LLLC
Luminaire-Level Lighting Controls

Minnesota Lighting Control Requirements: An Overview of Key Codes

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EXECUTIVE SUMMARY

Multiple codes, including energy, fire, and electrical regulations, outline the requirements for lighting in industrial, commercial, and multifamily residential buildings in Minnesota.

Lighting must be controlled by **ASHRAE 90.1-2019**, the energy standard adopted into code in Minnesota, at the start of 2024. Compliance drives cost-effectiveness by improving building performance, reducing electric bills, and improving occupant comfort.

The Minnesota State Fire Code and Minnesota's electrical code consists of the **National Electrical Code® (NEC)** as published by the National Fire Protection Association (NFPA) and references the NFPA 101 **Life Safety Code®**, all of which require emergency lighting be provided and maintained to enable safe paths of egress for building occupants.

Lighting controls turn on lights where they are needed, when people require electric light in buildings including during loss of power, fires, and other emergencies, enabling safe egress. They also turn lights off or dim them to a low level when areas are vacant or where ample sunlight illuminates the space. When they are implemented correctly, codes ensure our buildings meet Minnesotan’s needs and reduce costly waste of resources.

Energy Code

Requirements

Section 9.4.1 of ASHRAE 90.1-2019 details the mandatory provisions for lighting control operation including those shown in Figure 1.

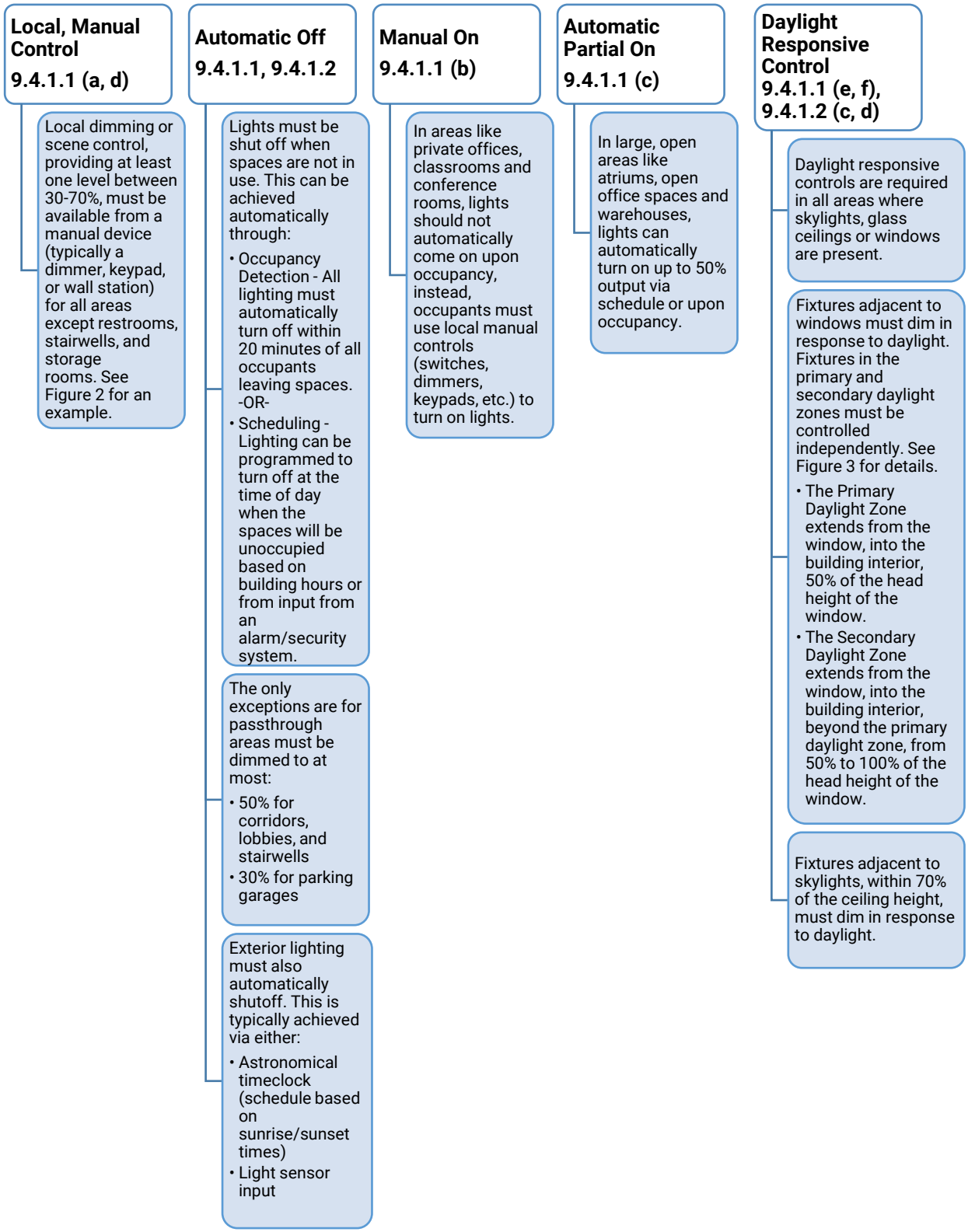

Figure 1: Mandatory Lighting Control Provisions

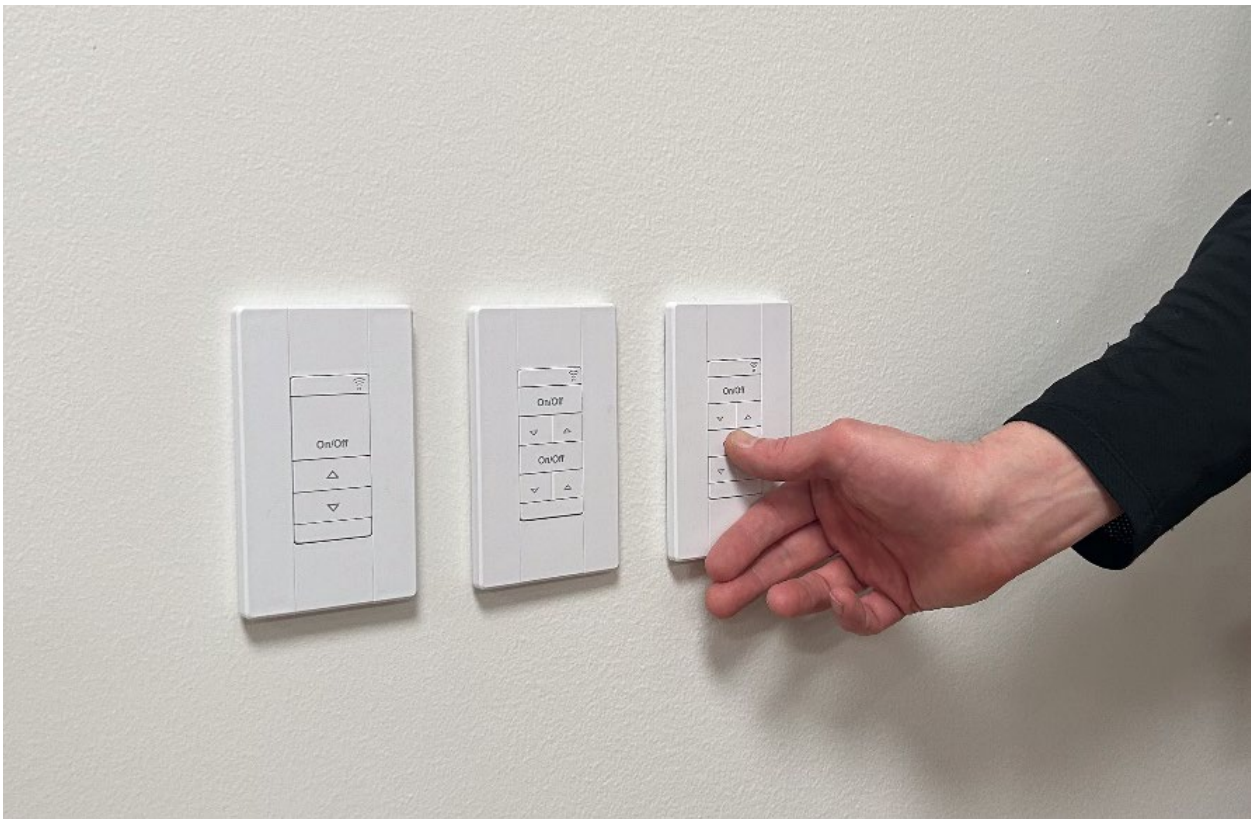

Figure 2 Local, Manual Override Example

Functional requirements depend on space type, daylight availability, and whether the space is intended for use as a means of egress during an emergency.[1]

Sections 4.2.5 and 9.9 detail verification and functional testing and commissioning requirements to the successful implementation of system design contributing to energy efficient buildings.

Verification of proper installation and testing to demonstrate functionality of lighting control devices and systems is required for all projects and must be documented.

[1] Table 9.6.1 of ASHRAE 90.1-2019 details the minimum control requirements by space type.

Figure 3: Daylight Areas

Fire and Electrical Codes

To enable timely evacuation of building occupants during emergency situations including loss of power and fire detection and alarm system activation, Minnesota State Fire Code sections 907.2.11.2 & 1008.3.5 and NEC article 700 require emergency lighting systems to provide adequate illumination at the floor level along egress paths.[2]

Minnesota State Fire Code section 1031.10 and NEC 700-4.B detail the requirements that emergency lighting must be tested monthly to ensure proper function and annually to ensure back-up power capacity meets the 90-minute duration requirement.

[2] Adequate illumination is defined as an average of 1 footcandle with a minimum of 0.1 footcandle at any point along the egress path at floor level.

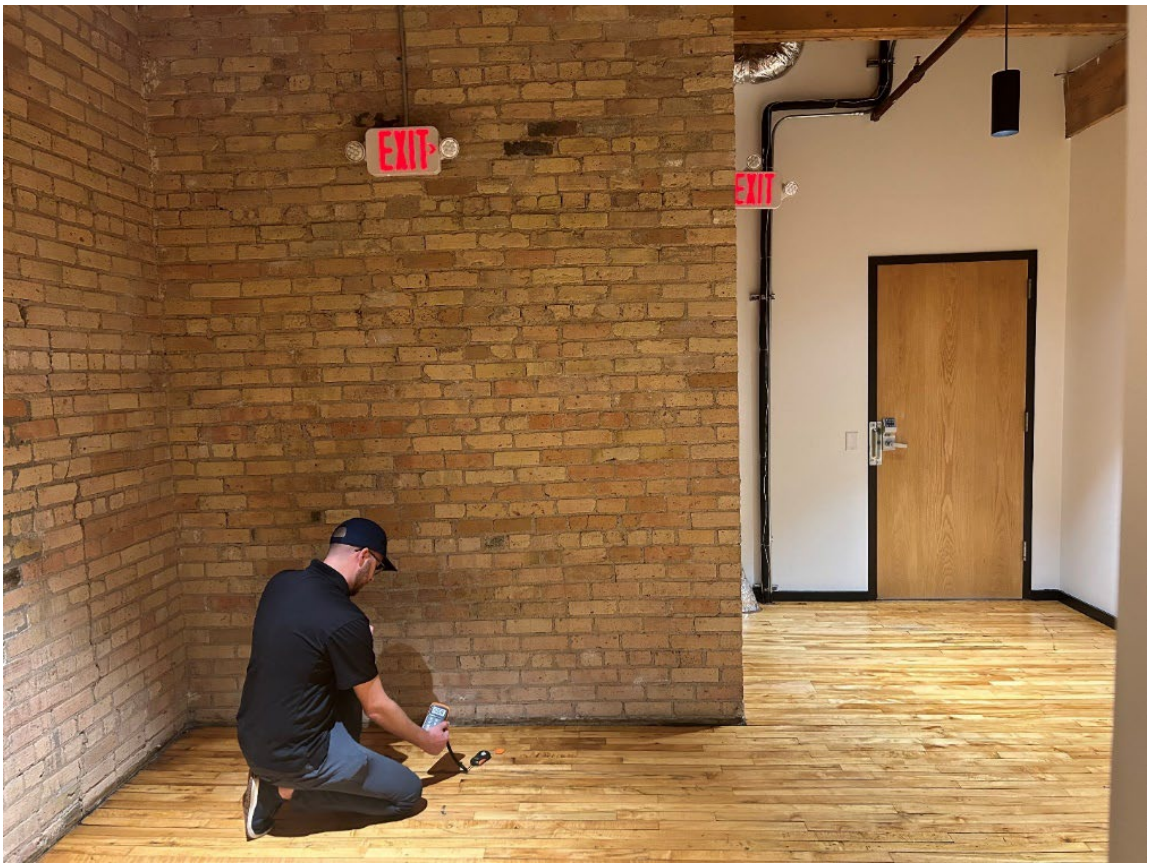

Figure 3: Measuring Egress Light Levels

Critical Checks

When lights are dimmed, they brighten to provide adequate illumination along the path of egress.

When lights are off, they turn on to provide adequate illumination along the path of egress.

See Figure 4 for example.

Emergency Simulations

Occupancy sensors - Lights dim or turn off within 20 minutes of vacancy.

OR

Schedules - Simulation of the unoccupied situation demonstrate lights turning off and any manual overrides last no longer than two hours.

Automatic Shut Off

Lights adjacent to windows & skylights dim or turn off in response to daylight. This can be simulated with a flashlight aimed at the photocell.

Daylight Response

Figure 4: Minimum Compliance Checks

When are these checks performed?

During permitting, plan reviewers should check that the lighting plans include provisions for automatic shut off and daylight response. Typically, these sequences of operation should be found in the notes legend, detailing how (occupancy sensors or by scheduled building hours), and within the reflected ceiling plan, identifying daylight zones, or in a the zone schedule, identifying which light fixtures are subject to daylight responsive control.

Before the certificate of occupancy can be issued, all these checks must be completed. Emergency simulation checks are to be performed during the electrical and fire inspections and automatic shut off and daylight response checks must be completed during the building inspection.

ROLES AND RESPONSIBILITIES

	DESIGN			CONSTRUCTION				OCCUPANCY
	Construction Documentation	Plan Review	Permits Issued	Installation	Programming	Training	Commissioning, Verification and Functional Performance Testing	Operation & Maintenance
Commissioning Agent	1							
Permit Technician		2	4					
Building Owner		3				8	11	14
Installer				5		9		
Building Official				6			12	
Programmer					7	10		
Fire Marshall							13	15

1. Submits the commissioning plan, design review report to the building owner.
2. Reviews construction documentation, checking for code compliance.

   Ensures commissioning plan is included and commissioning provider is designated in permit application.
3. Designates the commissioning provider for projects over 10,000 square feet.
4. Issues building permits.
5. Installs lighting and controls equipment.
6. May review code compliance for lighting controls during rough in inspection(s).
7. Configures installed equipment, known as "startup" per specifications.
8. Attend operations & maintenance training.
9. Coordinates training.
10. Delivers operations and maintenance training.
11. Inform the building official they have received and accepted all verification and functional performance testing documentation and the preliminary commissioning report.

    Provides the building official with all the verification and functional performance testing documentation, if requested by the building official.
12. May request verification and functional performance testing documentation from the building owner.

    Issues Certificate of Occupancy (CO) after verification and functional performance testing completed and critical checks are found to comply.
13. Ensures emergency lighting requirements are met prior to informing the building official of any conditions requiring delay of occupancy.
14. Maintains records of monthly and annual testing of emergency lighting systems performed by a lighting or fire/life safety service provider and provides to fire marshal during inspections.
15. Reviews records of emergency lighting testing during inspections.

Question and Answers

Q – What overlap is there between lighting controls and emergency lighting?

When an emergency occurs, lighting must turn on to at least meet the minimum requirement of one foot-candle for egress. If emergency lighting is turned off or dimmed at the time of the emergency, in compliance with energy code, ample illumination may require an override of the lighting control system. Emergencies are temporary and take precedence over energy code requirements during those events.

Q - How can you learn how the system operates?

Typically, the person who programmed the lighting controls knows best how the system operates. Sometimes this is the installer, while other times it is a representative from the manufacturer who performs the programming or "start-up" of the system, configuring the settings like schedules, occupancy sensors, automatic partial on, etc. Attending the system training delivered by this person is a great way to learn how the system is intended to function and assist in directing how to perform critical checks. For example, if automatic off was configured via schedule, this person can confirm what time the lights are meant to turn off so that this check can be performed at that time of day. Typically, the lighting installer or electrical contractor can inform you of the time of this training or put you in touch with the programmer. Another way to learn how the system is meant to operate is to reference the construction documents. This information is typically located on lighting plans; look for "Sequence of Operations" for these details.

Q – For which projects is Energy Code compliance required? When is compliance triggered?

- All projects that require permits.
- When there is a chance of occupancy or use of a space.
- For lighting alterations, if 20% or more of a space's lighting load (by connected watts) are being replaced.
    - Note: There is an exception for lamp replacements, or replacements that only involve one-for-one luminaire replacement, which only require automatic shutoff be implemented.

Q – How do you check for compliance of partial on?

Locate the manual control for the space (keypad, wall, or button station). Enter the space after it has automatically shut off (whether by motion detection or scheduling). After the space becomes occupied and the lights come on, use the manual control to increase the lighting level. In most cases, if the lighting level does not increase, the space does not comply.

Sometimes it can be difficult to assess if the lighting level increased with the naked eye. A light meter can be used, as in Figure 1, to measure the light level before and after using the manual control, to assess if the light level does increase from the automatic, partial on level.

In rare cases, the manual control has been configured to restrict override above the partial on level, in which case the lighting programmer may need to demonstrate that the partial on level is at most 50% of the lighting capacity. The construction documentation should indicate if this is the case on a particular project.

Q – What happens when compliance is not met?

As with all non-compliance, a Certificate of Occupancy should not be issued until mandatory provisions are met. Depending on the deficiency, resolution may mean installing and configuring additional equipment, which may be the case for local manual control or to enable partial on, where a button station may need to be added. Many possible deficiencies require re-programming the equipment that is already installed and configured. At times, this may be delayed by the availability of programmers. For this reason, and since lighting controls tend to be configured toward the end of the construction cycle, ensuring functional testing is complete and deficiencies rectified prior to inspection can prevent undesirable delays.

Q – What are some best practices?

In addition to ensuring functional testing is complete prior to final inspection, robust plan reviews for lighting controls requirements can help ensure compliance.