

LIGHTING CONTROL

INTRODUCTION

The electrical power needed for lighting in a commercial facility, including hospitals, accounts for 30% to 50% of the total electrical load. With rising energy costs and code requirements for energy efficient buildings, more attention is placed on lighting control.

In addition, revisions to the 1999 National Electric Code (NEC) force issues concerning the short circuit interrupting rating.

CODE CHANGES

The 1999 NEC revisions made two changes that relate to lighting control. First, the rating of devices was changed from short circuit withstand rating to short circuit current rating. Therefore each component of a lighting control system needs a short circuit rating rather than a withstand rating. Second, NEC code simplified compliance by requiring each component in a lighting system to comply with their short circuit ratings.

The design engineer is now responsible for choosing and approving system components with a short circuit rating above the available short circuit fault current. Branch circuit impedance needs to be accounted for in the design under this interpretation on the NEC.

Two Underwriters Laboratories (UL) standards are used to test lighting control gear standards for compliance. One is UL 508 the other is UL 916.

UL 508

Lighting contacts are listed under this standard that tests for industrial control equipment. It requires a test where a current of 1000 Amps are applied to relay and contactors,

clearly below the short circuit requirements some lighting control application where the contactor is located close to the distribution panel. Therefore the distance between the lighting contactor and the electrical distribution panel is critical to the available fault current and the calculated required contactor rating. Some contactors tested under this standard are suitable for use as lighting contactors, depending on the short circuit interrupting requirements.

UL 916

Generally, this UL standard is not a suitable rating for lighting contactors. Rather, the UL 916 rating typically is applied to energy management equipment such as facility control panels which use lower control voltages (24VAC or 24 VDC). This standard includes a short circuit test however the test is limited to 1000 Amperes. Further, UL 916 does not include labeling requirements making the UL 916 rating not a suitable testing standard for lighting contactors.

APPLICATION of STANDARDS

As outlined above, the application of UL 916 to lighting control devices has limitations. For complete compliance with NEC, fuses are installed between the distribution panel and the lighting panel. This configuration assures compliance with the rated interrupting capacity of the lighting contactor. However, an additional protection device, in this case fuses, are added to comply with the electrical code.

This method is costly and the addition of more protective devices makes the system needlessly complex.

FAULT CURRENT EXAMPLE

Figure 1 is an example of the application of a lighting con-

Cutler-Hammer Offers both Stand Alone and Facility Integrated Lighting Control Panels

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tactor with a 5000 Amp short circuit rating applied to a lighting control system where the distance between the distribution panel and the lighting control panel is only 25 feet. Assuming a 277 VAC lighting system with 10,000 Amps of available fault current at the panelboard, the calculated available fault current that the lighting contactor may encounter' in this example' is 5700 Amps. However the short circuit rating of the contactor is only 5000 Amps.

current at the lighting contactor is 1200 Amps; less than the contactor rating.

In summary, **the short circuit interrupting rating for the lighting control panel needs verification when the system is designed.**

CUTLER-HAMMER BREAKERS

The application of breakers in place of contactors provides a higher interrupting rating in addition to automatic lighting control. The application of breakers in lighting control applications provides a higher rating, in most cases 14,000 Amps. The reason for the higher rating is breakers are designed to a much higher UL standard than lighting contactor, specifically UL 489. The application of remotely operated breakers to lighting control system is sound design practice.

Figure 3 show the Cutler-Hammer remotely operated breaker. The features include: trip indication, remote operation, 65,000kA interrupting capacity at 120VAC, and 14,000kA interrupting capacity at 277VAC. This higher interrupting capacity, when compared to a standard lighting contactor, assures compliance with NEC.

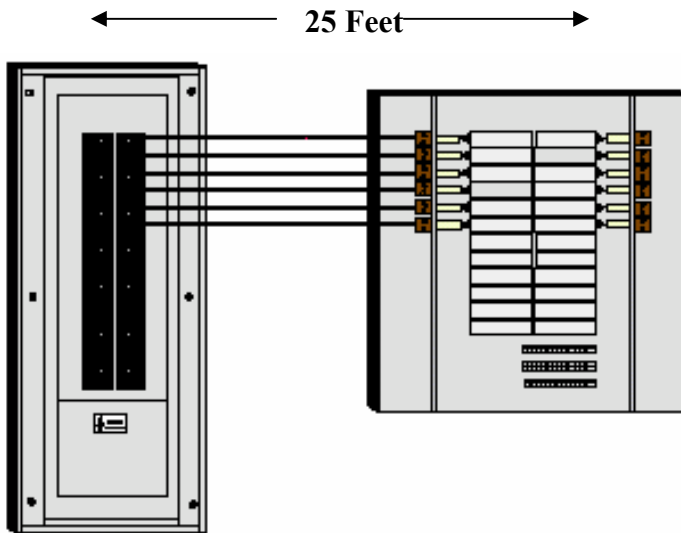


Figure 1 - Distribution & Lighting Panel at 25 Feet

In contrast, Figure 2 shows the same application on the lighting contactor with one important difference; the distance between the lighting contactor and the distribution panel now is 180 feet. The additional length of cable increases the impedance to a point where the available fault

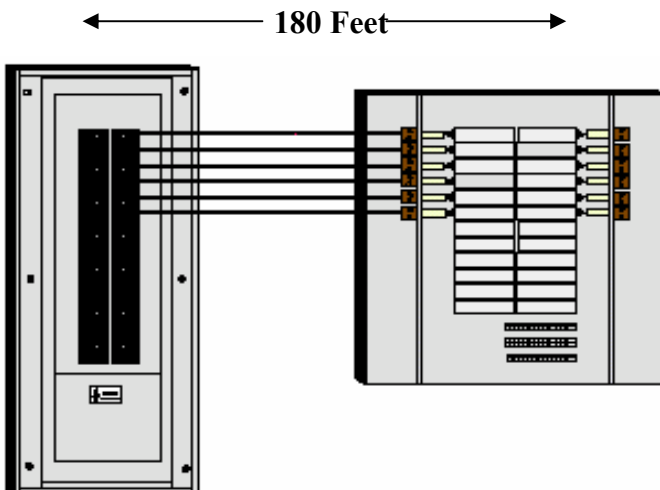


Figure 2 - Distribution & Lighting Panel at 180

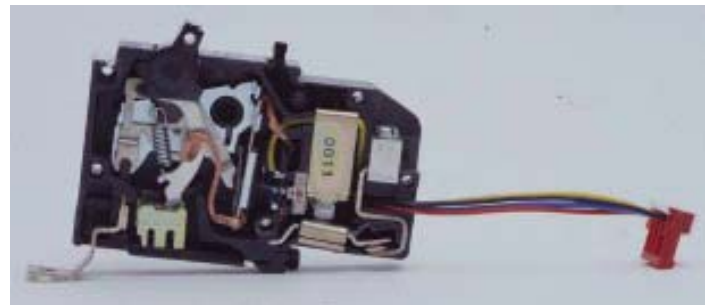


Figure 3 - Remotely Operated Breaker

In addition, remotely operated breakers can be retrofitted into existing panels.

WISCONSIN ENERGY CODE

In 1997, the Wisconsin Administration Code which governs the design of buildings adopted facility energy management requirements. Specific lighting control requirements include:

- Exterior lighting controlled using photocells or an as-

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tronomical time clock

- Interior spaces greater than 100 Ft² require control that reduce load by 50%. An exception is given if the space uses occupancy sensors
- All floors or metered spaces more than 5000 Ft² require automatic shut-off control with a manual override (the manual override cannot exceed 2 hours)

The code also requires tandem wiring of ballasts to allow for multilevel staging of lamp fixtures.

DAYLIGHT HARVESTING

New lighting technology includes dimmable ballasts on florescent lighting systems. This reduces the lighting electrical load by using daylight from windows and skylights for natural facility lighting. The florescent lighting system is dimmed in combination with the available natural light to match the required lighting load.

FACILITY LIGHTING CONTROL

Integration of the lighting panels into the Facility Management System (FMS) gives central control of the facility lighting. The scheduling and grouping are programmed through the FMS. Rather than employing a separate, stand alone panels or a separate central lighting control system, a communication card is added to each panel.

Cutler-Hammer has an *exclusive agreement* with Johnson Controls where the lighting panels communicate directly on the N2 communication bus. No gateways are needed. The N2 communication card is shown in Figure 4.

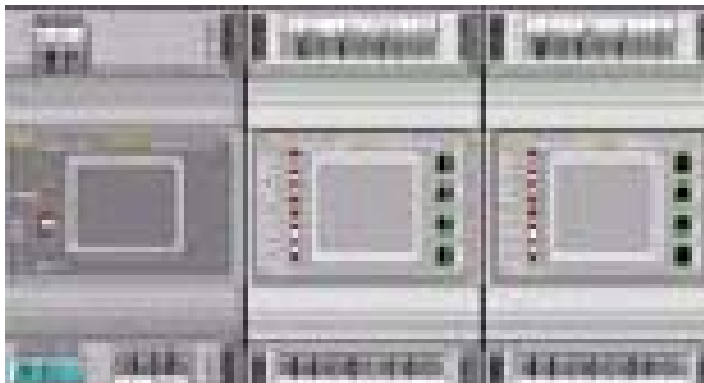


Figure 4 - N2 Communication Cards

CUTLER HAMMER

The Power Command lighting control panels are available in three levels of control.

The **PowRCommand 100** has the highest level of features:

- Software Programmed using Windows CE or Laptop
- Alarm Logging
- 120 Device Main Network
- Load Priority Management
- Lights Off Warning
- Manual Override
- Power Fail Recovery Sequence
- Memory Loss Protection

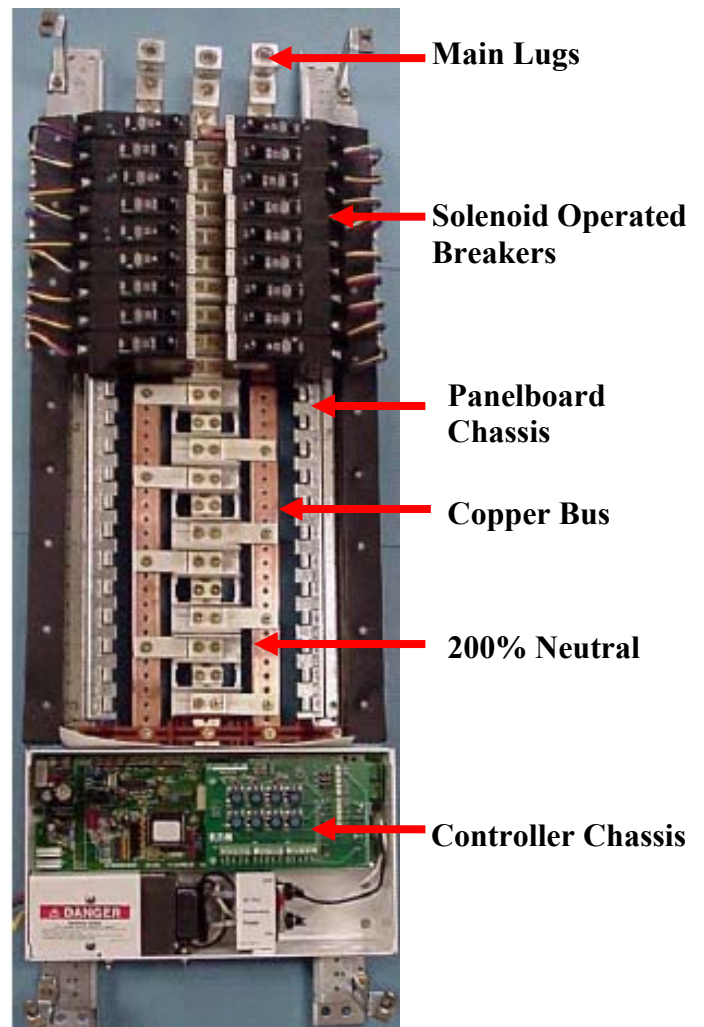


Figure 5 - Power Command 100

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The **PowRCommand 50** is stand alone lighting control panel with high level capabilities. The features include:

- Ability to group up to 42 breakers
- 8 individual zones
- Momentary or maintained inputs accepted
- 400 Amp main available
- Groups are changed via programming, no rewiring required
- Push button programming

The **PowRCommand 25** is a basic, hardwired lighting control panel using breaker for control.

The features include:

- Replaces multiple lighting contactors
- Designed to switch from dry contacts
- 6 individual zones
- 7 breakers per zone
- Groups are changed from a control wiring terminal in panel

The **PowRCommand JCI15** allows for direct lighting control through the Johnson Controls Metasys facility management system.

- Lighting panel recognized as an N2 device
- Zones defined from the Metasys

LIGHTING CONTROL COMPETATIVE COMPARISON

Features	Cutler- Hammer	Square D	General Electric	MicroLite
Trade Name	Pow-R-Command	PowerLink	GE TLC	MicroLite
Sales Force	Factory	Factory	Lighting Agents	Lighting Agents
Job Packaging	With Gear Package	With Gear Package	With Lighting Package	With Lighting Package
Controllable Breakers	Yes	Yes	No-Relays	Yes
Single Pole	15, 20 & 30 Amp	15, 20 & 30 Amp	---	15 & 20 Amp
Two Pole	15, 20 & 30 Amp	15, 20 & 30 Amp ①	---	No
Network Capabilities	Standard - Internal to Panelboard	Optional - Must Use PowerLogic	Optional	Not Available with 100 and 500 Series
Main Network Speed	57kb	19.2kb	19.2kb	9600 Baud
Expansion Network Speed	19.2kb	Not Available	Not Available	Not Available
UL916-Energy Management Equipment	Yes	Yes	Yes	No
Time of Day Scheduling	Up to 504 On/Off Per Panelboard	Up to 256 On/Offs Per Panelboard	12 Unique Schedules Per Relay Cabinet	Up to 336 On/Off Per Panelboard
Astronomical Scheduling	Standard	Standard	Standard	Standard
Holiday Scheduling	Standard	Standard	Standard	Standard
Load Sequencing	Standard	Optional	Not Available	Optional
Occupant Warning (Blinking of Lights)	Standard	Standard	Standard	Standard
Switch Override (Local Control)	Optional	Optional	Optional	Optional
Telephone Override	Optional	Not Available	Optional	Optional
Fluorescent Dimming	Optional	Not Available	Not Available	Optional
Fluorescent Daylighting	Optional	Not Available	Not Available	Optional
Remote Access Control via Modem	Optional	Optional	Optional	Not Available
Security Codes	Standard	Standard	Standard	Standard
Smart System Failure Override	Standard	Standard	Not Available	Standard

① Three Pole also available in 15 - 30 ampere ratings.