

ASHRAE 90.1 (2016)
DLM WIRELESS

COMMERCIAL SPACES BY CODE DESIGN GUIDE



Commercial energy codes are the foundation for a lighting control design specification. Every three years, the ASHRAE 90.1 energy code changes and while states and municipalities decide when to implement the changes, eventually the changes will become the new minimum compliance for design. Legrand® is an expert in Code Compliant Education and Training. The Wattstopper® product line leads the way in simple, flexible, and scalable code compliant, energy efficient lighting controls solutions.

Code compliance is often seen as a hindrance to business with added cost and changes in on-hand inventory needs. The code compliance team at Legrand see changes in code compliance as an opportunity for innovations and improved energy efficiency. The Wattstopper ASHRAE 90.1 (2016) Commercial Spaces by Code Design Guide provides designers and contractors with tools and design recommendations for common commercial spaces. Working together as partners, we can educate and simplify code compliant solutions for distribution and designers.

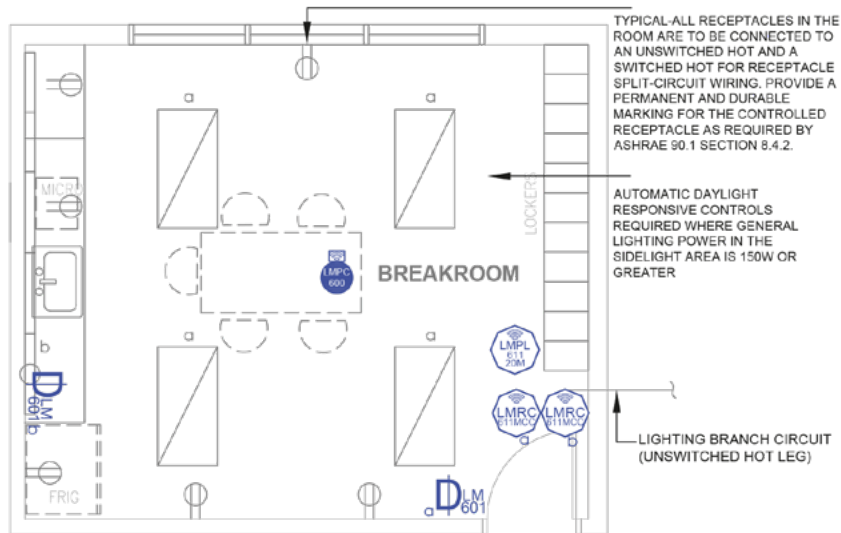
Download Legrand's code compliance tools and resources at
<https://legrand.us/codesolutions>

CONTENTS

- Breakroom / Kitchen
- Classroom
- Conference Room
- Large Private Office
- Multi-Stall Restroom
- Open Office
- Small Conference Room
- Small Office

designed to be better.™





BILL OF MATERIALS (Click product name to learn more)

LMRC-611MCC (2)	Wireless 1-Relay Room Controller, 0-10V Dimming Metering, Contact Closure
LMPC-600 (1)	Wireless PIR Ceiling Occupancy Sensor, Extended Lens
LMDM-601 (2)	Wireless 1-Button Dimming Switch
LMPL-611-20M (1)	Wireless 1 Relay Plug Load Controller, Metering
Optional: LMPC-600-RPM	Recessed Plenum Mounting Kit

CODE REQUIREMENTS

9.4.1.1(a)	Local Control Device
9.4.1.1(b, c)	Manual On / Partial Auto On
9.4.1.1(d)	Bi-level Control
9.4.1.1(h)	Auto Full Off
9.4.1.3	Special Application Lighting
8.4.2	Auto Receptacle Control

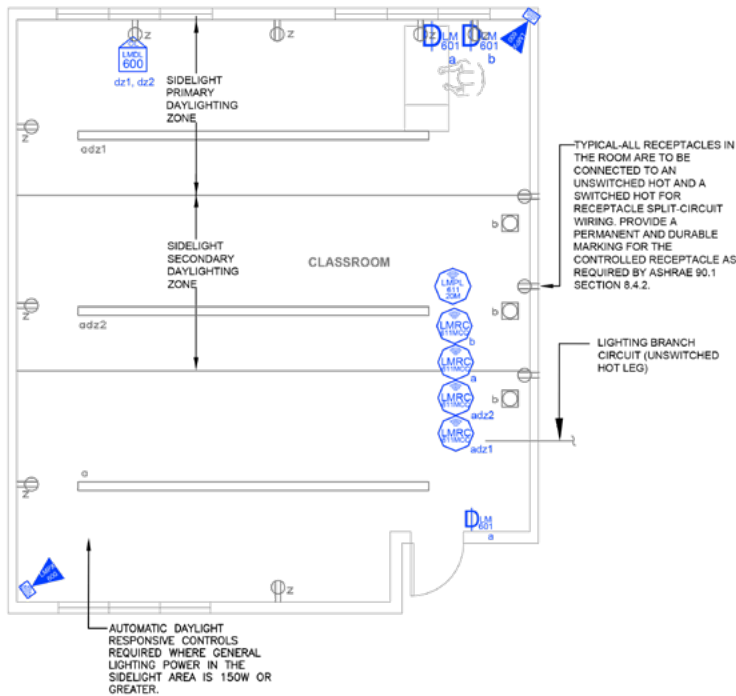
SEQUENCE OF OPERATION

1. Lighting (a) auto On to 50% and controlled receptacles auto On when occupancy detected.
2. Manual On/Off and bi-level 50% control of general lighting (a) with wall switch occupancy dimmer.
3. Manual On/Off control under cabinet lighting (b) with switch.
4. Auto off all lighting and controlled receptacles within 20 minutes of occupants leaving.

DESIGN CONSIDERATIONS

- Time scheduling and remote programming functions are enabled by connectivity to a LMBR-650 Border Router.
- To integrate occupancy detection control with the HVAC system, use contact outputs on the LMRC-611MCC.
- System Configuration Tools:
 - Standalone rooms use the configuration application (Apple or Android)
 - Networked rooms (with the LMBR-650) can be configured using LMCS-100.

ASHRAE 90.1 (2016) Compliant Space <5000Ft² Dimming with Wireless DLM product



BILL OF MATERIALS (Click product name to learn more)

LMRC-611MCC (4)	Wireless 1-Relay Room Controller, 0-10V Dimming Metering, Contact Closure
LMPX-600-1 (2)	Wireless PIR Corner/Wall Occupancy Sensor, Extended Lens
LMDM-601 (3)	Wireless 1-Button Dimming Switch
LMDL-600 (1)	Wireless Photosensor, Open Loop
LMPL-611-20M (1)	Wireless 1 Relay Plug Load Controller, Metering
Optional: LMDL-600-RPM	Recessed Plenum Mounting Kit

SEQUENCE OF OPERATION

1. General lighting (a, adz1, adz2) auto On to 50% and controlled receptacles auto on when occupancy detected.
2. Manual On/Off/Dim general lighting (a, adz1, adz2) with dimmer switches.
3. Manual On/Off/Dim white board lighting (b) with dimmer switch.
4. Lighting in primary (adz1) and secondary (adz2) daylight zones will continuously dim based on daylight contribution to maintain at least 35FC at task level.
5. Auto off all lighting and controlled receptacles within 20 minutes of occupants leaving.

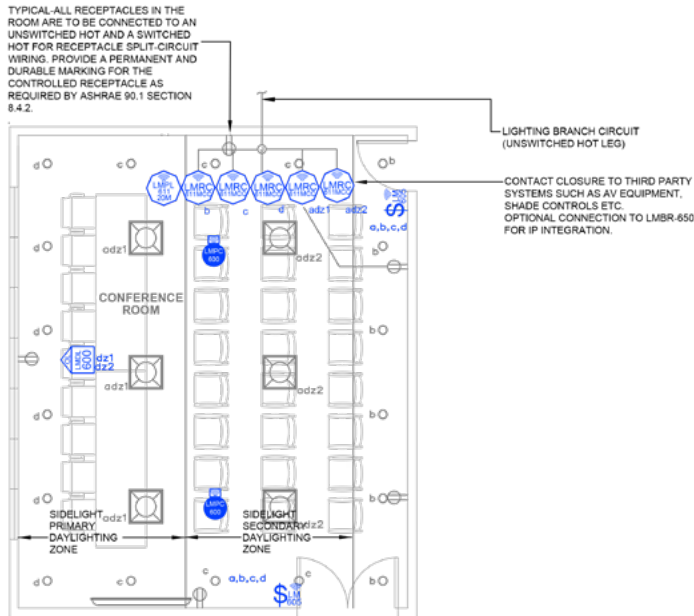
DESIGN CONSIDERATIONS

- Time scheduling and remote programming functions are enabled by connectivity to a LMBR-650 Border Router.
- To integrate occupancy detection control with the HVAC system, use contact outputs on the LMRC-611MCC.
- System Configuration Tools:
 - Standalone rooms use the configuration application (Apple or Android)
 - Networked rooms (with the LMBR-650) can be configured using LMCS-100.

CODE REQUIREMENTS

9.4.1.1(a)	Local Control Device
9.4.1.1(b, c)	Manual On / Partial Auto On
9.4.1.1(d)	Bi-level Control
9.4.1.1(e)	Auto Daylight Responsive
9.4.1.1(h)	Auto Full Off
9.4.1.3	Special Application Lighting
8.4.2	Auto Receptacle Control

ASHRAE 90.1 (2016) Compliant Space <5000Ft² Dimming with Wireless DLM product



BILL OF MATERIALS (Click product name to learn more)

LMRC-611MCC (5)	Wireless 1-Relay Room Controller, 0-10V Dimming Metering, Contact Closure
LMPC-600 (2)	Wireless Ceiling Mount Occupancy Sensor, Extended Lens
LMSW-605 (2)	Wireless Digital 5-Button Scene Switch
LMDL-600 (1)	Wireless Photosensor, Open Loop
LMPL-611-20M (1)	Wireless 1 Relay Plug Load Controller, Metering
Optional:	LMPC-600-RPM, Recessed Plenum Mounting Kit
Optional:	LMDL-600-RPM, Recessed Plenum Mounting Kit

SEQUENCE OF OPERATION

- General lighting (a, adz1, adz2) auto On to 50% and controlled receptacles auto On when occupancy detected.
- Manual On/Off/Dim general lighting (a, adz1, adz2) and down lighting (b, c, d) with scene switches.
- Scene settings

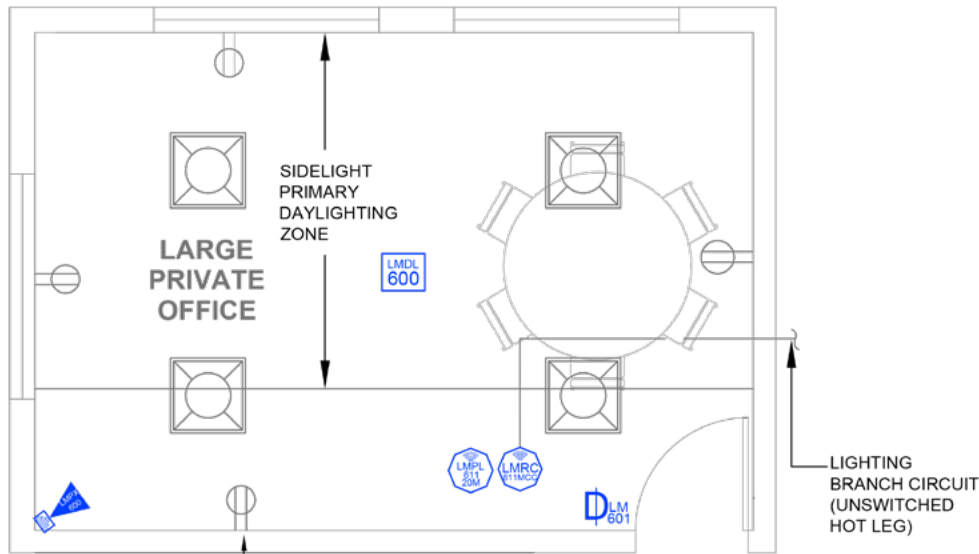
a. General Lighting	(a, adz1, adz2)	100%	(b) 0%	(c) 0%	(d) 0%
b. Projection	(a, adz1, adz2)	0%	(b) 75%	(c) 50%	(d) 0%
c. Conferencing	(a, adz1, adz2)	50%	(b) 50%	(c) 25%	(d) 50%
d. All Off	(a, adz1, adz2)	0%	(b) 0%	(c) 0%	(d) 0%
- Lighting in primary (adz1) and secondary (adz2) daylight zones will continuously dim based on daylight contribution to maintain at least 35FC at task level.
- Auto off all lighting, controlled receptacles, A/V systems within 20 minutes of occupants leaving.

CODE REQUIREMENTS

9.4.1.1(a)	Local Control Device
9.4.1.1(b, c)	Manual On / Partial Auto On
9.4.1.1(d)	Bi-level Control
9.4.1.1(e)	Auto Daylight Responsive
9.4.1.1(h)	Auto Full Off
8.4.2	Auto Receptacle Control

DESIGN CONSIDERATIONS

- Time scheduling, demand response and remote programming/diagnostic functions are enabled with installation of the LMBC-300 Network Bridge for system connectivity.
- To integrate occupancy detection control with the HVAC System, use a LMRL-100 Isolated Relay Interface.
- System Configuration Tools:
 - Standalone rooms use the configuration application (Apple or Android)
 - Networked rooms (with the LMBR-650) can be configured using LMCS-100.



TYPICAL-ALL RECEPTACLES IN THE ROOM ARE TO BE CONNECTED TO AN UNSWITCHED HOT AND A SWITCHED HOT FOR RECEPTACLE SPLIT-CIRCUIT WIRING. PROVIDE A PERMANENT AND DURABLE MARKING FOR THE CONTROLLED RECEPTACLE AS REQUIRED BY ASHRAE 90.1 SECTION 8.4.2.

BILL OF MATERIALS (Click product name to learn more)

LMRC-611MCC (1)	Wireless 1-Relay Room Controller, 0-10V Dimming Metering, Contact Closure
LMPX-600 (1)	Wireless PIR Corner/Wall Occupancy Sensor
LMDM-601 (1)	Wireless 1-Button Dimming Switch
LMDL-600 (1)	Wireless Photosensor, Open Loop
LMPL-611-20M (1)	Wireless 1 Relay Plug Load Controller, Metering
Optional:	LMDL-600-RPM, Recessed Plenum Mounting Kit

CODE REQUIREMENTS

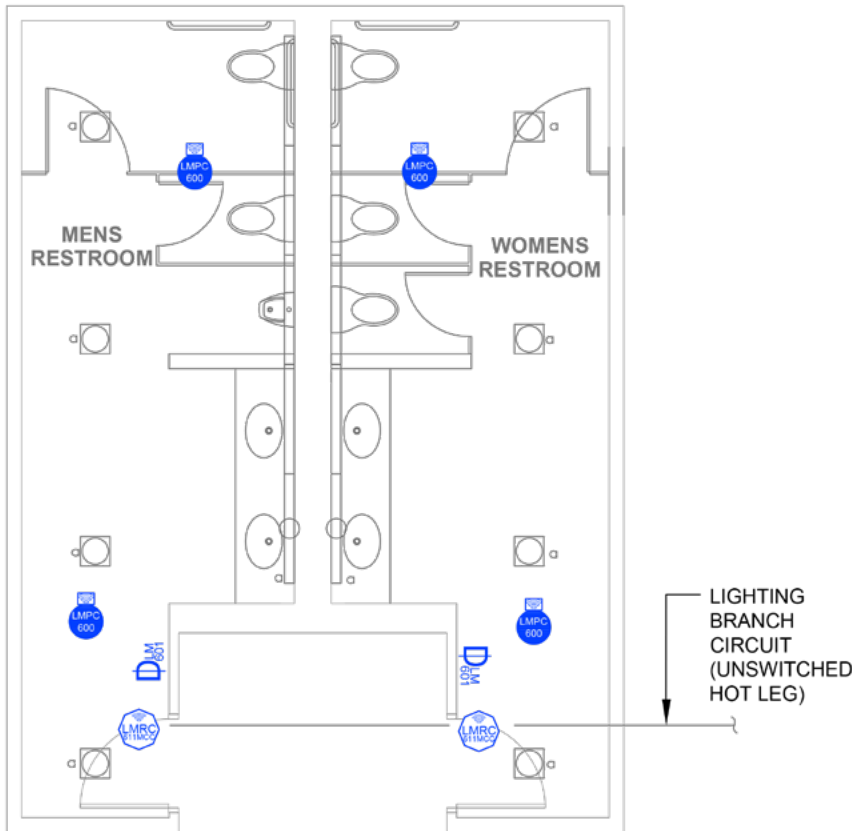
9.4.1.1(a)	Local Control Device
9.4.1.1(b, c)	Manual On / Partial Auto On
9.4.1.1(d)	Bi-level Control
9.4.1.1(e)	Auto Daylight Responsive
9.4.1.1(h)	Auto Full Off
8.4.2	Auto Receptacle Control

SEQUENCE OF OPERATION

1. Lighting auto On to 50% and controlled receptacles auto On when occupancy detected.
2. Manual On/Off/Dim lighting with dimmer switch.
3. Lighting in primary daylight zone will continuously dim based on daylight contribution to maintain at least 35FC at task level.
4. Auto off all lighting and controlled receptacles within 20 minutes of occupants leaving.

DESIGN CONSIDERATIONS

- Time scheduling, demand response and remote programming/diagnostic functions are enabled with installation of the LMBC-300 Network Bridge for system connectivity.
- To integrate occupancy detection control with the HVAC System, use a LMRL-100 Isolated Relay Interface.
- To integrate occupancy detection control with the HVAC system, use contact outputs on the LMRC611MCC.



SEQUENCE OF OPERATION

1. For each restroom independently, lighting auto On to 100% and exhaust fan auto on when occupancy detected.
2. Manual On/Off with local control switch.
3. Auto off all lighting and exhaust fans for each restroom independently within 20 minutes of occupants leaving.

DESIGN CONSIDERATIONS

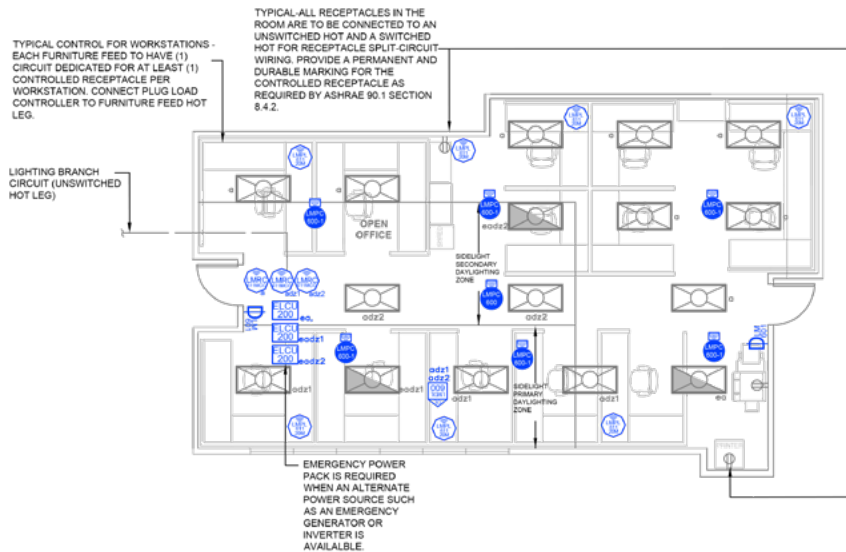
- Time scheduling and remote programming functions are enabled by connectivity to a LMBR-650 Border Router.
- To integrate occupancy detection control with the HVAC system, use contact outputs on the LMRC-611MCC.
- System Configuration Tools:
 - Standalone rooms use the configuration application (Apple or Android)
 - Networked rooms (with the LMBR-650) can be configured using LMCS-100.

BILL OF MATERIALS (Click product name to learn more)

LMRC-611MCC (2)	Wireless 1-Relay Room Controller, 0-10V Dimming Metering, Contact Closure
LMPC-600 (4)	Wireless PIR Ceiling Occupancy Sensor, Extended Lens
LMDM-601 (2)	Wireless 1-Button Dimming Switch
Optional:	LMPC-600-RPM, Recessed Plenum Mounting Kit

CODE REQUIREMENTS

9.4.1.1(a)	Local Control Device
9.4.1.1(h)	Auto Full Off
6.4.3.4.4	Ventilation Fan Controls



BILL OF MATERIALS (Click product name to learn more)

LMRC-611MCC (3)	Wireless 1-Relay Room Controller, 0-10V Dimming Metering, Contact Closure
LMPC-600-1 (6)	Wireless PIR Ceiling Occupancy Sensor, Hi-Density Lens
LMPC-600 (1)	Wireless PIR Ceiling Occupancy Sensor, Extended Lens
LMDM-601 (2)	Wireless 1-Button Dimming Switch
LMDL-600 (1)	Wireless Photosensor, Open Loop
LMPL-611-20M (7)	Wireless 1 Relay Plug Load Controller, Metering
ELCU-200 (3)	UL924 Emergency Control Unit
Optional:	LMPC-600-RPM, Recessed Plenum Mounting Kit
Optional:	LMDL-600-RPM, Recessed Plenum Mounting Kit

SEQUENCE OF OPERATION

1. General lighting (a, adz1, adz2) auto On to 50% and controlled receptacles auto On when occupancy detected.
2. Manual On/Off/Dim general lighting (a, adz1, adz2) with dimmer switches.
3. Lighting in primary (adz1) and secondary (adz2) daylight zones will continuously dim based on daylight contribution to maintain at least 35FC at task level.
4. Auto off all lighting and controlled receptacles within 20 minutes of occupants leaving.
5. Emergency lighting transfers to emergency power source and full On with loss of normal power.

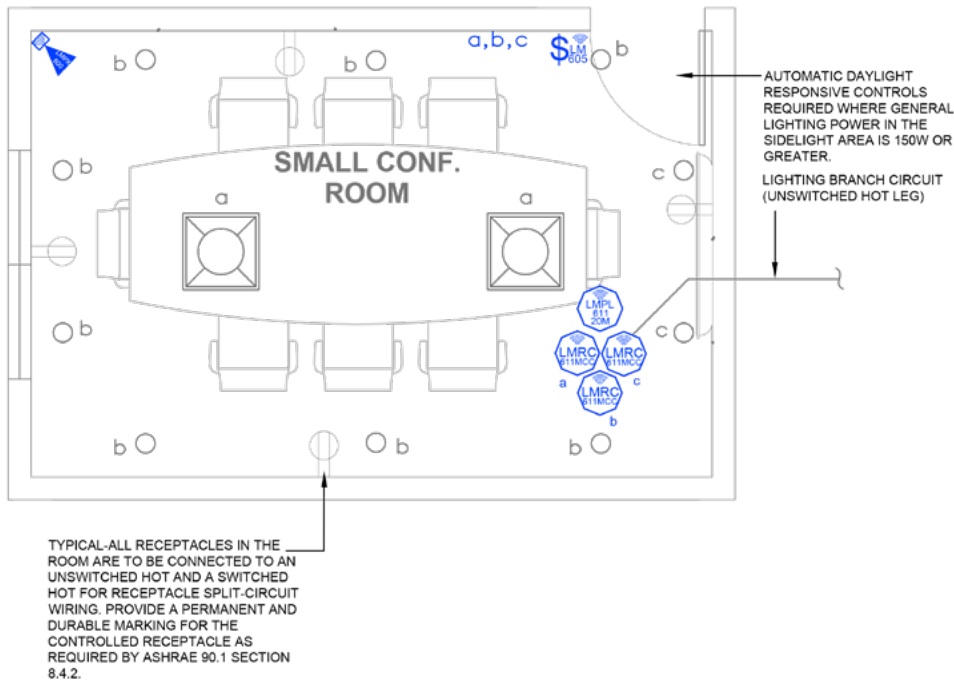
DESIGN CONSIDERATIONS

- Time scheduling and remote programming functions are enabled by connectivity to a LMBR-650 Border Router.
- To integrate occupancy detection control with the HVAC system, use contact outputs on the LMRC-611MCC.
- System Configuration Tools:
 - Standalone rooms use the configuration application (Apple or Android)
 - Networked rooms (with the LMBR-650) can be configured using LMCS-100.

CODE REQUIREMENTS

9.4.1.1(a)	Local Control Device
9.4.1.1(b, c)	Manual On / Partial Auto On
9.4.1.1(d)	Bi-level Control
9.4.1.1(e)	Auto Daylight Responsive
9.4.1.1(h)	Auto Full Off
8.4.2	Auto Receptacle Control

ASHRAE 90.1 (2016) Compliant Dimming with Wireless DLM product



SEQUENCE OF OPERATION

- General lighting (a) auto On to 50% and controlled receptacles auto On when occupancy detected.
- Manual On/Off/Dim of general lighting (a) and down lighting (b, c) with scene switch.
- Scene settings

a. General Lighting	(a) 100%	(b) 0%	(c) 0%
b. Presentation	(a) 75%	(b) 50%	(c) 100%
c. Video	(a) 20%	(b) 75%	(c) 0%
d. All Off	(a) 0%	(b) 0%	(c) 0%
- Auto off all lighting and controlled receptacles within 20 minutes of occupants leaving.

DESIGN CONSIDERATIONS

- Receptacle control can be designed using either an RF transmitter with receptacle RF receivers, or can be hardwired to receptacles using an LMPL-101 Plug Load Room Controller
- Time scheduling, demand response and remote programming/diagnostic functions are enabled with installation of the LMBC-300 Network Bridge for system connectivity.
- To integrate occupancy detection control with the HVAC System, use a LMRL-100 Isolated Relay Interface.

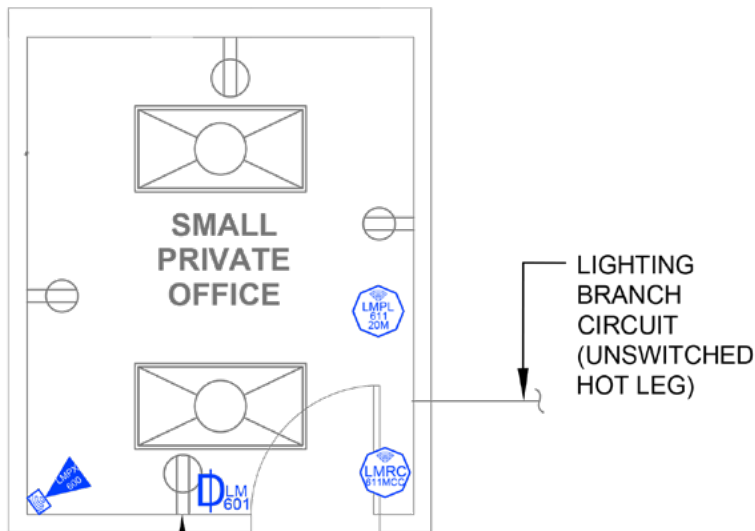
BILL OF MATERIALS (Click product name to learn more)

LMRC-611MCC (3)	Wireless 1-Relay Room Controller, 0-10V Dimming Metering, Contact Closure
LMPX-600-1 (1)	Wireless PIR Corner/Wall Occupancy Sensor, Extended Lens
LMSW-605 (1)	Wireless Digital 5-Button Scene Switch
LMPL-611-20M (1)	Wireless 1 Relay Plug Load Controller, Metering

CODE REQUIREMENTS

9.4.1.1(a)	Local Control Device
9.4.1.1(b, c)	Manual On / Partial Auto On
9.4.1.1(d)	Bi-level Control
9.4.1.1(h)	Auto Full Off
8.4.2	Auto Receptacle Control

ASHRAE 90.1 (2016) Compliant ≤250 SqFt Dimming with Wireless DLM product



TYPICAL ALL RECEPTACLES IN THE ROOM ARE TO BE CONNECTED TO AN UNSWITCHED HOT AND A SWITCHED HOT FOR RECEPTACLE SPLIT-CIRCUIT WIRING. PROVIDE A PERMANENT AND DURABLE MARKING FOR THE CONTROLLED RECEPTACLE AS REQUIRED BY ASHRAE 90.1 SECTION 8.4.2.

SEQUENCE OF OPERATION

1. Lighting (a) auto On to 50% and controlled receptacles auto On when occupancy detected.
2. Manual On/Off and bi-level 50% control of general lighting (a, b) with wall switch occupancy sensor.
3. Auto off all lighting and controlled receptacles within 20 minutes of occupants leaving.

DESIGN CONSIDERATIONS

- Time scheduling and remote programming functions are enabled by connectivity to a LMBR-650 Border Router.
- To integrate occupancy detection control with the HVAC system, use contact outputs on the LMRC-611MCC.
- System Configuration Tools:
 - Standalone rooms use the configuration application (Apple or Android)
 - Networked rooms (with the LMBR-650) can be configured using LMCS-100.

BILL OF MATERIALS (Click product name to learn more)

LMRC-611MCC (1)	Wireless 1-Relay Room Controller, 0-10V Dimming Metering, Contact Closure
LMPX-600 (1)	Wireless PIR Corner/Wall Occupancy Sensor
LMDM-601 (1)	Wireless 1-Button Dimming Switch
LMPL-611-20M (1)	Wireless 1 Relay Plug Load Controller, Metering

CODE REQUIREMENTS

9.4.1.1(a)	Local Control Device
9.4.1.1(b, c)	Manual On / Partial Auto On
9.4.1.1(d)	Bi-level Control
9.4.1.1(h)	Auto Full Off
8.4.2	Auto Receptacle Control