GE Current, a Daintree company, enables intelligent environments with a powerful combination of LED lighting solutions, digital controls and energy management. The purpose of this guide is to provide recommendations for deploying the Daintree™ wireless lighting controls in compliance with the 2018 International Energy Conservation Code (IECC).

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Introduction

GE Current, a Daintree company, enables intelligent environments with a powerful combination of LED lighting solutions, digital controls and energy management. The purpose of this guide is to provide recommendations for deploying the Daintree™ wireless lighting controls in compliance with the 2018 International Energy Conservation Code (IECC).
The recommendations in this document are based on our understanding and interpretation of the code. In order to ensure full compliance, please reference the official published code.
Daintree Wireless Controls

The Daintree wireless solution suite includes wireless lighting controls, edge hardware devices and an intuitive web-based software platform. Our three levels of Daintree wireless controls are upgradeable, cost-effective and, most importantly, code-compliant. For those interested in a wired solution, LightSweep® offers a reliable and scalable solution.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Wireless</th>
<th>Wired</th>
<th>Wireless</th>
<th>Wired</th>
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<td>Energy Harvesting Wireless Switch</td>
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<td>✔️</td>
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</tbody>
</table>

*Via BACNet
<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>CONTROL STRATEGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Occupancy/Vacancy</td>
<td>IECC 2018 requires the use of sensors to detect the presence of people in a given area. Sensors may be used in the following ways:</td>
</tr>
<tr>
<td></td>
<td>Auto-On</td>
<td>Lights in the area automatically illuminate upon entry. Set auto-on light levels below 100% for increased energy savings. If additional light is necessary, brightness can be manually increased if manual controls are present.</td>
</tr>
<tr>
<td></td>
<td>Auto-Off</td>
<td>IECC 2018 requires a maximum auto-off delay of 20 minutes for applicable areas. Decrease this time to maximize energy savings.</td>
</tr>
<tr>
<td></td>
<td>Auto-Partial Off</td>
<td>In certain environments (such as open offices or egress stairwells), it is allowed and desirable to dim lights rather than turn them off when the area is vacant. The off-delay time is a maximum of 20 minutes.</td>
</tr>
<tr>
<td></td>
<td>Demand Response</td>
<td>The control system has the capability of automatically reducing lighting power when a participating utility sends a peak demand signal. Daintree can also adjust integrated HVAC systems to reduce energy during peak demand times.</td>
</tr>
<tr>
<td></td>
<td>Emergency Fixture</td>
<td>Emergency fixtures are required by building codes and may be powered by a fixture-integrated battery backup or unswitched power circuit. To fully control an emergency fixture/zone without impeding its function during a power loss event, a shunt relay must be used to disable the control signal and switch the fixture/zone to emergency power.</td>
</tr>
<tr>
<td></td>
<td>Daylight Harvesting</td>
<td>IECC 2018 requires lights near windows and skylights to dim automatically and take advantage of sunlight entering the building. Photosensors in each zone are required to keep light levels consistent. The areas where this is necessary are daylighting zones, which have specific dimensions based on window size and ceiling height. For an in-depth explanation of these zones, see page 10 of this guide.</td>
</tr>
<tr>
<td></td>
<td>Manual Control</td>
<td>Manual control involves a switch and/or dimmer that overrides automatic and scheduled lighting behavior. Manual control is necessary in most areas but not all. Any override initiated via manual control may, by code, last up to two hours, after which the lighting will revert to its programmed behavior.</td>
</tr>
</tbody>
</table>
## LIGHTING CONTROL STRATEGIES

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>CONTROL STRATEGY</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image" alt="Clock" /></td>
<td><strong>Scheduling</strong></td>
<td>IECC 2018 allows or requires adjustment of lighting behavior based on normally occupied days/times. This is often in lieu of occupancy controls in areas (e.g., atriums) that may not be conducive to occupancy sensors. The controls system must be able to account for days of the week and holiday overrides.</td>
</tr>
<tr>
<td><img src="image" alt="Light" /></td>
<td><strong>Top Trimming</strong></td>
<td>LED lights are extremely efficient and may project more light than expected, even when considering their lumen rating. Top trimming limits the maximum power of the luminaire to save additional energy and extend the life of the chips and driver. As time goes on, trimming can be removed or reduced to increase light levels as a fixture ages.</td>
</tr>
<tr>
<td><img src="image" alt="Rainbow" /></td>
<td><strong>Scene Control</strong></td>
<td>Scene control is a helpful and efficient way to create custom dimming levels for different areas of the room. Although not explicitly required by any energy codes, this strategy meets bilevel dimming requirements and is popular in conference rooms for presentations.</td>
</tr>
</tbody>
</table>
| ![Zonal](image) | **Zonal** | A zonal design wires multiple lights together as a single control group. Zonal designs require less equipment and can offer a higher ROI. Zonal control groups are fixed in place and must be rewired if changes are necessary.  
*In a zonal scheme, the Daintree wireless lighting control adapter (WAPM) can govern 10 or more fixtures. Note that a single WAPM cannot be used to control fixtures on two different circuits.* |
| ![Granular](image) | **Granular** | A granular lighting design provides independent control of fixtures and requires the least amount of effort to deploy. Granular control allows the highest level of flexibility as lighting zones can be redefined and reprogrammed at any time. This scheme requires more equipment than a zonal design. In all cases, it is best to consult with a lighting estimator who can help optimize product and installation strategy. |
Daintree System Symbol Guide

Room: The application space  
z: Independently controlled zone  
dx: Device labeling

Wireless wall dimmer (WWD1)

[$] Room z, s#

Wireless PIR occupancy sensor (WOS2-RM-E)

[OS] Room z, ox

Wireless PIR occupancy sensor (WOS2-CM-E)

[OS] Room

Wireless PIR occupancy sensor (WOS2-WM-L)

[OS] Room

Wireless PIR occupancy sensor (WOS2-WM-W)

[OS] Room

Wireless photocell (WPS1)

[PS] Room z, px

Wireless lighting control adapter (WA100-PM)

[WAPM] Room z, dx

Wireless general adapter (WGA100)

[WGA] Room z, dx

Wireless fixture adapter (WFA100-SN)

[WFA] Room z, dx

Wireless sensor adapter (WSA10)

[WSA] Room

Wireless highbay adapter (WHS100)

[WHS] Room z, dx

Wireless thermostat (WTS10)

[STAT] x

Wireless 3-button switch (WWS3)

[$] 3

NON-Zigbee-enabled luminaire

Receptacle control

Wireless area controller (WAC60)

NET WAC

Shunt relay (0–10V)(RRU-X-UNV)

EM X

Aux relay (BZ200)

Receptacle control or 2-pole lighting

Phase to 0–10v converter (LDCM-PL - 120-277 - 010V - GR)

LDCM

Integrated fixture control with daylight and occupancy (Model number is specified with fixture)

WIZ100
Daintree Lighting Control
General Notes

1. Installer is responsible for the final location of all sensors, switches and controllers, and for conforming with the manufacturer’s recommendations and meeting the functional requirements of the system.

2. ControlScope utilizes distributed control for on/off and dim state. Existing relay panels and line-side switches must be overridden or removed. All wireless adapters must be provided with uninterrupted/unswitched power.

3. During installation, the last four digits of the IEEE address for each wireless component must be recorded on the shop drawing set corresponding to the location of the component.

4. During wireless adapter installation, follow these steps as defined in the device installation guide in the following order:
   - Confirm wireless adapter DIP switches are set correctly.
   - Reset adapter (all adapters).
   - Perform proper test suite.

5. Installer must become familiar with the published installation guides for the products in the project scope. Daintree installation guides can be found at Daintree.net/resources/development-tools/.

Daintree Power/Receptacle Control
General Notes

1. Installer is responsible for the final location of all sensors, switches and controllers, and for conforming with the manufacturer’s recommendations and meeting the functional requirements of the system.

2. ControlScope utilizes distributed control for on/off and dim state. Existing relay panels and line-side switches must be overridden or removed. All wireless adapters must be provided with uninterrupted/unswitched power.

3. During installation, the last four digits of the IEEE address for each wireless component must be recorded on the shop drawing set corresponding to the location of the component.

4. During wireless adapter installation, follow these steps as defined in the device installation guide in the following order:
   - Confirm wireless adapter DIP switches are set correctly.
   - Reset adapter (all adapters).
   - Perform proper test suite.

5. Installer must become familiar with the published installation guides for the products in the project scope. Daintree installation guides can be found at Daintree.net/resources/development-tools/.

Daintree Mechanical Control
General Notes

1. All wireless adapters must be provided with uninterrupted/unswitched power. WSA10 wireless sensor adapters require 24V power.

2. During installation, the last four digits of the IEEE address for each wireless component must be recorded on the shop drawing set corresponding to the location of the component.

3. For any sensors attached to a wireless adapter, the last four digits of the IEEE address for the respective adapter must be recorded.

4. During wireless adapter installation, follow these steps as defined in the device installation guide in the following order:
   - Confirm wireless adapter DIP switches are set correctly.
   - Reset adapter (all adapters).
   - Perform proper test suite.

5. Installer must become familiar with the published installation guides for the products in the project scope. Daintree installation guides can be found at Daintree.net/resources/development-tools/.

6. Electrical contractor is responsible for procurement and install of Daintree and related components pertaining to IT/data, lighting, power and HVAC.
Daylight Zone Requirements

**Daylight Zone Requirements**
- Sidelight daylight zones should be controlled separately from toplighted zones.
- The north, south, east and west zones should be controlled separately.

**Daylight Zone Exceptions**
- Total lighting power is 150W or less.
- Total glazing area is 24 sq. ft. or less.
- There may be additional exceptions based on space type, window area, neighboring obstructions and glass transmittance.

*Please refer to the energy code.*

**Sidelighting (Window)**

**Toplighting (Skylight)**
How to Use This Guide

Room type

Description of the lighting behavior for the space

List of control strategies being deployed in this scenario

Important notes related to the proposed solution

Wiring diagram showing the light fixtures, placement of control devices and line voltages

Bill of materials for the solution being described
Atrium: Fixed Zone

- Each WA100-PM is capable of supporting 5mA sink or source on its 0–10V dimming circuit and can provide on/off via its line voltage relay. Ensure zones are designed with respect to the lighting drivers used.
- Emergency zones should be fitted with a shunt relay (per WA100-PM), which would bypass normal controls and cause the light level to change to 100% after a loss of normal power.
CONTROL STRATEGIES

SCHEDULING

• Lights turn on and off based on time clock scheduling for normal occupied hours. Max light level trimmed to 80%.
• Lights automatically adjust brightness based on daylight availability.

TOP TRIMMING

• Occupants may use wall dimmers to set desired light levels.
• Scene control is optional.
• Lights on nonemergency circuits turn off when the area is vacant for at most 20 minutes.

MANUAL CONTROL

DAYLIGHT HARVESTING

SCENE CONTROL

EMERGENCY LIGHTING

LIGHTING BEHAVIOR

SOLUTION COMPONENTS

<table>
<thead>
<tr>
<th>Picture</th>
<th>Symbol</th>
<th>Model Number</th>
<th>Description</th>
<th>Quantity</th>
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<tr>
<td><img src="image1.png" alt="Image" /></td>
<td>WAPM</td>
<td>WA100-PM</td>
<td>Wireless lighting control adapter</td>
<td>4</td>
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<tr>
<td><img src="image2.png" alt="Image" /></td>
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<td>WWD1</td>
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<tr>
<td><img src="image3.png" alt="Image" /></td>
<td>OS</td>
<td>WOS2-CM-E</td>
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<tr>
<td><img src="image4.png" alt="Image" /></td>
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<td>WPS1</td>
<td>Wireless photocell</td>
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</tr>
<tr>
<td><img src="image5.png" alt="Image" /></td>
<td>$3</td>
<td>WWS3**</td>
<td>Wireless 3-button switch</td>
<td>1</td>
</tr>
</tbody>
</table>

* Top trimming maximum light output is not required by code, but is a recommended practice for energy savings.
** Optional; can be used for scene control or control of more than one WA100-PM instead of or in addition to a WWD1.
• Each WA100-PM is capable of supporting 5mA sink or source on its 0–10V dimming circuit and can provide on/off via its line voltage relay. Ensure zones are designed with respect to the lighting drivers used.
CONTROL STRATEGIES

OCCUPANCY/VACANCY CONTROL

TOP TRIMMING

LIGHTING BEHAVIOR
- Lights turn on automatically to 50% when an occupant enters the space. Max light level trimmed to 80%.
- Occupants may use wall dimmers to set desired light levels.
- All lights automatically turn off within 20 minutes after all occupants exit.

SOLUTION COMPONENTS

<table>
<thead>
<tr>
<th>Picture</th>
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<tr>
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<td><img src="image2.png" alt="Symbol WA100-PM" /></td>
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<tr>
<td><img src="image3.png" alt="Wireless wall dimmer" /></td>
<td><img src="image4.png" alt="Symbol WWD1" /></td>
<td>WWD1</td>
<td>Wireless wall dimmer</td>
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* Top trimming maximum light output is not required by code but is a recommended practice for energy savings.
Break Room: Granular
CONTROL STRATEGIES

**OCCUPANCY/VACANCY CONTROL**

**TOP TRIMMING**

**MANUAL CONTROL**

**SCENE CONTROL**

LIGHTING BEHAVIOR

- Lights turn on automatically to 50% when an occupant enters the space. Max light level trimmed to 80%.
- Occupants may use wall dimmers to set desired light levels.
- All lights automatically turn off within 20 minutes after all occupants exit.

SOLUTION COMPONENTS

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<tr>
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<td>WIZ100</td>
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<td>WOS2-CM-E</td>
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<tr>
<td><img src="image4.png" alt="3-button Switch Symbol" /></td>
<td>WWS3**</td>
<td>WWS3**</td>
<td>Wireless 3-button switch</td>
<td>1</td>
</tr>
</tbody>
</table>

* Top trimming maximum light output is not required by code but is a recommended practice for energy savings.

** Optional; can be used for scene control or control of more than one WA100-PM instead of or in addition to a WWD1.
Conference Room: Fixed Zone

- Each WA100-PM is capable of supporting 5mA sink or source on its 0–10V dimming circuit and can provide on/off via its line voltage relay. Ensure zones are designed with respect to the lighting drivers used.
CONTROL STRATEGIES

OCCUPANCY/VACANCY CONTROL

TOP TRIMMING

MANUAL CONTROL

DAYLIGHT HARVESTING

SCENE CONTROL

LIGHTING BEHAVIOR

• Lights turn on automatically to 50% when an occupant enters the space. Max light level trimmed to 80%.
• Lights adjust brightness based on daylight availability while the room is occupied. There is one perimeter daylighting zone.
• Occupants may use wall dimmers to set desired light levels.
• All lights automatically turn off within 20 minutes after all occupants exit.

SOLUTION COMPONENTS

<table>
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<tr>
<td></td>
<td><img src="image" alt="WAPM" /></td>
<td>WA100-PM</td>
<td>Wireless lighting control adapter</td>
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</tr>
<tr>
<td><img src="image" alt="WWD1" /></td>
<td></td>
<td>WWD1</td>
<td>Wireless wall dimmer</td>
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</tr>
<tr>
<td><img src="image" alt="WOS2-CM-E" /></td>
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<td>WOS2-CM-E</td>
<td>Wireless PIR occupancy sensor</td>
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<td><img src="image" alt="WPS1" /></td>
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<td>Wireless photocell</td>
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<tr>
<td><img src="image" alt="WWS3**" /></td>
<td></td>
<td>WWS3**</td>
<td>Wireless 3-button switch</td>
<td>1</td>
</tr>
</tbody>
</table>

* Top trimming maximum light output is not required by code but is a recommended practice for energy savings.
** Optional; can be used for scene control or control of more than one WA100-PM instead of or in addition to a WWD1.
Conference Room: Granular

Line-Voltage Wiring

Window
CONTROL STRATEGIES

**OCCUPANCY/VACANCY CONTROL**

**TOP TRIMMING**

**MANUAL CONTROL**

**DAYLIGHT HARVESTING**

**SCENE CONTROL**

LIGHTING BEHAVIOR

- Lights turn on automatically to 50% when an occupant enters the space. Max light level trimmed to 80%.
- Lights adjust brightness based on daylight availability while the room is occupied. There is one perimeter daylighting zone.
- Occupants may use wall dimmers to set desired light levels.
- All lights automatically turn off within 20 minutes after all occupants exit.

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<td><img src="image" alt="WIZ100" /></td>
<td>WIZ100</td>
<td>Integrated fixture control with daylight and occupancy</td>
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<td><img src="image" alt="WWD1" /></td>
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<td>Wireless wall dimmer</td>
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<td><img src="image" alt="WWS3**" /></td>
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<td>Wireless 3-button switch</td>
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</table>

* Top trimming maximum light output is not required by code but is a recommended practice for energy savings.

** Optional; can be used for scene control or control of more than one WA100-PM instead of or in addition to a WWD1.
Egress Corridor: Fixed Zone

- Each WA100-PM is capable of supporting 5mA sink or source on its 0–10V dimming circuit and can provide on/off via its line voltage relay. Ensure zones are designed with respect to the lighting drivers used.
- Add a daylight sensor for corridors with daylight zones.
- Emergency fixtures may require a shunt relay (per WA100-PM), which would bypass normal controls and cause the light level to change to 100% after a loss of normal power.
- Emergency fixture will dim but not turn off.
- If full-off is desired, a separate wireless adapter may be used at the emergency fixture. Locating the WA100 for the zone at the emergency fixture will also allow for this. A shunt relay will be required.
LIGHTING BEHAVIOR

• Lights turn on automatically to maximum when an occupant enters. Max light level trimmed to 80%.
• Occupants may use wall dimmers to set desired light levels.

• Lights connected to emergency zones default to 100% output during a power loss.
• Lights on nonemergency circuits turn off when the area is vacant for at most 20 minutes.

SOLUTION COMPONENTS

<table>
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<tr>
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<td>2</td>
</tr>
</tbody>
</table>

*Top trimming maximum light output is not required by code but is a recommended practice for energy savings.*
Egress Corridor: Granular

- Emergency fixtures may require a shunt relay (per WA100-PM), which would bypass normal controls and cause the light level to change to 100% after a loss of normal power.
CONTROL STRATEGIES

OCCUPANCY/VACANCY CONTROL

• Lights turn on automatically to maximum when an occupant enters. Max light level trimmed to 80%.
• Occupants may use wall dimmers to set desired light levels.

MANUAL CONTROL

• Lights connected to emergency circuits default to 100% output during a power loss.
• Lights on nonemergency circuits turn off when the area is vacant for at most 20 minutes.

LIGHTING BEHAVIOR

TOP TRIMMING*

SOLUTION COMPONENTS

<table>
<thead>
<tr>
<th>Picture</th>
<th>Symbol</th>
<th>Model Number</th>
<th>Description</th>
<th>Quantity</th>
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<tbody>
<tr>
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</tr>
</tbody>
</table>

* Top trimming maximum light output is not required by code but is a recommended practice for energy savings.
Egress Stairwell: Fixed Zone

- Emergency fixtures may require a shunt relay (per WA100-PM), which would bypass normal controls and cause the light level to change to 100% after a loss of normal power.
CONTROL STRATEGIES

LIGHTING BEHAVIOR

- Lights turn on automatically to maximum when an occupant enters. Max light level trimmed to 80%.
- Lights connected to emergency circuits default to 100% output during a power loss.
- Lights dim to 10% when the area is vacant for at most 20 minutes.

SOLUTION COMPONENTS

<table>
<thead>
<tr>
<th>Picture</th>
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<tbody>
<tr>
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<td>EM X</td>
<td>RRU-X</td>
<td>Shunt relay (0–10v)</td>
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</tr>
</tbody>
</table>

* Top trimming maximum light output is not required by code but is a recommended practice for energy savings.
• Emergency fixtures may require a shunt relay (per WA100-PM), which would bypass normal controls and cause the light level to change to 100% after a loss of normal power.
CONTROL STRATEGIES

LIGHTING BEHAVIOR

- Lights turn on automatically to maximum when an occupant enters. Max light level trimmed to 80%.
- Lights connected to emergency circuits default to 100% output during a power loss.
- Lights dim to 10% when the area is vacant for at most 20 minutes.

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<tbody>
<tr>
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<td>Integrated fixture control with daylight and occupancy</td>
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<tr>
<td><img src="Image" alt="Shunt rele" /></td>
<td>EM X</td>
<td>RRU-X</td>
<td>Shunt relay (0–10v)</td>
<td>2</td>
</tr>
</tbody>
</table>

* Top trimming maximum light output is not required by code but is a recommended practice for energy savings.
Multistall Restroom: Fixed Zone

- Each WA100-PM is capable of supporting 5mA sink or source on its 0–10V dimming circuit and can provide on/off via its line voltage relay. Ensure zones are designed with respect to the lighting drivers used.
- Emergency fixtures may require a shunt relay (per WA100-PM), which would bypass normal controls and cause the light level to change to 100% after a loss of normal power.
CONTROL STRATEGIES

LIGHTING BEHAVIOR
- Lights turn on automatically to maximum when an occupant enters. Max light level trimmed to 80%.
- Occupants may use wall dimmers to set desired light levels.
- All lights automatically turn off within 20 minutes after all occupants exit.
- Lights connected to emergency circuits default to 100% output during a power loss.

SOLUTION COMPONENTS

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<thead>
<tr>
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<th>Description</th>
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</table>

*Top trimming maximum light output is not required by code but is a recommended practice for energy savings.*
• Each WA100-PM is capable of supporting 5mA sink or source on its 0–10V dimming circuit and can provide on/off via its line voltage relay. Ensure zones are designed with respect to the lighting drivers used.
• Each control zone must be no larger than 600 sq. ft.
• All control zones in the open office area must be turned off if no activity is detected in any zone for 20 minutes.
• Emergency fixtures may require a shunt relay (per WA100-PM), which would bypass normal controls and cause the light level to change to 100% after a loss of normal power.
CONTROL STRATEGIES

OCCUPANCY/VACANCY CONTROL

• Lights turn on automatically when an occupant enters the zone. Max lighting capped at 80%.
• Lights adjust brightness based on daylight availability while the room is occupied. There is one perimeter daylighting zone.
• Occupants may use wall dimmers to set desired light levels.

TOP TRIMMING

• Lights turn off when a zone is vacant for at most 20 minutes.
• Lights connected to emergency circuits default to 100% output during a power loss.

DAYLIGHT HARVESTING

EMERGENCY LIGHTING

LIGHTING BEHAVIOR

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</tbody>
</table>

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Each control zone must be no larger than 600 sq. ft.

All control zones in the open office area must be turned off if no activity is detected in any zone for 20 minutes.

Emergency fixtures may require a shunt relay (per WA100-PM), which would bypass normal controls and cause the light level to change to 100% after a loss of normal power.
CONTROL STRATEGIES

**OCCUPANCY/VACANCY CONTROL**
- Lights turn on automatically when an occupant enters the zone. Max lighting capped at 80%.
- Lights adjust brightness based on daylight availability while the room is occupied. There is one perimeter daylighting zone.
- Occupants may use wall dimmers to set desired light levels.

**TOP TRIMMING**

**MANUAL CONTROL**

**DAYLIGHT HARVESTING**
- Lights turn off when a zone is vacant for at most 20 minutes.
- Lights connected to emergency circuits default to 100% output during a power loss.

**EMERGENCY LIGHTING**

LIGHTING BEHAVIOR

**SOLUTION COMPONENTS**

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</table>

* Top trimming maximum light output is not required by code but is a recommended practice for energy savings.
Private Office: Fixed Zone

- Each WA100-PM is capable of supporting 5mA sink or source on its 0–10V dimming circuit and can provide on/off via its line voltage relay. Ensure zones are designed with respect to the lighting drivers used.
- Due to the size of the room, daylighting controls need to be installed individually. This can be done by field installing an adapter or ordering an integrated granular fixture.
CONTROL STRATEGIES

OCCUPANCY/VACANCY CONTROL

• Lights turn on automatically to 50% when an occupant enters the space. Max light level trimmed to 80%.
• Lights adjust brightness based on daylight availability while the room is occupied. There is one perimeter daylighting zone.

TOP TRIMMING

• Occupants may use wall dimmers to set desired light levels.
• All lights automatically turn off within 20 minutes after all occupants exit.

MANUAL CONTROL

DAYLIGHT HARVESTING

LIGHTING BEHAVIOR

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Private Office: Granular
CONTROL STRATEGIES

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