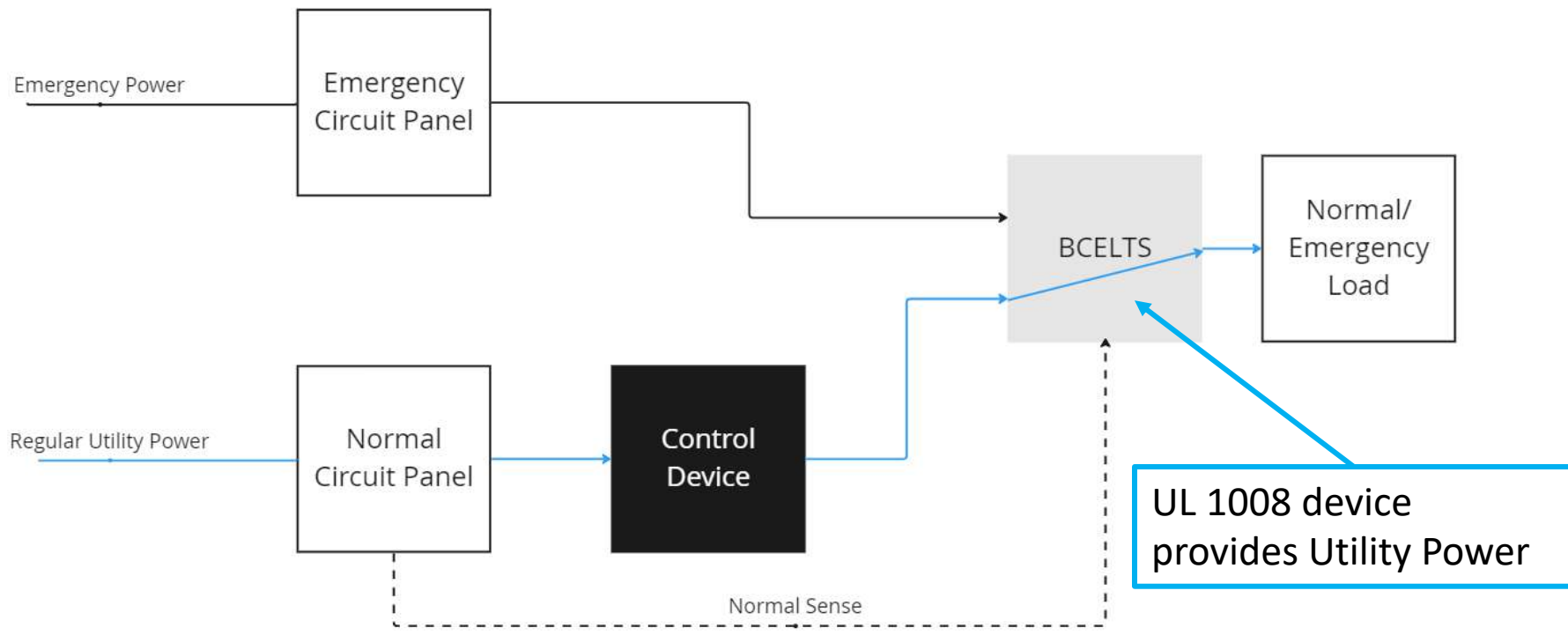
Distributed EM Sensing

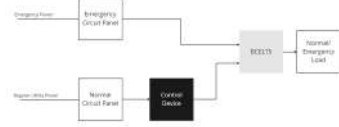




BCELTS Centralized Power, Distributed EM Sensing

Normal Operation

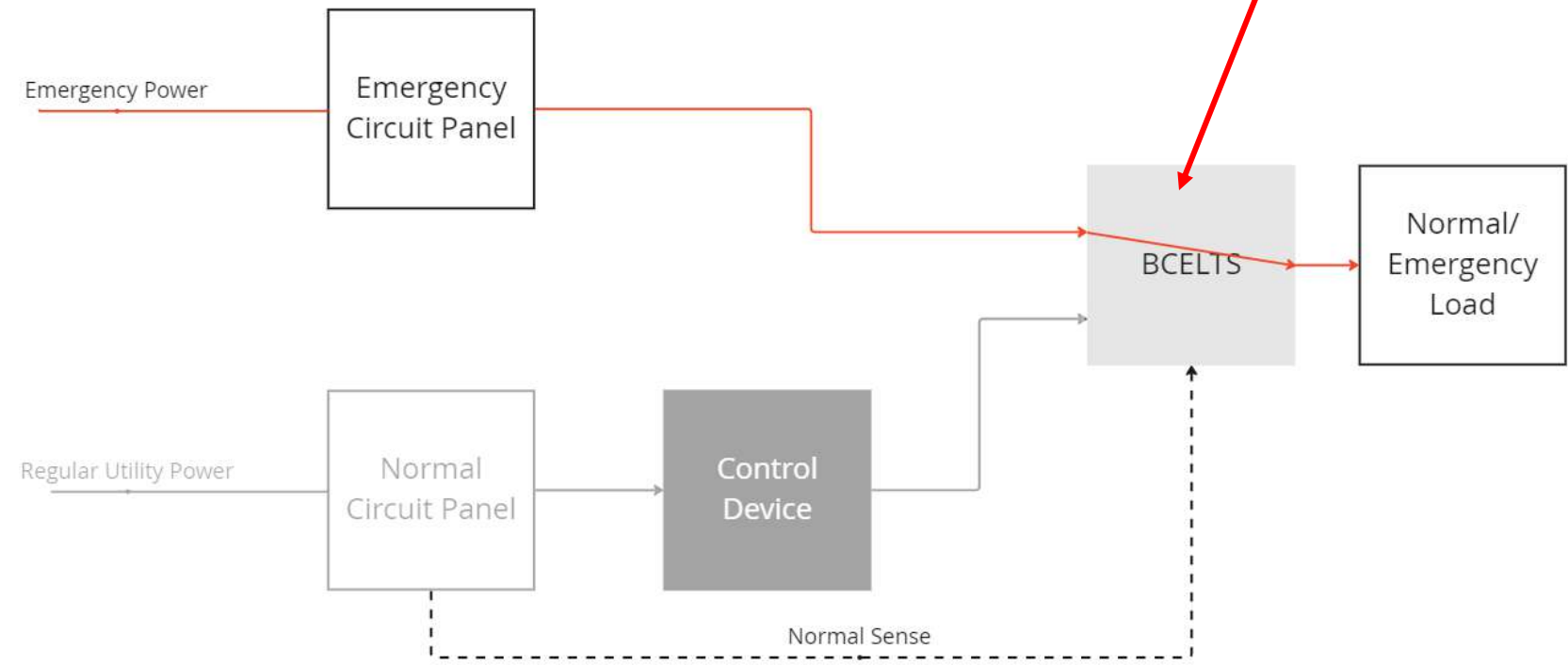




BCELTS Centralized Power, Distributed EM Sensing

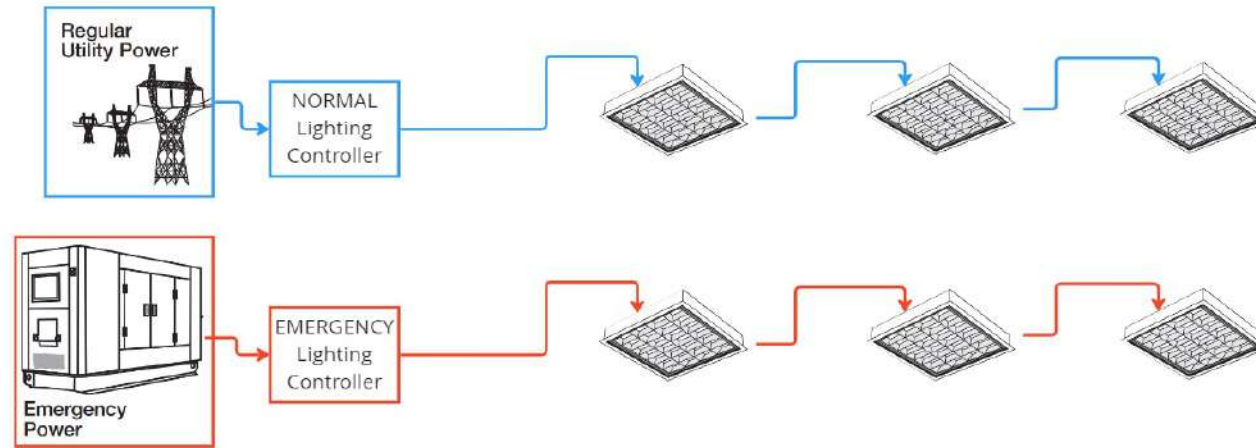
Emergency Operation

UL 1008 device provides
Emergency Power

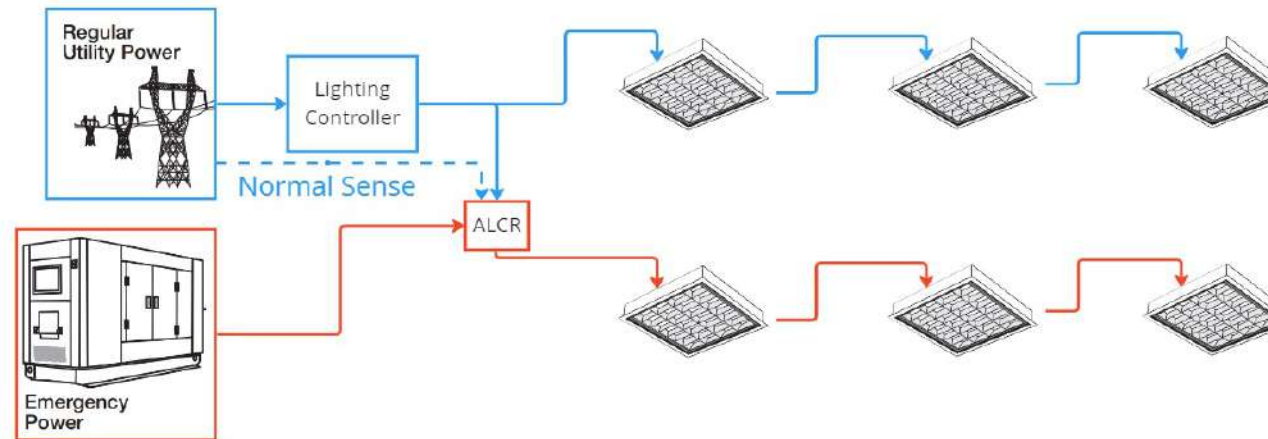


More Emergency System Architecture

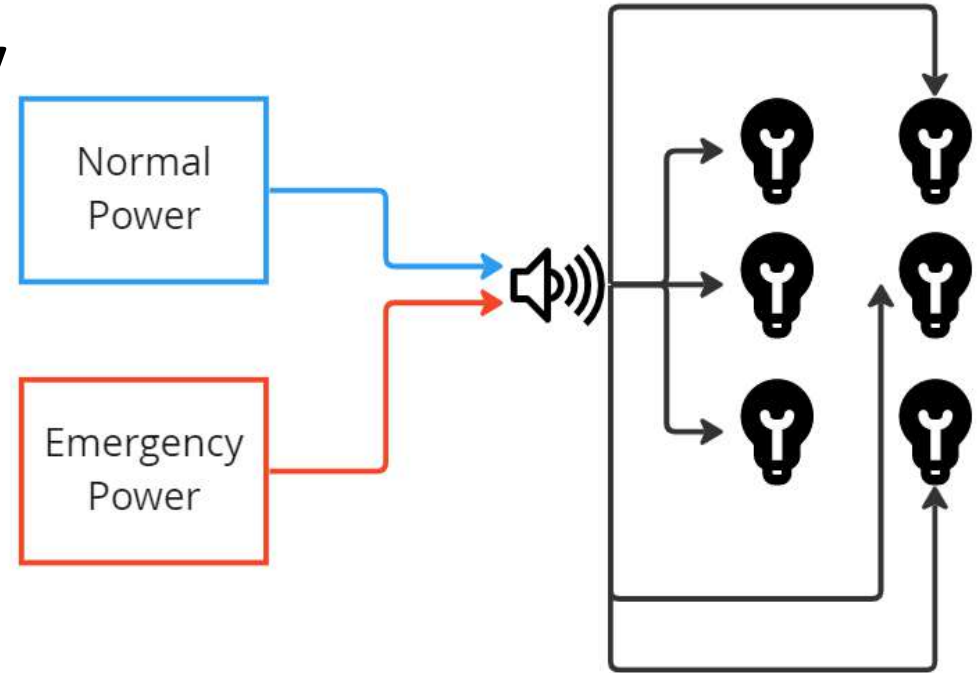
- Separate controllers:
 - Normal
 - Emergency



- Combined Normal and Emergency controller

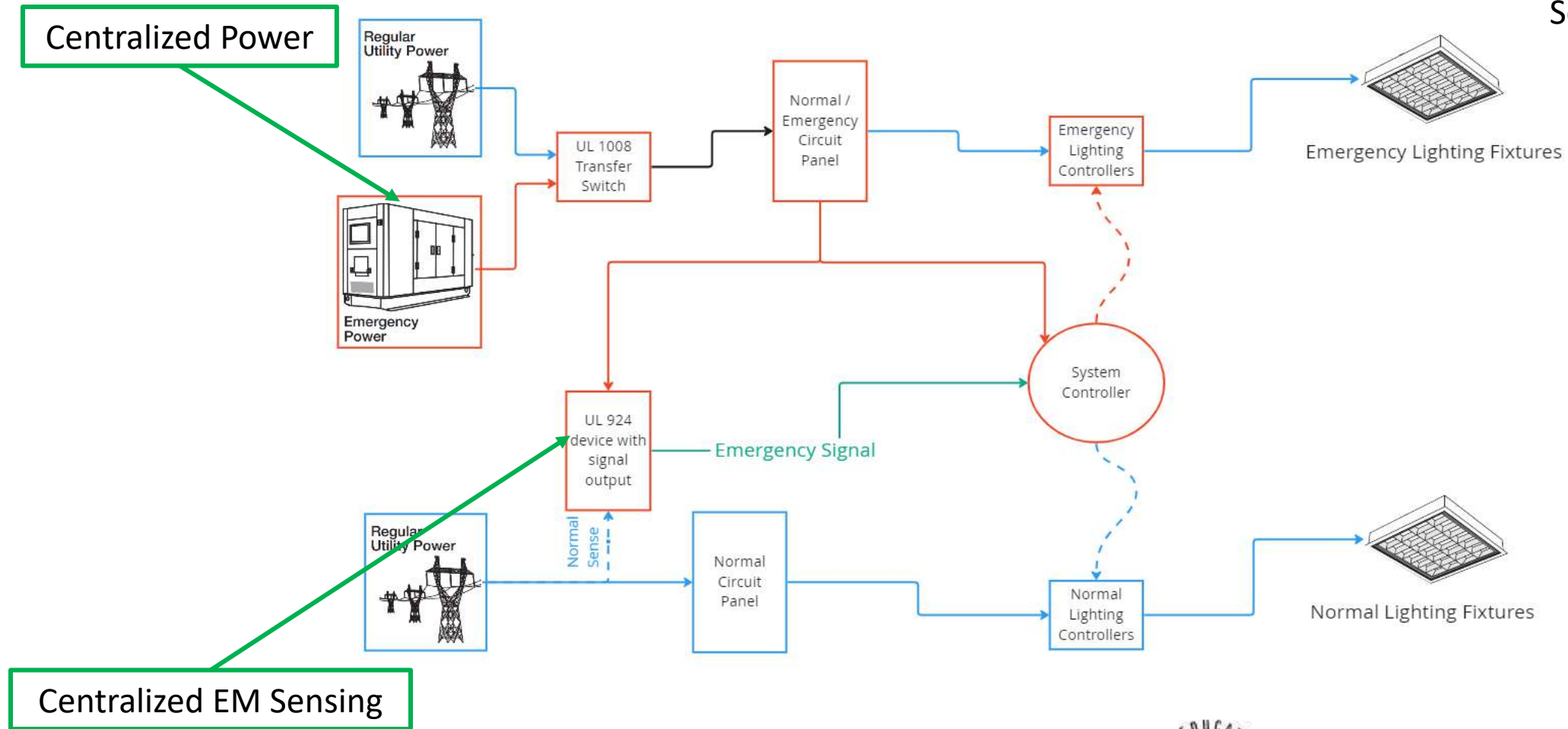


Centralized Emergency Sensing



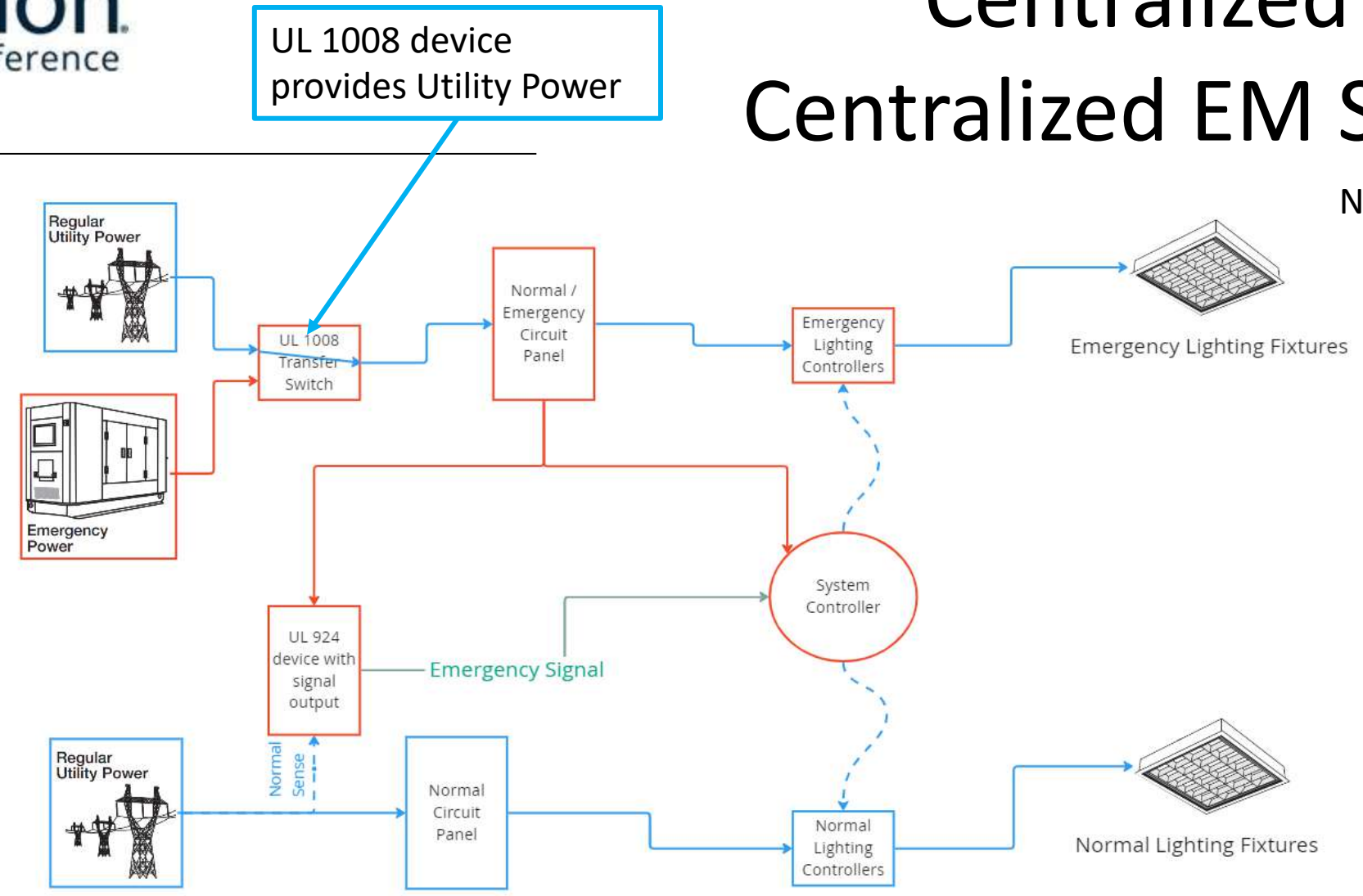
Centralized Power, Centralized EM Sensing

Schematic Diagram



Centralized Power, Centralized EM Sensing

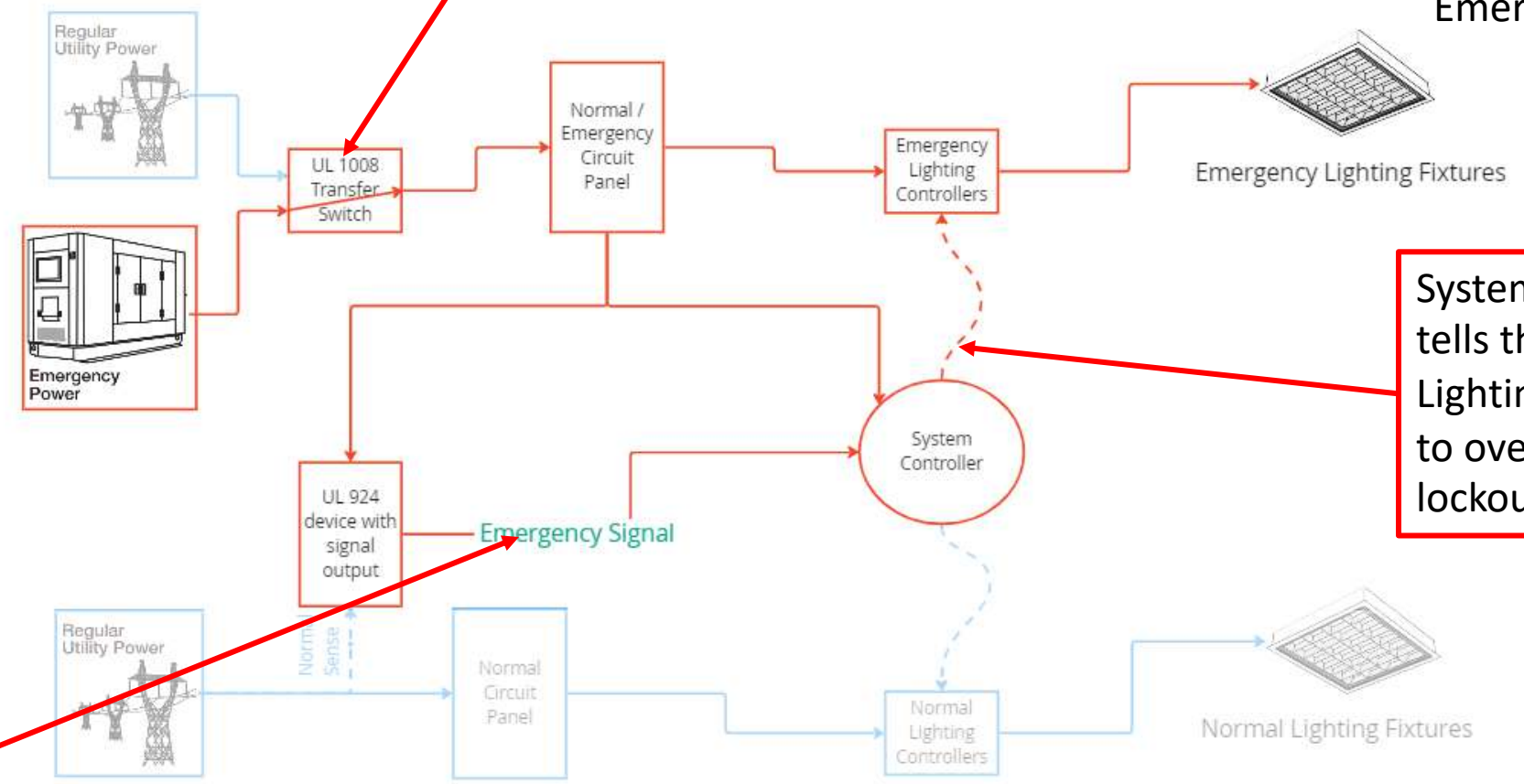
Normal Operation



Centralized Power, Centralized EM Sensing

UL 1008 device provides
Emergency Power

Emergency Operation



System Controller
tells the Emergency
Lighting Controllers
to override and
lockout

Emergency Sensed!

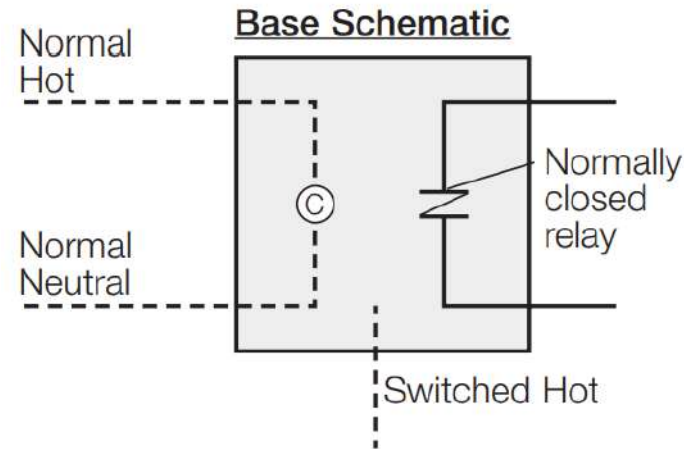
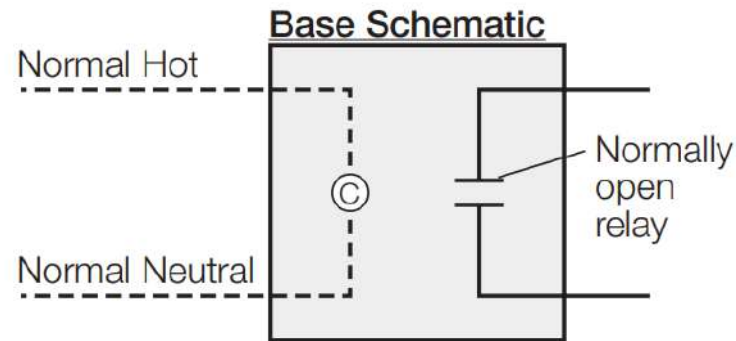
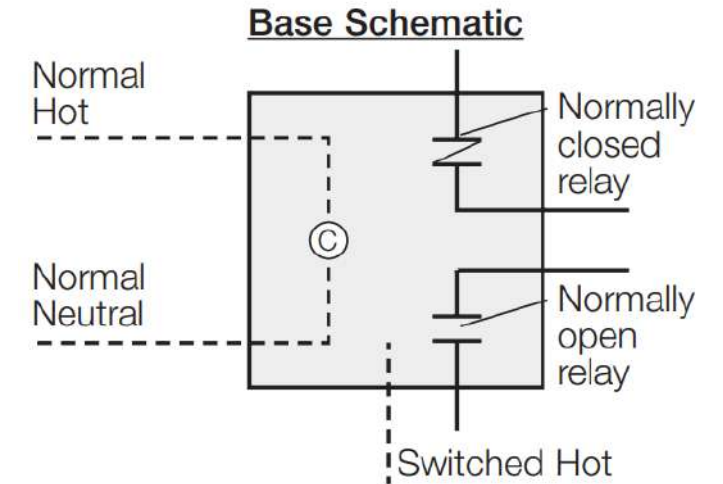
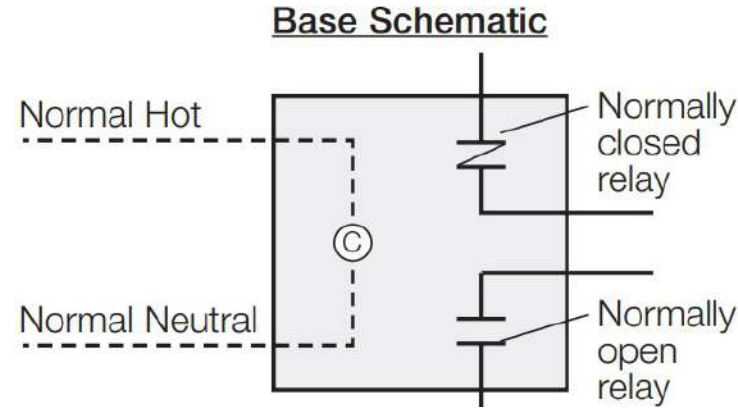
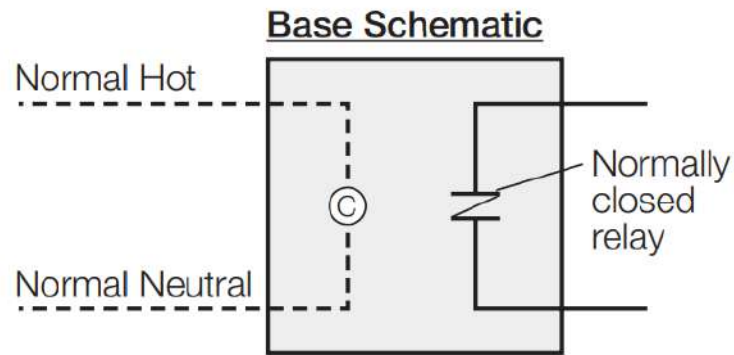


Summary



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- What Information Do I Need?
 - Is EM power central or distributed?
 - Will EM fixtures be general purpose or EM only?
 - What kind of EM override do I need? ALCR or BCELTS? (check with control system manufacturer)
 - What Help Can I get?
 - A manufacturer that has documents and design tools to help guide your emergency lighting decisions can make this easier for you.

Which ALCR Do I Need?



Application Note #106

Revision N
August 2022

Emergency Lighting

Overview

Emergency lighting is an important aspect of designing a lighting system for commercial spaces. The system requirements are defined by several codes and standards. These requirements can be fulfilled by using a variety of equipment and methods.

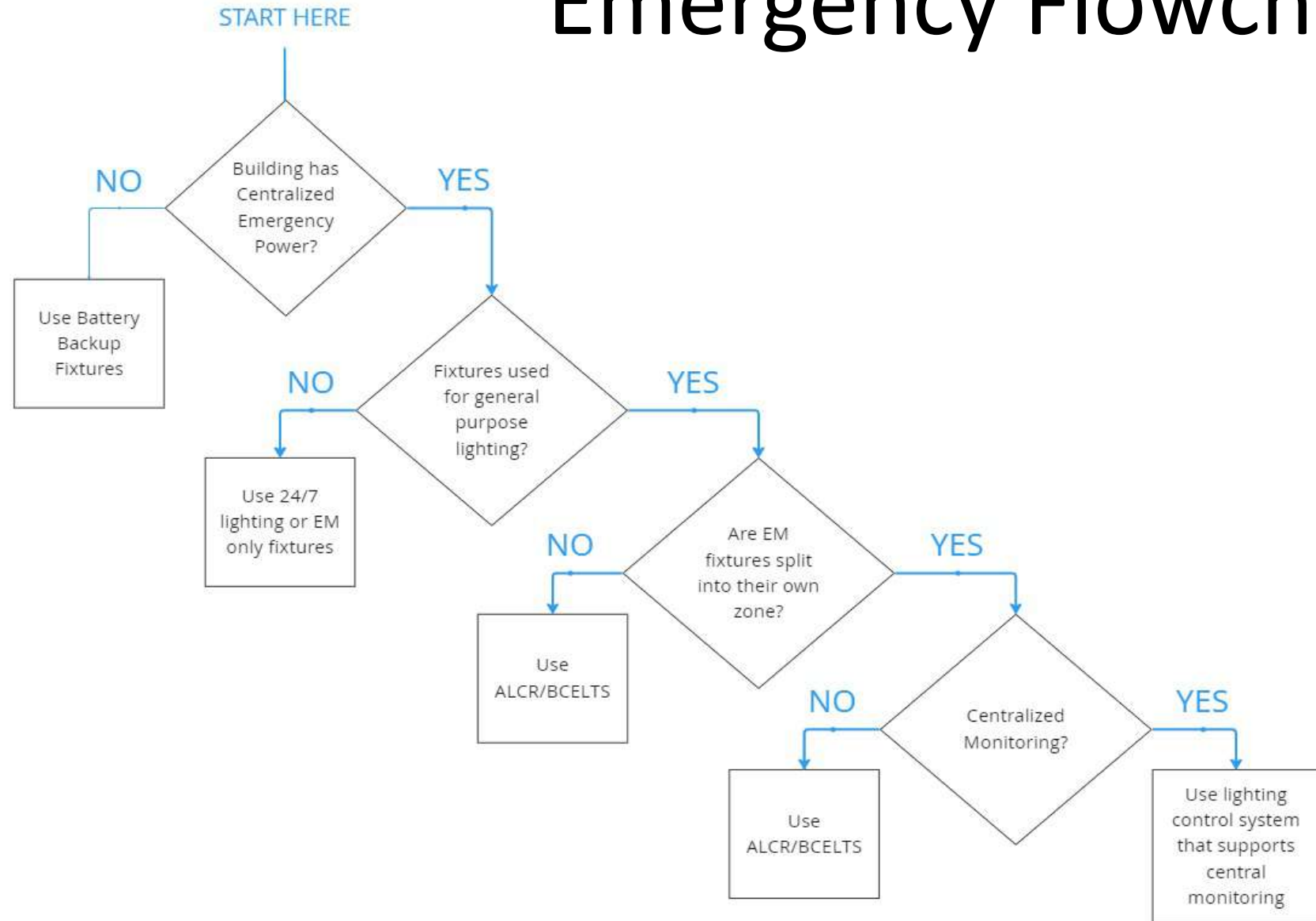
The purpose of this application note is to give the reader an understanding of codes and standards, basic emergency system components and how those components work together with [redacted] products to fulfill emergency lighting requirements; it is not intended to provide a design guide for emergency systems. This guide focuses on installations in the United States. Consult local and national codes for emergency lighting requirements in other countries.

For [redacted] systems, refer to Application Note #628 [redacted]

For [redacted] systems, refer to Application Note #730 [redacted]



Emergency Flowchart



This concludes The American Institute of Architects Continuing
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