

ASHRAE 90.1 (2013)
DLM SOLUTIONS

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 (2013) 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>

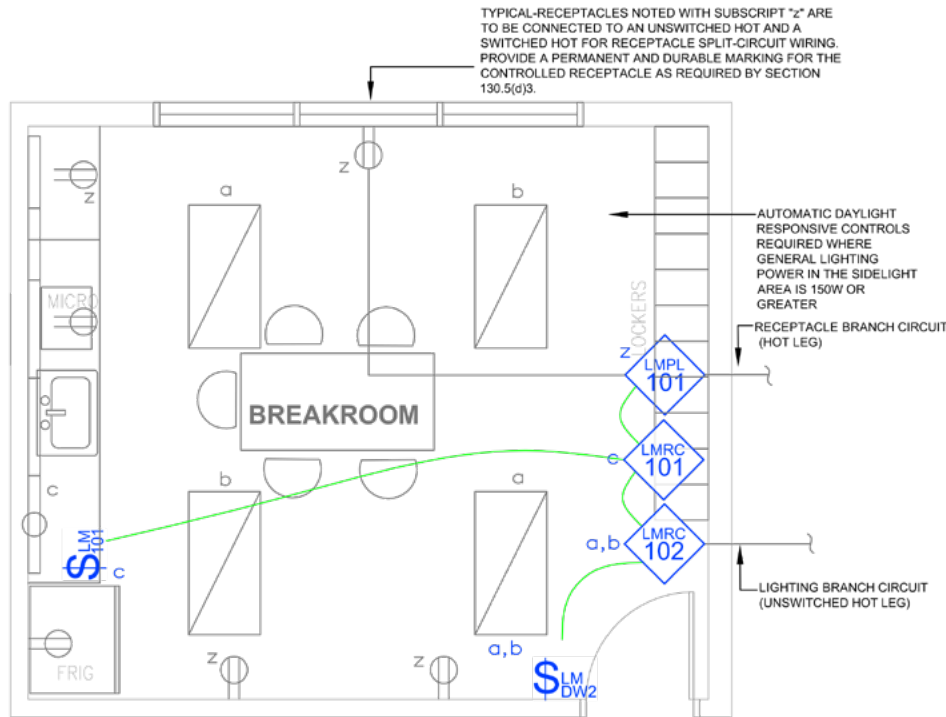
CONTENTS

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

designed to be better.™



ASHRAE 90.1 (2013) Compliant On/Off Switching with DLM Product



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. Manual On/Off control under cabinet lighting (c) with switch.
4. 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.
- A ceiling or corner mount occupancy sensor can be used instead of the wall switch occupancy sensor for larger rooms or to achieve a more specific area of occupancy detection coverage.
- 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.

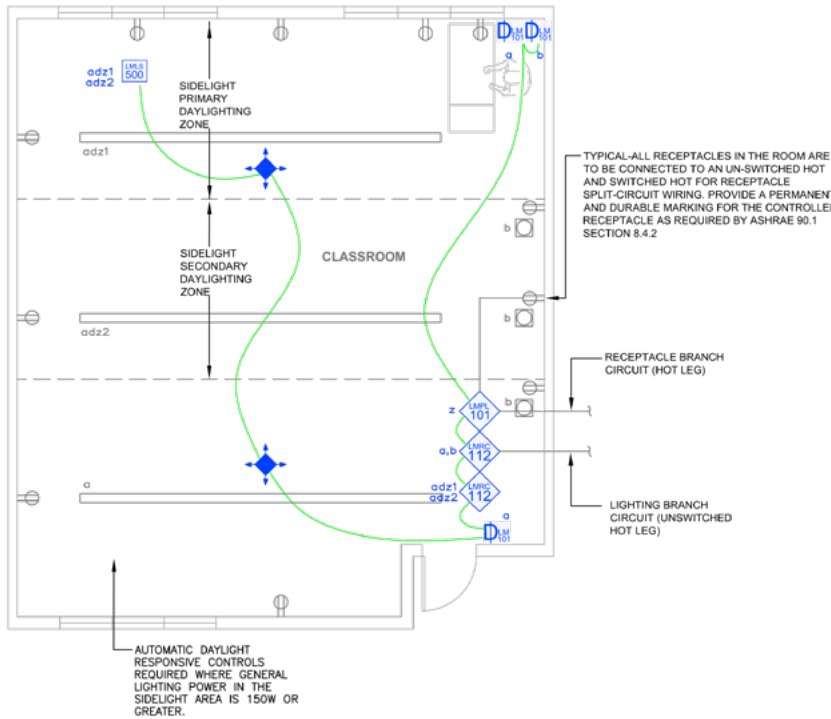
BILL OF MATERIALS

LMRC-101 (1)	1-Relay Room Controller
LMRC-102 (1)	2-Relay Room Controller
LMDW-102 (1)	2-Button Dual Tech Wall Switch Occupancy Sensor
LMSW-101 (1)	1-Button Digital Wall Switch
LMPL-101 (1)	Plug Load Room Controller
LMRJ	Pre-Terminated Cable

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 (2013) Compliant Space < 5000Ft², Dimming with DLM product



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

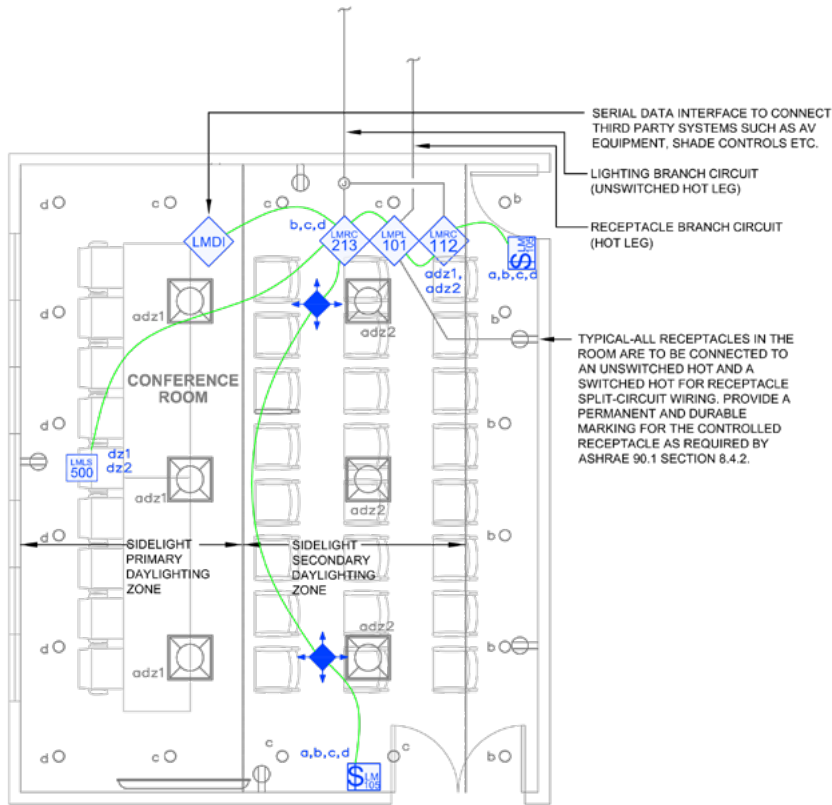
- Receptacle control can be designed using either an RF transmitter with receptacle RF receivers, or can be hardwired to receptacles using an LMPL-101 Plug Load Room Controller.
- Time scheduling, demand response and remote programming/diagnostic functions are enabled with installation of the LMBC-300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

BILL OF MATERIALS

LMRC-112 (2)	2-Relay Room Controller, 0-10V Dimming
LMDC-100 (2)	Ceiling Mount Dual Tech Occupancy Sensor
LMDM-101 (3)	1-Button Dimming Wall Switch
LMLS-500 (1)	Photosensor, Open Loop
LMPL-101 (1)	Plug Load Room Controller
LMRJ	Pre-Terminated Cable

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



BILL OF MATERIALS

LMRC-213 (1)	3-Relay Room Controller, 0-10V Dimming
LMRC-112 (1)	2-Relay Room Controller, 0-10V Dimming
LMDC-100 (2)	Ceiling Mount Dual Tech Occupancy Sensor
LMSW-105 (2)	5-Button Scene Switch
LMLS-500 (1)	Photosensor, Open Loop
LMPL-101 (1)	Plug Load Room Controller
LMDI-100 (1)	Serial Data (A/V) Interface
LMRJ	Pre-Terminated Cable

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

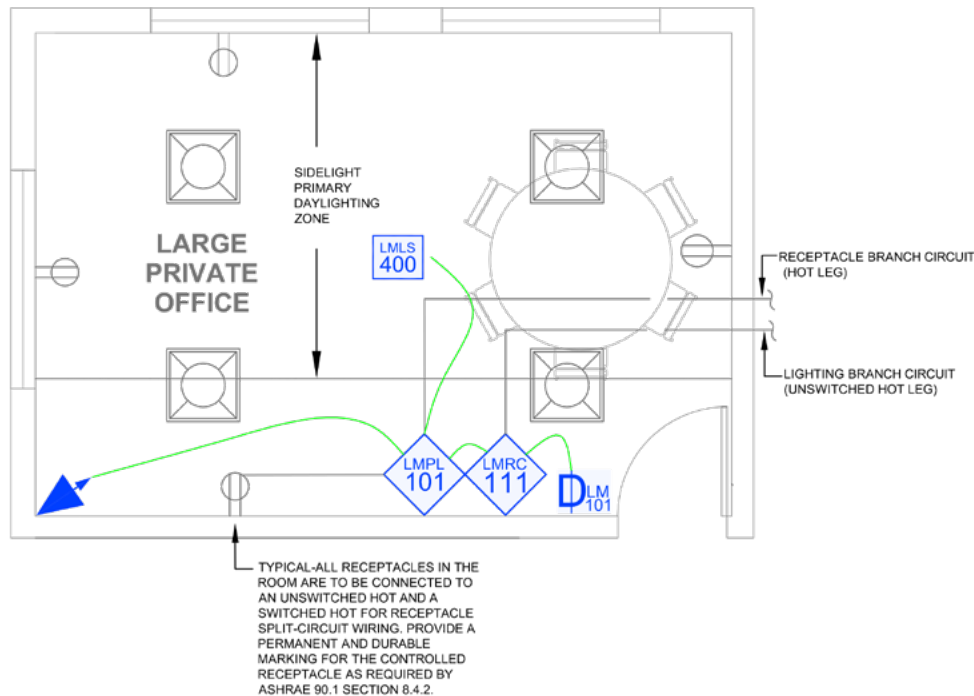
DESIGN CONSIDERATIONS

- 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.

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) and down lighting (b, c, d) with scene switches.
3. 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%
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, controlled receptacles, A/V systems within 20 minutes of occupants leaving.



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

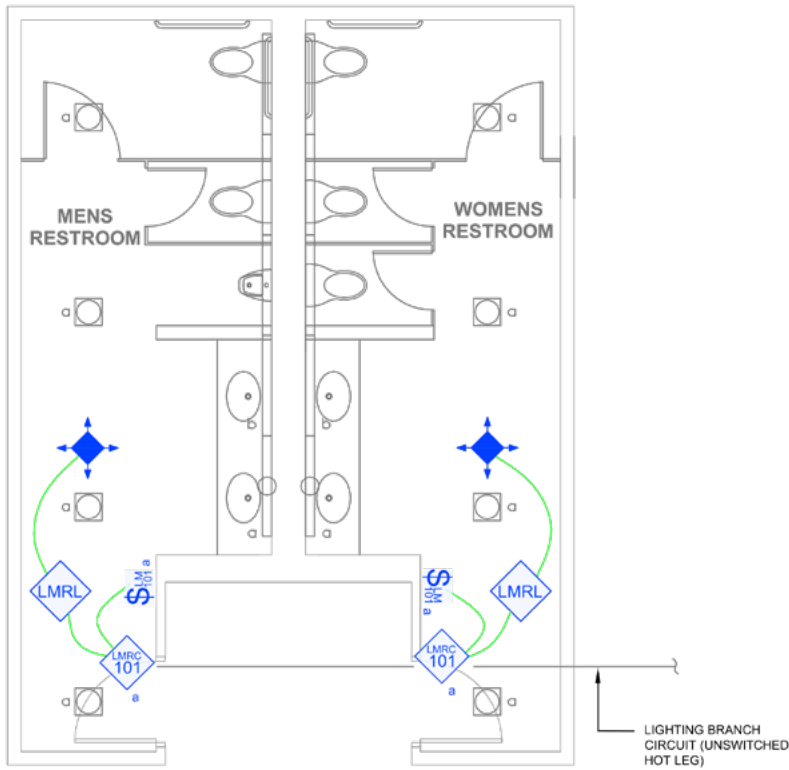
- Receptacle control can be designed using either an RF transmitter with receptacle RF receivers, or can be hardwired to receptacles using an LMPL-101 Plug Load Room Controller.
- Time scheduling, demand response and remote programming/diagnostic functions are enabled with installation of the LMBC-300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

BILL OF MATERIALS

LMRC-111 (1)	1-Relay Room Controller, 0-10V Dimming
LMDX-100 (1)	Corner Mount Dual Tech Occupancy Sensor
LMDM-101 (1)	1-Button Dimming Wall Switch
LMLS-400 (1)	Photosensor, Closed Loop
LMPL-101 (1)	Plug Load Room Controller
LMRJ	Pre-Terminated Cable

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. 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

- It is important that each restroom (men and women) operate independently and be isolated for correct auto configuration and operation of each independent exhaust fan.
- Time scheduling, demand response and remote programming/diagnostic functions are enabled with installation of the LMBC-300 Network Bridge for system connectivity.

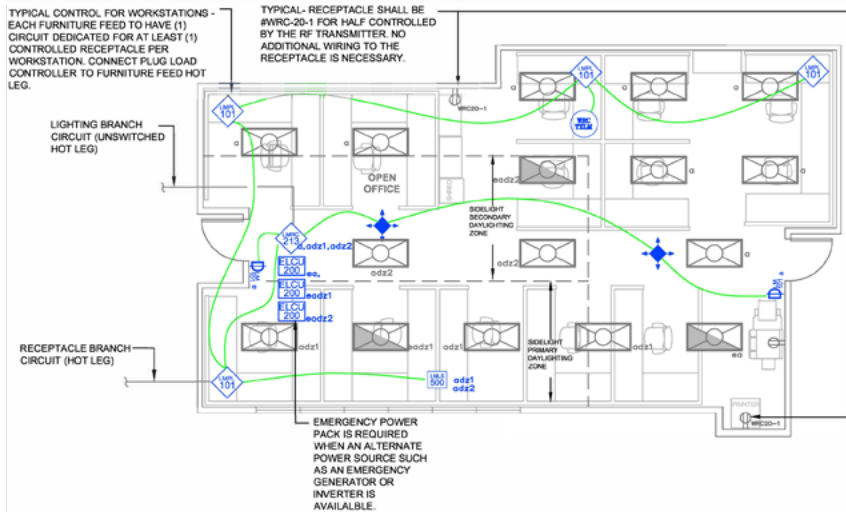
BILL OF MATERIALS

LMRC-101 (2)	1-Relay Room Controller
LMDC-100 (2)	Ceiling Mount Dual Tech Occupancy Sensor
LMSW-101 (2)	1-Button Digital Wall Switch
LMRL-100 (2)	Isolated Relay Interface
LMRJ	Pre-Terminated Cable

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

ASHRAE 90.1 (2013) Compliant Space < 5000Ft², Dimming with DLM product



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

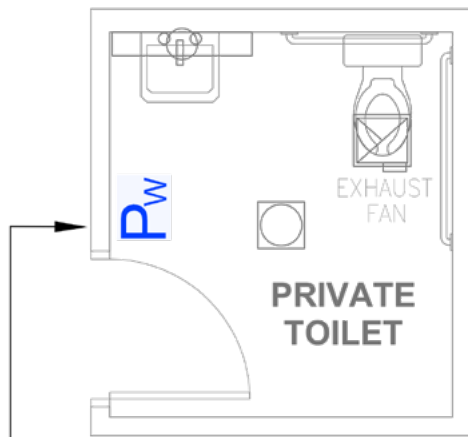
- Receptacle control can be designed using either an RF transmitter with receptacle RF receivers, or can be hardwired to receptacles using an LMPL-101 Plug Load Room Controller.
- Time scheduling, demand response and remote programming/diagnostic functions are enabled with installation of the LMBC-300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

BILL OF MATERIALS

LMRC-213 (1)	3-Relay Room Controller, 0-10V Dimming
LMDC-100 (2)	Ceiling Mount Dual Tech Occupancy Sensor
LMDM-101 (2)	1-Button Dimming Wall Switch
LMLS-500 (1)	Photosensor, Open Loop
LMPL-101 (4)	Plug Load Room Controller
WRC-TX-LM (1)	Plug Load RF Transmitter
WRC-20-1 (2)	Plug Load Half Controlled Receptacle
ELCU-200 (3)	UL924 Emergency Control Unit
LMRJ	Pre-Terminated Cable

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



OCCUPANCY WALL SWITCH TO CONTROL LIGHTS AND EXHAUST FAN ON/OFF.

SEQUENCE OF OPERATION

1. Lighting and fan are manually controlled On/Off with occupancy sensor switch.
2. Lighting and fan will auto Off within 20 minutes of occupants leaving.

DESIGN CONSIDERATIONS

- Demand Response, time scheduling and remote programming functions may be enabled by using DLM product with LMBC-300 Network Bridge connectivity for this space.

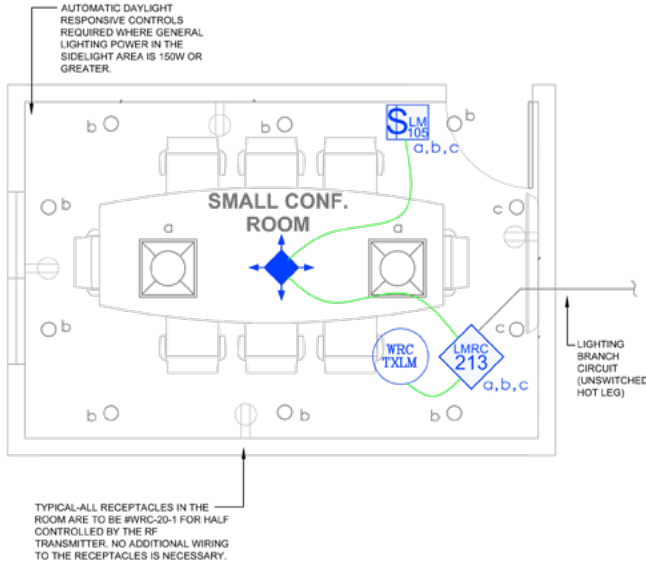
BILL OF MATERIALS

PW-301 (1)	Wallbox PIR Occupancy Sensor
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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

ASHRAE 90.1 (2013) Compliant Dimming with 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.

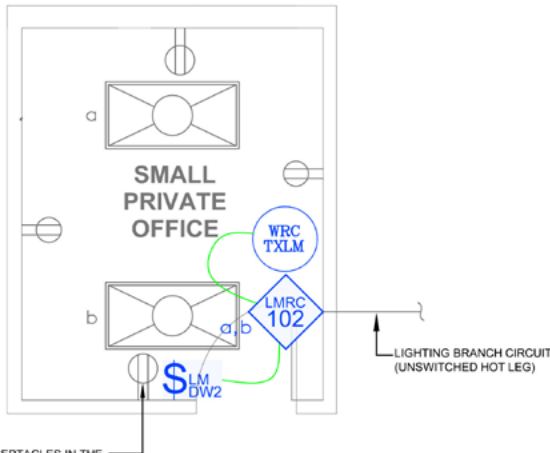
BILL OF MATERIALS

LMRC-213 (1)	3-Relay Room Controller, 0-10V Dimming
LMDC-100 (1)	Ceiling Mount Dual Tech Occupancy Sensor
LMSW-105 (1)	5-Button Scene Switch
WRC-TX-LM (1)	Plug Load RF Transmitter
WRC-20-1 (4)	Plug Load Half Controlled Receptacle
LMRJ	Pre-Terminated Cable

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 (2013) Compliant ≤ 250 Sq Ft, On/Off Switching with DLM product



TYPICAL-ALL RECEPTACLES IN THE ROOM ARE TO BE #WRC-20-1 FOR HALF CONTROLLED BY THE RF TRANSMITTER. NO ADDITIONAL WIRING TO THE RECEPTACLES IS NECESSARY.

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

- 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

LMRC-102 (1)	2-Relay Room Controller
LMDW-102 (1)	2-Button Dual Tech Wall Switch Occupancy Sensor
WRC-TX-LM (1)	Plug Load RF Transmitter
WRC-20-1 (4)	Plug Load Half Controlled Receptacle
LMRJ	Pre-Terminated Cable

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