design and application guide



Connected Lighting Energy Codes





cooperlighting.com

Simplified connected lighting solutions for **Buildings, Communities & Homes**

Cooper Lighting Solutions portfolio of connected lighting solutions leverages the real-estate of the physical light fixture to increase building, business and community operating efficiency through controls and data. With connected lighting solutions, we go beyond controlling light to solve higher complexity problems enabled by sensing and communication capabilities within the light fixture itself.

Table of Contents

Energy Codes

ANSI / ASHRAE / IES Standard 90.1-2016	4
International Energy Conservation Code (IECC) 2015	4
California Title 24	4
Application code compliant sequence best practices	6-7
Terminology	8-9

WaveLinx applications & typical wiring diagrams

wavelinx overview	10
Classroom examples	11-13
Conference room examples	14-15
Office corridor example	16
Private office example	17
Lobby example	18
Open office example	19
Restaurant example	20
Retail example	21
Warehouse example	22
Exterior example	23

Connected lighting energy codes

Energy Codes application notes

ANSI / ASHRAE / IES Standard 90.1-2019

Energy Standard for Buildings Except Low-Rise Residential Buildings (Standard 90.1-2019) adopted as of May 2018. This code significantly fine-tunes the design requirements for code-compliant lighting controls systems, mechanical systems, and the building envelope. This application note summarizes the new mandatory lighting control requirements and highlights where they can be used in various spaces. Please note: this document is intended to provide a general reference and design professionals should consult Standard 90.1-2013 and the authority having jurisdiction for project-specific requirements and interpretation.

ASHRAE 90.1 was recognized by the U.S. Department of Energy (DOE) as the national energy reference standard.

Below summarizes changes from 90.1-2016 to 90.1-2019:

- Reduced LPD by ~5%
- Includes DC Low-voltage lighting systems with flexible cabling for plug-in connection
- Step dimming requirements removed in favor of continuous dimming
- · Partial off is subject to daylighting

International Energy Conservation Code (IECC) 2018

IECC 2018 establishes minimum energy efficiency requirements for new and renovated buildings. This latest iteration contains dramatic changes to the prescriptive and performance-based criteria that previously defined IECC-compliant lighting and lighting control systems. ASHRAE 90.1 is recognized by the DOE as the national reference standard, however IECC is adopted by many states. Please note: this document is intended to provide a general reference and design professionals should consult IECC 2018 and the authority having jurisdiction for project-specific requirements and interpretation.

Below summarizes changes from 2015 to 2018:

- Use Luminaire level lighting controls (LLLC) to satisfy controls requirements
- Daylighting enhancements
- Expand occupancy sensor requirements to open office
- Reduces Light Power Densities (LPD) for interior and exterior lighting systems

California Title 24

California's Building Energy Efficiency Standards are updated on an approximately three-year cycle. The 2019 Standards will continue to improve upon the 2016 Standards for new construction of, and additions and alterations to, residential and nonresidential buildings. The effective date of the 2019 Standards is January 1, 2020.

Below summarizes changes from 2016 to 2019:

- Indoor lighting power allowances reduced by 37 percent (complete building method), and 29 percent (area category method)
- Mandatory automatic daylighting control language clarified

Energy saving lighting control strategies

STRATEGY	DESCRIPTION	ESTIMATED SAVINGS
Manual Dimmer	Manual dimming control is one of five methods that satisfy the multi-level lighting control requirements.	10-20%
کی کی Occupancy Sensor کی	Occupancy/vacancy control turns lights Off (or partially Off) when a room is unoccupied. Lights can be turned On automatically or manually, when a person enters a room.	20-60%
Daylighting Control	Daylighting control automatically adjusts lighting levels in response to the amount of daylight available in the space.	20-45%
Manual ON/ Auto OFF	Manual ON/Automatic OFF or Vacancy Mode is designed to ensure that lighting does not turn ON automatically.	40%-60%
Task	High-end tuning lowers the maximum light level, creating energy savings.	10-30%
Demand Response	Demand Response reduces light levels in response to a signal from an OpenADR device or BMS closure.	10-40%
Manually Switched ON/OFF	Manually switched ON/OFF method allows users to manually control the lighting within the space and complies with local control requirements.	10-20%
Receptacle Control	Plug load control turns controlled receptacles On, when the space is occupied, and Off, when the space is vacant.	15-50% Controlled loads
UL924	The ability to control emergency lighting along with normal lighting while ensuring they go to full bright during normal power loss.	15-30%

Application code compliant sequence best practices

	ASHRAE 90.1 2019	IECC 2018	T24 2019	Atrium	Banking	Classroom / Training / Lecture	Conference / Meeting room
Local Control	9.4.1(a)	C405.2.5	130.1(a), (b)				
Manual ON	9.4.1(b)	C405.2.5	130.1(a), (b)	\bigcirc	\bigcirc		\bigcirc
Partial Automatic ON	9.4.1(c)	C405.2.1.1.2	130.1(b)	\bigcirc	\bigcirc		\bigcirc
Bi-level Lighting	9.4.1(d)						
Daylighting Side lighting	9.4.1(e)	C405.2.3.2	130.1(d)				
Daylighting Top lighting	9.4.1(f)	C405.2.3.3	130.1(d)				
Automatic Partial OFF	9.4.1(g)	C405.2.1.3	130.1(c).6				
Automatic Full OFF	9.4.1(h)	C405.2.1.1.1	130.1(c).5	\bigcirc	\bigcirc		\bigcirc
Scheduled Shutoff	9.4.1(i)	C405.2.2	130.1(c)	\bigcirc			\bigcirc
Receptacle Control	8.4.2	C405.2.4	130.5(d)				
Energy Monitoring	8.4.3.2		130.5(b)	\bigcirc	\bigcirc		\bigcirc
Parking Garage Lighting Control	9.4.2	C405.2.6	130.1(a), (b)				
Functional Testing	9.4.3	C408.3	130.1(a), (b)				
Demand Response			130.1(a), (b)	\bigcirc	\bigcirc		\bigcirc
Enhanced Digital Lighting Controls		C406.4		\bigcirc	\bigcirc		\bigcirc

Copy / Print room	Corridor	Courtroom	Dining area	Food preparation	Library	Office	Restroom	Sales area	Stairwell
\bigcirc		\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc
		\bigcirc	\bigcirc		\bigcirc	\bigcirc	\bigcirc		\bigcirc
	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc		\bigcirc	•	\bigcirc
		\bigcirc	\bigcirc		\bigcirc				\bigcirc
		\bigcirc	\bigcirc		\bigcirc	\bigcirc	\bigcirc		\bigcirc
\bigcirc		\bigcirc	\bigcirc		\bigcirc	\bigcirc	\bigcirc		\bigcirc
\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc	\bigcirc		\bigcirc

Required

Choose one

Choose one

Terminology

HIGH-LEVEL TERMINOLOGY	RECOMMENDED PRODUCTS*
 Local control If the controlled space is ≤10,000 ft2, a control device shall not control more than 2500 ft2 If the controlled space is larger than 10,000 ft2, no device shall control more than 10,000 ft2 The installed device shall be readily accessible and the load being controlled shall be visible when operating the control 	 WaveLinx Room Controller System Fifth Light Wallbox dimmers/sensors GDS when connected to LiteKeeper, ControlKeeper
 Restricted to Manual ON Vacancy modes must be used such that lights will not turn on automatically 	 WaveLinx Room Controller System Fifth Light VSW, VNW, VNLW VAC
 Restricted to Partial Automatic ON When in occupancy mode, automatic ON shall not exceed 50% of the lighting power 	 WaveLinx Room Controller System Fifth Light LiteKeeper/, ControlKeeper
 Bi-level Lighting Control The general lighting in a space must have the following functionality: Full ON, Full OFF, and Dimming Dimming may be continuous or through step dimming If step dimming, at least one intermediate step shall be between 30% and 50% of full lighting power 	 WaveLinx Room Controller System Fifth Light LiteKeeper, ControlKeeper OAC, OAWC with Low Voltage Switches
 Automatic Daylight Responsive Controls for Sidelighting Primary sidelighted areas with combined input power at 150W or greater shall be controlled by photocontrols Secondary sidelighted areas with combined input power at 300W or greater, the area shall be controlled by photocontrols Controls must also: be readily accessible for calibration, control primary and secondary sidelighted areas independently, and shall incorporate daylight dimming 	 WaveLinx Room Controller System Fifth Light Analog Photosensors with ControlKeeper
 Automatic daylight responsive controls for toplighting Space within any daylight area that has combined input power for all general lighting at 150W or greater shall be controlled by photocontrols. Control must: Be readily accessible for calibration adjustments Have daylight response through continuous dimming or Step dimming with a point between 50% and 70%, a point between 20% and 40% (or lowest dimming level that the technology permits), and a third point at full off General lighting with overlapping toplighted and sidelighted areas shall be controlled together 	 WaveLinx Room Controller System Fifth Light Analog Photosensors with ControlKeeper
 Automatic partial OFF (full OFF complies) Within 20 minutes of occupants leaving a space, lighting power shall automatically decrease at least 50% 	 WaveLinx Room Controller System Fifth Light ControlKeeper

* Additional product combinations may be code compliant. Please contact your Cooper Lighting Solutions representative for more information. Exceptions: more detailed information may apply, please reference your local code for more detailed information.

Terminology

HIGH-LEVEL TERMINOLOGY	RECOMMENDED PRODUCTS*
 Automatic full OFF Within 20 minutes of occupants leaving a space,lighting shall be automatically shut OFF Each control shall not control more than 5000 ft2 	 WaveLinx Room Controller System Fifth Light LiteKeeper, ControlKeeper Wallbox and Ceiling Sensors
 Scheduled Shut-off When a space is scheduled to be vacant, lighting shall be automatically shut OFF. Any override control shall revert back to the schedule within 2 hours of the last action 	 WaveLinx Room Controller System Fifth Light LiteKeeper, ControlKeeper
 Receptacle Control Automatically turn off plug loads when the space is unoccupied by sensor or time schedule 	 WaveLinx Room Controller System Fifth Light LiteKeeper, ControlKeeper
 Energy Monitoring Provide energy measurement data on the system collected at a minimum of every 15 minute and reported at least hourly 	 WaveLinx (via WaveLinx CORE) Fifth Light (included with system) PowerXpert (external measurement for all other systems)



WaveLinx PRO Connected Lighting System

Wireless, code-compliant, and cost-effective, WaveLinx Connected Lighting System offers the most out-of-the-box functionality on the market. It's also one of the easiest connected lighting systems to install and manage.

Automatic code compliance? Yes, it's true

- · Automatic code commissioning meets or exceeds code requirements
- · Wireless integrated sensors ensure maximum efficiency and flexibility
- A simple mobile app allows building managers to easily adjust settings, even after the project has finished, with no need to go back into the wall
- · Connected fixtures provide a platform for future scalability





Classroom example 1

Γ	H (a) Receptacle Control (ASHRAE / Title 24)
Wallstation	H Receptacle Control (ASHRAE / Title 24)



Bill of Material

Quantity	Catalog #	Description
1	WAC2-POE	WaveLinx Area Controller
2	WSP-UV-010	Universal Voltage Dimming Switchpack
1	CWPD-1500	WaveLinx ceiling sensor
1	W4S-RL-W	WaveLinx Wallstation
1	WR-20	WaveLinx Receptacle (ASHRAE / Title 24)
12	24EN-LD2-34-UNV- L835-CD1-U	Encounter 2x4

Design Consideration	Best Practice	Maximum
Gateway / WaveLinx Area Controller range	150ft LOS	300 ft LOS
Number of interior walls	2 walls	3 walls
Distance from WaveLinx Area Controller to 1st WaveLinx device	150 ft	200 ft
Distance between WaveLinx devices	75 ft	150 ft
Number of hops from WaveLinx Area Controller	4 hops	5 hops
Number of areas per WaveLinx Area Controller	15 + 1 cons	truction area
Number of zones per area	3	16
Number of scenes per area	16	16

渻 5 کر ا <u>``</u> 60 <u>-ờ</u>æ X1/ Manual ON / Daylightin Control Lume Tuning Contro Switche ON / OF Auto OFF Control IECC 2018 . • ASHRAE 90.1 - 2019 ٠ ٠ ٠ ٠ ٠ ٠ ٠ ٠ T24 2019 . . . NECB 2017 • • • • •

Sequence of Operations

Lighting

- 0-10V lighting loads
- Up to 3 dimmable zones
- Daylight dimming zones of no • more than eight luminaires (IECC only)
- Out of the box 75% high end trim

Daylighting

- Continuous dimming to off
- Daylighting not required for • indoor spaces without windows Not required in spaces without
- windows or that are less than 150W (120W for ASHRAE / Title 24)

Occupancy

- Automatic auto on to 50%
- Optional vacancy mode .
- Optional auto on to scene Plug load turns on with occupancy
- Automatic off of lighting and plug load on vacancy

Manual Controls

- Programmable scenes Dominant button is 50% light level
- Scene raise / Scene lower
- All off
- **Additional Features**
- Energy calculations (available through WaveLinx CORE)
- Automatic demand response through wireless area controller
- Scheduling of partial off light levels from wireless area controller .
- UL924 emergency control capabilities via luminaire battery backup or CEPC-2-D for entire switchpack circuit when emergency panels are deployed

Typical Wiring Detail

PoE Network Switch provided by others



((())) WALZ-L WaveLinx Area Controller Installed within 150ft of WCL devices

(((**•**•))) Б

W4S-RL-W Wireless 4 small button scene wallstation



WR-20 Wireless Receptacle

0-10V 24EN-LD2-34-UNV-L835-CD1-U

Encounter 2x4 recessed light fixture with 0-10V dimming



CWPD-1500

Wireless Ceiling

Sensor

occupancy sensor

(((**•**)))



RSP-P-010-347 20A Relay w/ 0-10V Dimming

	Local Control	Manual ON	Partial ON	Bilevel Lighting	Daylight Side	Daylight Top	Partial OFF	Automatic OFF	Scheduled OFF	Receptacle Control	Energy Monitoring	Parking Garage	Functional Testing	Demand Response	Enhanced Digital
IECC 2018	C405.2.5	C405.2.5	C405.2.2.1.2		C405.2.3.2	C405.2.3.3	C405.2.1.3	C405.2.1.1.1	C405.2.2	C405.2.4		C405.2.6	C408.3		C406. 4
ASHRAE 90.1-2019	9.4.1 (a)	9.4.1.1 (b)	9.4.1.1 (c)	9.4.1.1 (d)	9.4.1.1 (e)	9.4.1.1 (f)	9.4.1.1 (g)	9.4.1.1 (h)	9.4.1.1 (i)	8.4.2	8.4.3.2	9.4.1.2	9.4.3		C406. 4
T24 2019	130.1 (a)(b)	130.1 (a)(b)	130.1 (b)		130.1 (d)	130.1 (d)	130.1 (c).6	130.1 (c).5	130.1 (c)	130.5 (d)	130.5 (b)	130.1 (d)	130.4	130.1 (e) 130.1 (e)	
NECB 2017	4.2.2.1.(3)	4.2.2.1.(3), 4.2.2.1.(6)	4.2.2.1 (8)	4.2.2.1.(9)	4.2.2.1.(10)	4.2.2.1.(13)	4.2.4.1. (16-17)	4.2.2.1. (18-19)	4.2.2.1. (20-23)			4.2.2.2 4.2.2.4			

WaveLinx PRO connected lighting

Classroom example 2





	Bill of Material									
Quantity	Catalog #	Description								
1	WAC2-POE	WaveLinx Area Controller								
1	W4S-RL-W	WaveLinx Wallstation								
1	WR-20	WaveLinx Receptacle (ASHRAE / Title 24)								
12	24EN-LD2-34-UNV- L835-CD1-WAA-U	Encounter 2x4 with WaveLinx Sensor								

Design Consideration	Best Practice	Maximum			
Gateway / WaveLinx Area Controller range	150 ft LOS	300 ft LOS			
Number of interior walls	2 walls	3 walls			
Distance from WaveLinx Area Controller to 1st WaveLinx device	150 ft	200 ft			
Distance between WaveLinx devices	75 ft	150 ft			
Number of hops from WaveLinx Area Controller	4 hops	5 hops			
Number of areas per WaveLinx Area Controller	15 + 1 construction area				
Number of zones per area	3	16			
Number of scenes per area	16	16			

渻 ┨ کر ا ÷Ķ-60 × æ Manual ON / Daylightin Control Lumer Tuning Control Manua Occupar Senso Receptac Control ON / OFF Auto OFF Contro IECC 2018 ASHRAE 90.1 - 2019 ٠ • ٠ ٠ ٠ ٠ ٠ • T24 2019 . . NECB 2017 • • • • •

Sequence of Operations

•

•

•

level

All off

Occupancy

· Automatic auto on to 50%

Optional vacancy mode

Plug load turns on with occupancy (optional for IECC) Automatic off of lighting and plug

Programmable scenes

Dominant button is 50% light

Scene raise / Scene lower

load on vacancy **Manual Controls**

Optional auto on to scene

Lighting

- 0-10V lighting loads
- · Up to 3 dimmable zones
- Out of the box 75% high end trim

Daylighting

- · Continuous dimming to off · Individual luminaire daylight dimming to approximately
- 500 lux Daylighting not required for •
- indoor spaces without windows Not required in spaces without
- windows or that are less than 150W (120W for ASHRAE / Title 24)

Additional Features

- · Energy calculations (available through WaveLinx CORE)
- · Automatic demand response through wireless area controller
- •
- fixture integrated transfer device (consult fixture spec sheet)
- Complies with Enhanced Digital Lighting Control section C406 (IECC)

PoE Network Switch provided by others



W4S-RL-W Wireless 4 small button scene wallstatio



•)))

((()))) WAC2-POE WaveLinx Area

Controller

Installed within 150ft of WCL devices



(((**(p**)))

Receptacle

 \odot

	Local Control	Manual ON	Partial ON	Bilevel Lighting	Daylight Side	Daylight Top	Partial OFF	Automatic OFF	Scheduled OFF	Receptacle Control	Energy Monitoring	Parking Garage	Functional Testing	Demand Response	Enhanced Digital
IECC 2018	C405.2.5	C405.2.5	C405.2.2.1.2		C405.2.3.2	C405.2.3.3	C405.2.1.3	C405.2.1.1.1	C405.2.2	C405.2.4		C405.2.6	C408.3		C406. 4
ASHRAE 90.1-2019	9.4.1 (a)	9.4.1.1 (b)	9.4.1.1 (c)	9.4.1.1 (d)	9.4.1.1 (e)	9.4.1.1 (f)	9.4.1.1 (g)	9.4.1.1 (h)	9.4.1.1 (i)	8.4.2	8.4.3.2	9.4.1.2	9.4.3		C406. 4
T24 2019	130.1 (a)(b)	130.1 (a)(b)	130.1 (b)		130.1 (d)	130.1 (d)	130.1 (c).6	130.1 (c).5	130.1 (c)	130.5 (d)	130.5 (b)	130.1 (d)	130.4	130.1 (e) 130.1 (e)	
NECB 2017	4.2.2.1.(3)	4.2.2.1.(3), 4.2.2.1.(6)	4.2.2.1 (8)	4.2.2.1.(9)	4.2.2.1.(10)	4.2.2.1.(13)	4.2.4.1. (16-17)	4.2.2.1. (18-19)	4.2.2.1. (20-23)			4.2.2.2 4.2.2.4			

- Scheduling of partial off light levels from wireless area controller
- UL924 emergency control capabilities via luminaire battery backup or

Typical Wiring Detail

Ø

(((**n**)))

Ν 0-10V

WaveLinx PRO connected lighting

Classroom example 3

	ليتنب	لىشىا	ليبقينا	ليبتقيها	
	ΞĹ	ΞĹĹΞ	μ	ΞĴĴΖ	
	Ξ. L Z	ΞIJZ	Ω I I	Ξ	l
Wallstation	Ξ	ΞĴζ	μ	μ	

潂 51 Ť -ÿ:-60 **A** <u>کلا</u> Daylightin Control Lume Tuning Control Receptaci Control Manual ON / ON / OF Auto OFF Contro IECC 2018 • ASHRAE 90.1 - 2019 ٠ • ٠ ٠ ٠ ٠ ٠ • T24 2019 • • • . NECB 2017 • • • •

Sequence of Operations

Lighting

- 0-10V lighting loads
- · Up to 3 dimmable zones
- Out of the box 75% high end trim

Daylighting

- · Continuous dimming to off Individual luminaire daylight • dimming to approximately 500 lux
- Daylighting not required for indoor spaces
- Not required in spaces without windows or that are less than 150W

Additional Features

- Energy calculations (available through WaveLinx CORE)
- Automatic demand response through wireless area controller
- Scheduling of partial off light levels from wireless area controller
- UL924 emergency control capabilities via luminaire battery backup •
- Complies with Enhanced Digital Lighting Control section C406

· Automatic auto on to 50% Optional vacancy mode

Occupancy

- Optional auto on to scene Optional Plug load turns on with occupancy
- Automatic off of lighting and plug load on vacancy

Manual Controls

- Programmable scenes Dominant button is 50% light level
- Scene raise / Scene lower
- All off



Bill of Material									
Quantity	Catalog #	Description							
1	WAC2-POE	WaveLinx Area Controller							
1	CWPD-1500	WaveLinx ceiling sensor							
1	W4S-RL-W	WaveLinx Wallstation							
12	24EN-LD2-34-UNV- L835-WN1-U	Encounter 2x4 WaveLinx Wireless Fixture							

	provided by others
(((†))) H Z	

W4S-RL-W Wireless



(((**n**))) Ν 0-10V

24EN-LD2-34-UNV-L835-WN1-U Encounter 2x4 WaveLinx Wireless Fixture

Design Consideration	Best Practice	Maximum			
Gateway / WaveLinx Area Controller range	150 ft LOS	300 ft LOS			
Number of interior walls	2 walls	3 walls			
Distance from WaveLinx Area Controller to 1st WaveLinx device	150 ft	200 ft			
Distance between WaveLinx devices	75 ft	150 ft			
Number of hops from WaveLinx Area Controller	4 hops	5 hops			
Number of areas per WaveLinx Area Controller	15 + 1 construction area				
Number of zones per area	3	16			
Number of scenes per area	16	16			

4 small button scene wallstation



CWPD-1500 Wireless Ceiling Sensor occupancy sensor

	Local Control	Manual ON	Partial ON	Bilevel Lighting	Daylight Side	Daylight Top	Partial OFF	Automatic OFF	Scheduled OFF	Receptacle Control	Energy Monitoring	Parking Garage	Functional Testing	Demand Response	Enhanced Digital
IECC 2018	C405.2.5	C405.2.5	C405.2.2.1.2		C405.2.3.2	C405.2.3.3	C405.2.1.3	C405.2.1.1.1	C405.2.2	C405.2.4		C405.2.6	C408.3		C406. 4
ASHRAE 90.1-2019	9.4.1 (a)	9.4.1.1 (b)	9.4.1.1 (c)	9.4.1.1 (d)	9.4.1.1 (e)	9.4.1.1 (f)	9.4.1.1 (g)	9.4.1.1 (h)	9.4.1.1 (i)	8.4.2	8.4.3.2	9.4.1.2	9.4.3		C406. 4
T24 2019	130.1 (a)(b)	130.1 (a)(b)	130.1 (b)		130.1 (d)	130.1 (d)	130.1 (c).6	130.1 (c).5	130.1 (c)	130.5 (d)	130.5 (b)	130.1 (d)	130.4	130.1 (e) 130.1 (e)	
NECB 2017	4.2.2.1.(3)	4.2.2.1.(3), 4.2.2.1.(6)	4.2.2.1 (8)	4.2.2.1.(9)	4.2.2.1.(10)	4.2.2.1.(13)	4.2.4.1. (16-17)	4.2.2.1. (18-19)	4.2.2.1. (20-23)			4.2.2.2 4.2.2.4			

Typical Wiring Detail

ø PoE Network Switch

((()))) WAC2-POE WaveLinx Area ·))) Controller Installed within 150ft of WCL devices

Conference Room

example 1





Bill of Material									
Quantity	Catalog #	Description							
1	WAC2-POE	WaveLinx Area Controller							
1	W4S-RL-W	WaveLinx Wallstation							
1	WR-20	WaveLinx Receptacle (ASHRAE / Title 24)							
1	WTA	WaveLinx Tilemount Sensor Kit							
3	LD4 or LD6	Portfolio Commercial Recessed LED							
4	22EN-LD2-34-UNV- L835-CD1-WAA-U	Encounter 2x2 with WaveLinx Sensor							

Design Consideration	Best Practice	Maximum				
Gateway / WaveLinx Area Controller range	150 ft LOS	300 ft LOS				
Number of interior walls	2 walls	3 walls				
Distance from WaveLinx Area Controller to 1st WaveLinx device	150 ft	200 ft				
Distance between WaveLinx devices	75 ft	150 ft				
Number of hops from WaveLinx Area Controller	4 hops	5 hops				
Number of areas per WaveLinx Area Controller	x Area Controller 15 + 1 construction area					
Number of zones per area	3	16				
Number of scenes per area	16	16				

	Manually Switched ON / OFF	Manual Dimmer	Manual ON / Auto OFF	کڑ Occupancy Sensor		Lumen Maintenance Control	Tuning Control	Receptacle Control	Demand Response
IECC 2018	•	•	•	•	•	•	•		
ASHRAE 90.1 - 2019	•	•	•	•	•	•	•	•	•
T24 2019	•	•	•	•	•	•	•	•	•
NECB 2017	•	•	•	•	•	•	•		

Sequence of Operations

•

Occupancy

All off

· Automatic auto on to 50%

Optional vacancy mode

Plug load turns on with occupancy

load on vacancy **Manual Controls**

Optional auto on to scene

Automatic off of lighting and plug

Remaining buttons trigger scenes

Top or dominant button half lights (sets lights to 50% or less)

Scene raise / Scene lower

Lighting

- 0-10V lighting loads
- · Up to 3 dimmable zones
- Out of the box 75% high end trim

Daylighting

- · Continuous dimming to off · Individual luminaire daylight dimming to approximately 500 lux
- Daylighting not required for • indoor spaces without windows
- Not required in spaces without windows or that are less than 150W (120W for ASHRAE / Title 24)

Additional Features

- Energy calculations (available through WaveLinx CORE)
- · Automatic demand response through wireless area controller
- Scheduling of partial off light levels from wireless area controller •
- UL924 emergency control capabilities via luminaire battery backup or fixture integrated transfer device (consult fixture spec sheet)
- Complies with Enhanced Digital Lighting Control section C406 (IECC)





W4S-RL-W Wireless 4 small button scene wallstatio



WR-20 Wireless Receptacle



occupancy / daylighting 3A Relay with 0-10V

Wireless Tilemount Sensor Kit

WTA



22EN-LD2-34-UNV-L835-CD1-WAA-U

Encounter 2x2 with WaveLinx Sensor

LD4/LD6 Portfolio Commercial Recessed LED

Controller

	Local Control	Manual ON	Partial ON	Bilevel Lighting	Daylight Side	Daylight Top	Partial OFF	Automatic OFF	Scheduled OFF	Receptacle Control	Energy Monitoring	Parking Garage	Functional Testing	Demand Response	Enhanced Digital
IECC 2018	C405.2.5	C405.2.5	C405.2.2.1.2		C405.2.3.2	C405.2.3.3	C405.2.1.3	C405.2.1.1.1	C405.2.2	C405.2.4		C405.2.6	C408.3		C406.4
ASHRAE 90.1-2019	9.4.1 (a)	9.4.1.1 (b)	9.4.1.1 (c)	9.4.1.1 (d)	9.4.1.1 (e)	9.4.1.1 (f)	9.4.1.1 (g)	9.4.1.1 (h)	9.4.1.1 (i)	8.4.2	8.4.3.2	9.4.1.2	9.4.3		C406.4
T24 2019	130.1 (a)(b)	130.1 (a)(b)	130.1 (b)		130.1 (d)	130.1 (d)	130.1 (c).6	130.1 (c).5	130.1 (c)	130.5 (d)	130.5 (b)	130.1 (d)	130.4	130.1 (e) 130.1 (e)	
NECB 2017	4.2.2.1.(3)	4.2.2.1.(3), 4.2.2.1.(6)	4.2.2.1 (8)	4.2.2.1.(9)	4.2.2.1.(10)	4.2.2.1.(13)	4.2.4.1. (16-17)	4.2.2.1. (18-19)	4.2.2.1. (20-23)			4.2.2.2 4.2.2.4			

Conference Room

example 2





Bill of Material

Quantity	Catalog #	Description
1	WAC2-POE	WaveLinx Area Controller
1	W4S-RL-W	WaveLinx Wallstation
1	WR-20	WaveLinx Receptacle (ASHRAE / Title 24)
1	WTA	WaveLinx Tilemount Sensor Kit
6	LD4 or LD6	Portfolio Commercial Recessed LED
2	DSI-WS-40L835-1D- UNV-STD-WAA-DC-W- AC48-T1-8	Divide Suspended with WaveLinx Sensor

Design Consideration	Best Practice	Maximum
Gateway / WaveLinx Area Controller range	150 ft LOS	300 ft LOS
Number of interior walls	2 walls	3 walls
Distance from WaveLinx Area Controller to 1st WaveLinx device	150 ft	200 ft
Distance between WaveLinx devices	75 ft	150 ft
Number of hops from WaveLinx Area Controller	4 hops	5 hops
Number of areas per WaveLinx Area Controller	15 + 1 const	ruction area
Number of zones per area	3	16
Number of scenes per area	16	16

澎 5 Ť **A** 60 -ờ́- \mathbf{X} сħ. Manual ON / Occupa Senso Daylightiı Control Tuning Contro Manual Dimmer Receptacle Control Switche ON / OFF Auto OF Contro IECC 2018 • ASHRAE 90.1 - 2019 ٠ . ٠ ٠ ٠ ٠ • T24 2019 • . NECB 2017 • • •

Sequence of Operations

•

All off

Occupancy

occupancy

load on vacancy **Manual Controls**

Automatic auto on to 50%

Optional vacancy mode

Plug load turns on with

Programmable Scenes

Scene raise / Scene lower

Optional auto on to scene

Automatic off of lighting and plug

Remaining buttons trigger scenes

Lighting

- 0-10V lighting loads
- Up to 3 dimmable zones
- Out of the box 75% high end trim
- Individually addressable luminaires (IECC)

Daylighting

- · Continuous dimming to off Individual luminaire daylight • dimming to approximately 500 lux
- Daylighting not required for indoor spaces without windows
- Not required in spaces without windows or that are less than 150W (120W for ASHRAE / Title 24)

Additional Features

- Energy calculations (available through WaveLinx CORE)
- Automatic demand response through wireless area controller
- Scheduling of partial off light levels from wireless area controller UL924 emergency control capabilities via luminaire battery backup or
- fixture integrated transfer device (consult fixture spec sheet)
- Complies with Enhanced Digital Lighting Control section C406 (IECC)



Divide Suspended 8ft with WaveLinx Sensor



scene wallstation



occupancy / daylighting 3A Relay with 0-10V

WR-20 Wireless Receptacle

WTA

Wireless Tilemount Sensor Kit



LD4/LD6 Portfolio Commercial Recessed LED

	Local Control	Manual ON	Partial ON	Bilevel Lighting	Daylight Side	Daylight Top	Partial OFF	Automatic OFF	Scheduled OFF	Receptacle Control	Energy Monitoring	Parking Garage	Functional Testing	Demand Response	Enhanced Digital
IECC 2018	C405.2.5	C405.2.5	C405.2.2.1.2		C405.2.3.2	C405.2.3.3	C405.2.1.3	C405.2.1.1.1	C405.2.2	C405.2.4		C405.2.6	C408.3		C406. 4
ASHRAE 90.1-2019	9.4.1 (a)	9.4.1.1 (b)	9.4.1.1 (c)	9.4.1.1 (d)	9.4.1.1 (e)	9.4.1.1 (f)	9.4.1.1 (g)	9.4.1.1 (h)	9.4.1.1 (i)	8.4.2	8.4.3.2	9.4.1.2	9.4.3		C406. 4
T24 2019	130.1 (a)(b)	130.1 (a)(b)	130.1 (b)		130.1 (d)	130.1 (d)	130.1 (c).6	130.1 (c).5	130.1 (c)	130.5 (d)	130.5 (b)	130.1 (d)	130.4	130.1 (e) 130.1 (e)	
NECB 2017	4.2.2.1.(3)	4.2.2.1.(3), 4.2.2.1.(6)	4.2.2.1 (8)	4.2.2.1.(9)	4.2.2.1.(10)	4.2.2.1.(13)	4.2.4.1. (16-17)	4.2.2.1. (18-19)	4.2.2.1. (20-23)			4.2.2.2 4.2.2.4			

Office Corridor example



	Bill of	Material
Quantity	Catalog #	Description
1	WAC2-POE	WaveLinx Area Controller
2	W4S-RL-W	WaveLinx Wallstation
6	24EN-LD2-34-UNV- L835-CD1-WAA-U	Encounter 2x4 with WaveLinx Sensor

Design Consideration	Best Practice	Maximum
Gateway / WaveLinx Area Controller range	150 ft LOS	300 ft LOS
Number of interior walls	2 walls	3 walls
Distance from WaveLinx Area Controller to 1st WaveLinx device	150 ft	200 ft
Distance between WaveLinx devices	75 ft	150 ft
Number of hops from WaveLinx Area Controller	4 hops	5 hops
Number of areas per WaveLinx Area Controller	15 + 1 const	ruction area
Number of zones per area	3	16
Number of scenes per area	16	16

	Local Control	Manual ON	Partial ON	Bilevel Lighting	Daylight Side	Daylight Top	Partial OFF	Automatic OFF	Scheduled OFF	Receptacle Control	Energy Monitoring	Parking Garage	Functional Testing	Demand Response	Enhanced Digital
IECC 2018	C405.2.5	C405.2.5	C405.2.2.1.2		C405.2.3.2	C405.2.3.3	C405.2.1.3	C405.2.1.1.1	C405.2.2	C405.2.4		C405.2.6	C408.3		C406.4
ASHRAE 0.1-2019	9.4.1 (a)	9.4.1.1 (b)	9.4.1.1 (c)	9.4.1.1 (d)	9.4.1.1 (e)	9.4.1.1 (f)	9.4.1.1 (g)	9.4.1.1 (h)	9.4.1.1 (i)	8.4.2	8.4.3.2	9.4.1.2	9.4.3		
T24 2019	130.1 (a)(b)	130.1 (a)(b)	130.1 (b)		130.1 (d)	130.1 (d)	130.1 (c).6	130.1 (c).5	130.1 (c)	130.5 (d)	130.5 (b)	130.1 (d)	130.4	130.1 (e) 130.1 (e)	
NECB 2017	4.2.2.1.(3)	4.2.2.1.(3), 4.2.2.1.(6)	4.2.2.1 (8)	4.2.2.1.(9)	4.2.2.1.(10)	4.2.2.1.(13)	4.2.4.1. (16-17)	4.2.2.1. (18-19)	4.2.2.1. (20-23)			4.2.2.2 4.2.2.4			

(((**†**)))

Ο

W4S-RL-W Wireless

4 small button

scene wallstation

	Manually Switched ON / OFF	Manual Dimmer	Manual ON / Auto OFF	کر Occupancy Sensor		Lumen Maintenance Control	Tuning Control	Receptacle Control	Demand Response
IECC 2018	•	•	•	•	•	•	•		
ASHRAE 90.1 - 2019	•	•	•	•	•	•	•	•	•
T24 2019	•	•	•	•	•	•	•	•	•
NECB 2017	•	•	•	•	•	•	•		

Sequence of Operations

•

•

•

•

level

All off •

Occupancy

occupancy

load on vacancy **Manual Controls**

Manual on/off

· Automatic auto on to 50%

Optional vacancy mode

Plug load turns on with

Programmable scenes

Dominant button is 50% light

Scene raise / Scene lower

Optional auto on to scene

Automatic off of lighting and plug

Lighting

- 0-10V lighting loads
- · Up to 3 dimmable zones
- Individually addressable . luminaires (IECC only)
- Out of the box 75% high end trim

Daylighting

- · Continuous dimming to off · Individual luminaire daylight dimming to approximately 500 lux
- Daylighting not required for indoor spaces without windows
- Not required in spaces without windows or that are less than 150W (120W for ASHRAE / Title 24)

Additional Features

- · Energy calculations (available through WaveLinx CORE)
- · Automatic demand response through wireless area controller
- Scheduling of partial off light levels from wireless area controller •
- UL924 emergency control capabilities via luminaire battery backup or • fixture integrated transfer device (consult fixture spec sheet)

Typical Wiring Detail



24EN-LD2-34-UNV-L835-CD1-WAA-U Encounter 2x4 recessed light fixture with 0-10V dimming

	Bill of	Material
ty	Catalog #	Description
	WAC2-POE	WaveLinx Area Controller
	W4S-RL-W	WaveLinx Wallstation
	24EN-LD2-34-UNV-	Encounter 2x4 with

Private Office

example





	Bill o	f Material	
Quantity	Catalog #	Description	
1	WAC2-POE	WaveLinx Area Controller	
1	W4S-RL-W	WaveLinx Wallstation	
1	WR-20	WaveLinx Receptacle (ASHRAE / Title 24)	
2	22EN-LD2-34-UNV- L835-CD1-WAA-U	Encounter 2x2 with WaveLinx Sensor	

Design Consideration	Best Practice	Maximum
Gateway / WaveLinx Area Controller range	150 ft LOS	300 ft LOS
Number of interior walls	2 walls	3 walls
Distance from WaveLinx Area Controller to 1st WaveLinx device	150 ft	200 ft
Distance between WaveLinx devices	75 ft	150 ft
Number of hops from WaveLinx Area Controller	4 hops	5 hops
Number of areas per WaveLinx Area Controller	15 + 1 cons	truction area
Number of zones per area	3	16
Number of scenes per area	16	16

	Manually Switched ON / OFF	Manual Dimmer	Manual ON / Auto OFF	کر Occupancy Sensor		Lumen Maintenance Control	Tuning Control	Receptacle Control	Demand Response
IECC 2018	•	•	•	•	•	•	•		
ASHRAE 90.1 - 2019	•	•	•	•	•	•	•	•	•
T24 2019	•	•	•	•	•	•	•	•	•
NECB 2017	•	•	•	•	•	•	•		

Sequence of Operations

Occupancy

Automatic auto on to 50%

Optional vacancy mode

Plug load turns on with occupancy

load on vacancy

Manual Controls

All off

Optional auto on to scene

Automatic off of lighting and plug

Remaining buttons trigger scenes

Top or dominant button half lights (sets lights to 50% or less)

Scene raise / Scene lower

Lighting

- 0-10V lighting loads
- Up to 3 dimmable zones
- Out of the box 75% high end trim

Daylighting

- Continuous dimming to off
 Individual luminaire daylight dimming to approximately 500 lux
- Daylighting not required for indoor offices without windows
- Not required in spaces without windows or that are less than 150W (120W for ASHRAE / Title 24)

Additional Features

- Energy calculations (available through WaveLinx CORE)
- Automatic demand response through wireless area controller
- Scheduling of partial off light levels from wireless area controller
 UL924 emergency control capabilities via luminaire battery backup or
- fixture integrated transfer device (consult fixture spec sheet)
- Complies with Enhanced Digital Lighting Control section C406 (IECC)

Typical Wiring Detail

മ

(())

D

W4S-RL-W Wireless

4 small button

scene wallstation

•••

WR-20

Wireless

Receptacle

(((**(**)))



22EN-LD2-34-UNV-L835-CD1-WAA-U Encounter 2x2 with WaveLinx Sensor

(((**(**))))

·)))

WAC2-POE WaveLinx Area

Controller

Installed within 150ft of WCL devices



22EN-LD2-34-UNV-L835-CD1-WAA-U Encounter 2x2 with WaveLinx Sensor

	Local Control	Manual ON	Partial ON	Bilevel Lighting	Daylight Side	Daylight Top	Partial OFF	Automatic OFF	Scheduled OFF	Receptacle Control	Energy Monitoring	Parking Garage	Functional Testing	Demand Response	Enhanced Digital
IECC 2018	C405.2.5	C405.2.5	C405.2.2.1.2		C405.2.3.2	C405.2.3.3	C405.2.1.3	C405.2.1.1.1	C405.2.2	C405.2.4		C405.2.6	C408.3		C406. 4
ASHRAE 90.1-2019	9.4.1 (a)	9.4.1.1 (b)	9.4.1.1 (c)	9.4.1.1 (d)	9.4.1.1 (e)	9.4.1.1 (f)	9.4.1.1 (g)	9.4.1.1 (h)	9.4.1.1 (i)	8.4.2	8.4.3.2	9.4.1.2	9.4.3		
T24 2019	130.1 (a)(b)	130.1 (a)(b)	130.1 (b)		130.1 (d)	130.1 (d)	130.1 (c).6	130.1 (c).5	130.1 (c)	130.5 (d)	130.5 (b)	130.1 (d)	130.4	130.1 (e) 130.1 (e)	
NECB 2017	4.2.2.1.(3)	4.2.2.1.(3), 4.2.2.1.(6)	4.2.2.1 (8)	4.2.2.1.(9)	4.2.2.1.(10)	4.2.2.1.(13)	4.2.4.1. (16-17)	4.2.2.1. (18-19)	4.2.2.1. (20-23)			4.2.2.2 4.2.2.4			

WaveLinx PRO connected lighting

l ohhv example

	Manually Switched ON / OFF	Manual Dimmer	Manual ON / Auto OFF	۲ Occupancy Sensor	Daylighting Control	Lumen Maintenance Control	Tuning Control	Receptacle Control	Demand Response
IECC 2018	•	•	•	•	•	•	•		
ASHRAE 90.1 - 2019	•	•	•	•	•	•	•	•	•
T24 2019	•	•	•	•	•	•	•	•	•
NECB 2017	•	•	•	•	•	•	•		





Bill of Material										
Quantity	Catalog #	Description								
1	WAC2-POE	WaveLinx Area Controller								
2	W4S-RL-W	WaveLinx Wallstation								
1	WR-20	WaveLinx Receptacle (ASHRAE / Title 24)								
1	WTA	WaveLinx Tilemount Daylight Sensor								
6	LD4 OR LD6	Portfolio Commercial Recessed LED								
2	22EN-LD2-34-UNV- L835-CD1-WAA-U	Encounter 2x2 with WaveLinx Sensor								

Design Consideration	Best Practice	Maximum		
Gateway / WaveLinx Area Controller range	150 ft LOS	300 ft LOS		
Number of interior walls	2 walls	3 walls		
Distance from WaveLinx Area Controller to 1st WaveLinx device	150 ft	200 ft		
Distance between WaveLinx devices	75 ft	150 ft		
Number of hops from WaveLinx Area Controller	4 hops	5 hops		
Number of areas per WaveLinx Area Controller	15 + 1 construction area			
Number of zones per area	3	16		
Number of scenes per area	16	16		

Sequence of Operations Occupancy

•

.

•

. All off

· Automatic auto on to 50%

Optional vacancy mode

Plug load turns on with occupancy

load on vacancy **Manual Controls**

Optional auto on to scene

Dominant button half lights (sets lights to 50% or less)

Programmable scenes

Scene raise / Scene lower

Automatic off of lighting and plug

Lighting

- 0-10V lighting loads · Up to 3 dimmable zones

• Out of the box 75% high end trim

Daylighting

- · Continuous dimming to off Individual luminaire daylight dimming to approximately 500 lux
- Daylighting not required for • indoor space without windows
- Not required in spaces without windows or that are less than 150W (120W for ASHRAE / Title 24)

Additional Features

- Energy calculations (available through WaveLinx CORE)
- · Automatic demand response through wireless area controller
- Scheduling of partial off light levels from wireless area controller •
- UL924 emergency control capabilities via luminaire battery backup or fixture integrated transfer device (consult fixture spec sheet)
- Complies with Enhanced Digital Lighting Control section C406 (IECC)

മ

Typical Wiring Detail PoE Network Switch provided by others (((**†**))) (((**p**)))



W4S-RL-W Wireless 4 small button scene wallstation



WR-20 Wireless Receptacle



WTA Wireless Tilemount Sensor Kit occupancy / daylighting 3A Relay with 0-10V

((()))) WAL2-1 C_ WaveLinx Area

Controller

Installed within 150ft of WCL devices

•)))

22EN-LD2-34-UNV-L835-CD1-WAA-U

Encounter 2x2 with WaveLinx Sensor

LD4/LD6 Portfolio Commercial Recessed LED

	Local Control	Manual ON	Partial ON	Bilevel Lighting	Daylight Side	Daylight Top	Partial OFF	Automatic OFF	Scheduled OFF	Receptacle Control	Energy Monitoring	Parking Garage	Functional Testing	Demand Response	Enhanced Digital
IECC 2018	C405.2.5	C405.2.5	C405.2.2.1.2		C405.2.3.2	C405.2.3.3	C405.2.1.3	C405.2.1.1.1	C405.2.2	C405.2.4		C405.2.6	C408.3		C406. 4
ASHRAE 90.1-2019	9.4.1 (a)	9.4.1.1 (b)	9.4.1.1 (c)	9.4.1.1 (d)	9.4.1.1 (e)	9.4.1.1 (f)	9.4.1.1 (g)	9.4.1.1 (h)	9.4.1.1 (i)	8.4.2	8.4.3.2	9.4.1.2	9.4.3		
T24 2019	130.1 (a)(b)	130.1 (a)(b)	130.1 (b)		130.1 (d)	130.1 (d)	130.1 (c).6	130.1 (c).5	130.1 (c)	130.5 (d)	130.5 (b)	130.1 (d)	130.4	130.1 (e) 130.1 (e)	
NECB 2017	4.2.2.1.(3)	4.2.2.1.(3), 4.2.2.1.(6)	4.2.2.1 (8)	4.2.2.1.(9)	4.2.2.1.(10)	4.2.2.1.(13)	4.2.4.1. (16-17)	4.2.2.1. (18-19)	4.2.2.1. (20-23)			4.2.2.2 4.2.2.4			

Office ben example 1





Bill of Material									
Quantity	Catalog #	Description							
1	WAC2-POE	WaveLinx Area Controller							
2	W4S-RL-W	WaveLinx Wallstation							
2	WR-20	WaveLinx Receptacle (ASHRAE / Title 24)							
24	24EN-LD2-34-UNV- L835-CD1-WAA-U	Encounter 2x4 with WaveLinx Sensor							

Design Consideration	Best Practice	Maximum		
Gateway / WaveLinx Area Controller range	150 ft LOS	300 ft LOS		
Number of interior walls	2 walls	3 walls		
Distance from WaveLinx Area Controller to 1st WaveLinx device	150 ft	200 ft		
Distance between WaveLinx devices	75 ft	150 ft		
Number of hops from WaveLinx Area Controller	4 hops	5 hops		
Number of areas per WaveLinx Area Controller	15 + 1 construction area			
Number of zones per area	3	16		
Number of scenes per area	16	16		

	Manually Switched ON / OFF	Manual Dimmer	Manual ON / Auto OFF	کر Occupancy Sensor		Lumen Maintenance Control	Tuning Control	Receptacle Control	Demand Response
IECC 2018	•	•	•	•	•	•	•		
ASHRAE 90.1 - 2019	•	•	•	•	•	•	•	•	•
T24 2019	•	•	•	•	•	•	•	•	•
NECB 2017	•	•	•	•	•	•	•		

Sequence of Operations

Occupancy

occupancy

All off

load on vacancy **Manual Controls**

Automatic auto on to 50%

Optional vacancy mode

Plug load turns on with

Optional auto on to scene

Automatic off of lighting and plug

Remaining buttons trigger scenes

Top or dominant button half lights (sets lights to 50% or less)

Scene raise / Scene lower

Lighting

- 0-10V lighting loads
- Up to 3 dimmable zones
- Out of the box 75% high end trim

Daylighting

- Continuous dimming to off Individual luminaire daylight • dimming to approximately 500 lux
- Daylighting not required for indoor spaces without windows
- Not required in spaces without windows or that are less than 150W (120W for ASHRAE / Title 24)

Additional Features

- Energy calculations (available through WaveLinx CORE)
- Automatic demand response through wireless area controller
- Scheduling of partial off light levels from wireless area controller UL924 emergency control capabilities via luminaire battery backup or
- fixture integrated transfer device (consult fixture spec sheet)
- Complies with Enhanced Digital Lighting Control section C406 (IECC)

Typical Wiring Detail

PoE Network Switch provided by others (((**†**)))

B

W4S-RL-W Wireless

4 small button

scene wallstatio

 (\mathbf{I}) ••

WR-20 Wireless Receptacle

(((**(m**)))

Installed within 150ft of WCL devices

(((**•**•)))

.

WAC2-POE WaveLinx Area

Controller

Encounter 2x4 recessed light fixture with 0-10V dimming

	Local Control	Manual ON	Partial ON	Bilevel Lighting	Daylight Side	Daylight Top	Partial OFF	Automatic OFF	Scheduled OFF	Receptacle Control	Energy Monitoring	Parking Garage	Functional Testing	Demand Response	Enhanced Digital
IECC 2018	C405.2.5	C405.2.5	C405.2.2.1.2		C405.2.3.2	C405.2.3.3	C405.2.1.3	C405.2.1.1.1	C405.2.2	C405.2.4		C405.2.6	C408.3		C406. 4
ASHRAE 90.1-2019	9.4.1 (a)	9.4.1.1 (b)	9.4.1.1 (c)	9.4.1.1 (d)	9.4.1.1 (e)	9.4.1.1 (f)	9.4.1.1 (g)	9.4.1.1 (h)	9.4.1.1 (i)	8.4.2	8.4.3.2	9.4.1.2	9.4.3		
T24 2019	130.1 (a)(b)	130.1 (a)(b)	130.1 (b)		130.1 (d)	130.1 (d)	130.1 (c).6	130.1 (c).5	130.1 (c)	130.5 (d)	130.5 (b)	130.1 (d)	130.4	130.1 (e) 130.1 (e)	
NECB 2017	4.2.2.1.(3)	4.2.2.1.(3), 4.2.2.1.(6)	4.2.2.1 (8)	4.2.2.1.(9)	4.2.2.1.(10)	4.2.2.1.(13)	4.2.4.1. (16-17)	4.2.2.1. (18-19)	4.2.2.1. (20-23)			4.2.2.2 4.2.2.4			

}))))
(((())))	

ဖာ



Restaurant example





Bill of Material										
Quantity	Catalog #	Description								
1	WAC2-POE	WaveLinx Area Controller								
5	W4S-RL-W	WaveLinx Wallstation								
2	WR-20	WaveLinx Receptacles (ASHRAE / Title 24)								
24	24EN-LD2-34-UNV- L835-CD1-WAA-U	Encounter 2x4 with WaveLinx Sensor								

Design Consideration	Best Practice	Maximum
Gateway / WaveLinx Area Controller range	150 ft LOS	300 ft LOS
Number of interior walls	2 walls	3 walls
Distance from WaveLinx Area Controller to 1st WaveLinx device	150 ft	200 ft
Distance between WaveLinx devices	75 ft	150 ft
Number of hops from WaveLinx Area Controller	4 hops	5 hops
Number of areas per WaveLinx Area Controller	15 + 1 const	ruction area
Number of zones per area	3	16
Number of scenes per area	16	16

Partial ON

C405.2.2.1.2

9.4.1.1 (c)

130.1 (b)

4.2.2.1 (8)

	Manually Switched ON / OFF	Manual Dimmer	Manual ON / Auto OFF	کر Occupancy Sensor		Lumen Maintenance Control	Tuning Control	Receptacle Control	Demand Response
IECC 2018	•	•	•	•	•	•	•		
ASHRAE 90.1 - 2019	•	•	•	•	•	•	•	•	•
T24 2019	•	•	•	•	•	•	•	•	•
NECB 2017	•	•	•	•	•	•	•		

Sequence of Operations

•

Occupancy

All off

· Automatic on to 50%

load on vacancy **Manual Controls**

Optional vacancy mode

Plug load turns on with

Optional auto on to scene

occupancy (optional IECC)

Top or dominant button half lights (sets lights to 50% or less)

Scene raise / Scene lower

Automatic off of lighting and plug

Remaining buttons trigger scenes

Lighting

- · 0-10V lighting loads
- · Up to 3 dimmable zones
- Individually addressable luminaires (IECC only)
- Out of the box 75% high end trim

Daylighting

- · Continuous dimming to off • Individual luminaire daylight
- dimming to approximately 500 lux
- Daylighting not required for indoor spaces without windows
- Not required in spaces without windows or that are less than 150W (120W for ASHRAE / Title 24)

Additional Features

- · Energy calculations (available through WaveLinx CORE)
- · Automatic demand response through wireless area controller
- Scheduling of partial off light levels from wireless area controller •
- UL924 emergency control capabilities via luminaire battery backup or fixture integrated transfer device (consult fixture spec sheet)
- Complies with Enhanced Digital Lighting Control section C406 (IECC)

Typical Wiring Detail

Ø



W4S-RL-W Wireless

4 small button

scene wallstatic

 (\mathbf{I},\mathbf{I}) •

WR-20

130.1 (c)

4.2.2.1

(20-23)

130.5 (d)

130.5 (b)

(((**(n**)))



(((**n**)))

•)))

WAC2-POE

WaveLinx Area

Controller

Installed within 150ft of WCL devices

Enhanced Digital

C406.4

Demand

130.1 (e) 130.1 (e)

24EN-LD2-34-UNV-L835-CD1-WAA-U Encounter 2x4 recessed light fixture with 0-10V dimming

Functional Testing

C408.3

9.4.3

130.4

130.1 (d)

4.2.2.2

4.2.2.4

	3 16	16 16		Wireless Receptacle					
Bilevel Lighting	Daylight Side	Daylight Top	Partial OFF	Automatic OFF	Scheduled OFF	Receptacle Control	Energy Monitoring	Parking Garage	
	C405.2.3.2	C405.2.3.3	C405.2.1.3	C405.2.1.1.1	C405.2.2	C405.2.4		C405.2.6	
9.4.1.1 (d)	9.4.1.1 (e)	9.4.1.1 (f)	9.4.1.1 (g)	9.4.1.1 (h)	9.4.1.1 (i)	8.4.2	8.4.3.2	9.4.1.2	

130.1 (c).5

4.2.2.1

(18-19)

IECC 2018

ASHRAE

90.1-2019 T24 2019

NECB 2017

Local Contro

C405.2.5

9.4.1 (a)

130.1 (a)(b)

4.2.2.1.(3)

Manı ON

C405.2.5

9.4.1.1 (b)

130.1 (a)(b)

4.2.2.1.(3)

4.2.2.1.(6)

4.2.2.1.(9)

130.1 (d)

4.2.2.1.(10)

130.1 (d)

4.2.2.1.(13)

130.1 (c).6

4.2.4.1

(16-17)

WaveLinx PRO connected lighting

Retail example





Bill of Material

Quantity	Catalog #	Description
1	WAC2-POE	WaveLinx Area Controller
6	W4S-RL-W	WaveLinx Wallstation
4	WSP-UV-010	WaveLinx Relay Switchpack with 0-10V dimming
2	WR-20	WaveLinx Receptacles (ASHRAE / Title 24)
4	LDCM-PL-120-277- 010V-GR	Linear Dimming Control Modules
12	24EN-LD2-34-UNV- L835-CD1-WAA-U	Encounter 2x4 with WaveLinx Sensor

Design Consideration	Best Practice	Maximum
Gateway / WaveLinx Area Controller range	150 ft LOS	300 ft LOS
Number of interior walls	2 walls	3 walls
Distance from WaveLinx Area Controller to 1st WaveLinx device	150 ft	200 ft
Distance between WaveLinx devices	75 ft	150 ft
Number of hops from WaveLinx Area Controller	4 hops	5 hops
Number of areas per WaveLinx Area Controller	15 + 1 const	ruction area
Number of zones per area	3	16
Number of scenes per area	16	16

渻 5 کر ا <u>-ÿ</u>-60 æ \mathbf{M} Manual ON / Daylightin Control Lumer Tuning Contro Occupar Senso Switche ON / OF Auto OFF Control . • ASHRAE 90.1 - 2019 ٠ ٠ ٠ ٠ ٠ . ٠ ٠ . . • • • •

Sequence of Operations

Occupancy

Automatic on to 50%

load on vacancy

Manual Controls

All off

Optional vacancy mode

Plug load turns on with occupancy (optional IECC)

Optional auto on to scene

Top or dominant button half lights (sets lights to 50% or less)

Scene raise / Scene lower

Automatic off of lighting and plug

Remaining buttons trigger scenes

Lighting

IECC 2018

T24 2019

NECB 2017

- 0-10V lighting loads
- Up to 3 dimmable zones •
- Out of the box 75% high end . trim

Daylighting

- Continuous dimming to off Individual luminaire daylight • dimming to approximately 500 lux
- Daylighting not required for indoor spaces without windows
- Not required in spaces without windows or that are less than 150W (120W for ASHRAE / Title 24)

Additional Features

- Energy calculations (available through WaveLinx CORE) •
- Automatic demand response through wireless area controller
- Scheduling of partial off light levels from wireless area controller UL924 emergency control capabilities via luminaire battery backup or
- fixture integrated transfer device (consult fixture spec sheet)
- Complies with Enhanced Digital Lighting Control section C406 (IECC)

Typical Wiring Detail

ଡ

PoE Network Switch provided by others (((¶))) D

W4S-RL-W Wireless 4 small button scene wallstation



WR-20 Wireless Receptacle

0-10V

•)))

24EN-LD2-34-UNV-L835-CD1-WAA-U Encounter 2x4 recessed light fixture with 0-10V dimming



RSP-P-010-347 20A Relay w/ 0-10V Dimming

M



(((۱۹۷۱)) WALZ-۱ ک WaveLinx Area

Controller

Installed within 150ft of WCL devices

LDCM-PL-120-277-0-10V-GR Linear Dimming Control Module

	Local Control	Manual ON	Partial ON	Bilevel Lighting	Daylight Side	Daylight Top	Partial OFF	Automatic OFF	Scheduled OFF	Receptacle Control	Energy Monitoring	Parking Garage	Functional Testing	Demand Response	Enhanced Digital
IECC 2018	C405.2.5	C405.2.5	C405.2.2.1.2		C405.2.3.2	C405.2.3.3	C405.2.1.3	C405.2.1.1.1	C405.2.2	C405.2.4		C405.2.6	C408.3		C406. 4
ASHRAE 90.1-2019	9.4.1 (a)	9.4.1.1 (b)	9.4.1.1 (c)	9.4.1.1 (d)	9.4.1.1 (e)	9.4.1.1 (f)	9.4.1.1 (g)	9.4.1.1 (h)	9.4.1.1 (i)	8.4.2	8.4.3.2	9.4.1.2	9.4.3		C406. 4
T24 2019	130.1 (a)(b)	130.1 (a)(b)	130.1 (b)		130.1 (d)	130.1 (d)	130.1 (c).6	130.1 (c).5	130.1 (c)	130.5 (d)	130.5 (b)	130.1 (d)	130.4	130.1 (e) 130.1 (e)	
NECB 2017	4.2.2.1.(3)	4.2.2.1.(3), 4.2.2.1.(6)	4.2.2.1 (8)	4.2.2.1.(9)	4.2.2.1.(10)	4.2.2.1.(13)	4.2.4.1. (16-17)	4.2.2.1. (18-19)	4.2.2.1. (20-23)			4.2.2.2 4.2.2.4			

WaveLinx PRO connected lighting

Warehouse example



	Manually Switched ON / OFF	Manual Dimmer	Manual ON / Auto OFF	کر Occupancy Sensor		Lumen Maintenance Control	Tuning Control	Receptacle Control	Demand Response
IECC 2018	•	•	•	•	•	•	•		
ASHRAE 90.1 - 2019	•	•	•	•	•	•	•	•	•
T24 2019	•	•	•	•	•	•	•		
NECB 2017	•	•	•	•	•	•	•		

Sequence of Operations

Occupancy

level

level

Manual Controls

control

Control

All Off

Automatic on to programmable

Programmable unoccupied light

Programmable Zone/Scene

Optional Scene/Raise/Lower

((()))) WAC2-POE WaveLinx Area

Controller

Installed within 150ft of WCL devices

Lighting

- 0-10V lighting loadsEach luminaire includes
- dimmable integrated sensor • Control zones of no more than
- 4 luminaires (IECC only)
 Each luminaire supports occupied/unoccupied
- occupied/unoccupied programmable light levels

Daylighting

- Continuous dimming
- Individual luminaire daylight
- dimming
 Daylighting not required for indoor space

Additional Features

- Energy calculations (available through WaveLinx CORE)
- Automatic demand response available from wireless
- area controller • Scheduling of partial off light levels and times from
- wireless area controller
 UL924 emergency control capabilities available via luminaire battery backup or fixture integrated transfer device (see fixture spec sheet)

WAC2-POE WaveLinx Area Controller

	Bill of	Material
Quantity	Catalog #	Description
1	WAC2-POE	WaveLinx Area Controller
6	W4S-RL-W	WaveLinx Wallstation
24	SSLED-LD524-M-UNV- L840-CD2- WHT-SWPD3-U	Steeler with integrated sensor

Typical Wiring Detail

PoE Network Switch



W4S-RL-W Wireless 4 small button scene wallstation



Ø

SSLED-LD524-M-UNV-L840-CD2-WHT-ZW-SWPD3-U Steeler with integrated sensor

·)))

Design Consideration	Best Practice	Maximum
Gateway / WaveLinx Area Controller range	150 ft LOS	300 ft LOS
Number of interior walls	2 walls	3 walls
Distance from WaveLinx Area Controller to 1st WaveLinx device	150 ft	200 ft
Distance between WaveLinx devices	75 ft	150 ft
Number of hops from WaveLinx Area Controller	4 hops	5 hops
Number of areas per WaveLinx Area Controller	15 + 1 const	ruction area
Number of zones per area	3	16
Number of scenes per area	16	16

	Local Control	Manual ON	Partial ON	Bilevel Lighting	Daylight Side	Daylight Top	Partial OFF	Automatic OFF	Scheduled OFF	Receptacle Control	Energy Monitoring	Parking Garage	Functional Testing	Demand Response	Enhanced Digital
IECC 2018	C405.2.5	C405.2.5	C405.2.1.1		C405.2.3.2	C405.2.3.1	C405.2.1.2	C405.2.1.1	C405.2.2.1	C405.2.4		C405.2.5	C408.2.3		C406. 4
ASHRAE 90.1-2019	9.4.1 (a)	9.4.1.1 (b)	9.4.1.1 (c)	9.4.1.1 (d)	9.4.1.1 (e)	9.4.1.1 (f)	9.4.1.1 (g)	9.4.1.1 (h)	9.4.1.1 (i)	8.4.2	8.4.3.2	9.4.1.2	9.4.3		
T24 2019	130.1 (a)(b)	130.1 (a)(b)	130.1 (b)		130.1 (d)	130.1 (d)	130.1 (c).6	130.1 (c).5	130.1 (c)	130.5 (d)	130.5 (b)	130.1 (d)	130.4	130.1 (e) 130.1 (e)	
NECB 2017	4.2.2.1.(3)	4.2.2.1.(3), 4.2.2.1.(6)	4.2.2.1 (8)	4.2.2.1.(9)	4.2.2.1.(10)	4.2.2.1.(13)	4.2.4.1. (16-17)	4.2.2.1. (18-19)	4.2.2.1. (20-23)			4.2.2.2 4.2.2.4			

Exterior Lighting

example



Design Consideration	Best Practice	Maximum
Gateway / WaveLinx Area Controller range	150 ft LOS	300 ft LOS
Number of interior walls	LOS throug to first	h a window nodes
Distance from WaveLinx Area Controller to 1st WaveLinx device	160 ft	160 ft
Distance between WaveLinx devices	160 ft	160 ft
Number of hops from WaveLinx Area Controller	10 hops	10 hops
Number of areas per WaveLinx Area Controller	15 + 1 cons	truction area
Number of zones per area	3	16
Number of scenes per area	16	16

	Dimming	Automatic OFF	Scheduled OFF	Bilevel Lighting	Manual	Functional Testing
IECC 2018	C405.2.6	C405.2.6	C405.2.6	C405.2.6		
ASHRAE 90.1-2019	9.4.1.1 (e) (f)	9.4.1.1 (g) (h)	9.4.1.1 (i)	9.4.1.1 (d)	9.4.1.1 (a)	9.4.3
T24 2019	130.2 (c)	130.2 (c)	130.2 (c)	130.2 (c)		
NECB 2017	4.2.2.1.(3)(6)	4.2.2.1.(18-19)	4.2.2.1.(20-23)	4.2.2.1.(9)	4.2.2.1.(3)(6)	

	Sensor	Dayinginting Control	(Energy Back-Up Circuit)	
IECC 2018		•		
ASHRAE 90.1 - 2019		•	•	
T24 2019	•	•	•	
NECB 2017		•	•	

÷Ķ-

Occupancy

level

level

control

Control All Off

•

Manual Controls

Automatic auto on to 50%

Automatic on to programmable

Programmable unoccupied light

Programmable Zone/Scene

Optional Scene/Raise/Lower

¥

آلاً

Sequence of Operations

Lighting

- 0-10V lighting loads
 Each luminaire includes
- dimmable integrated sensor
 Each luminaire supports occupied/unoccupied programmable light levels

Daylighting

- Continuous dimmingIndividual luminaire daylight
- dimming
- Daylighting not required for indoor space

Additional Features

- Energy calculations (available through WaveLinx CORE)
- · Automatic demand response available from wireless area controller
- Scheduling of partial off light levels and times from wireless area controller
- UL924 emergency control capabilities available via luminaire battery backup

	Bill of N	Material
Quantity	Catalog #	Description
1	WAC2-POE	WaveLinx Area Controller
8	GLEON-AF-04-LED-E1- 5MQ-BZ -SWPD5BZ	Galleon LED Area/Site Luminaire
5	GLEON-AF-04-LED-E1- T4W-BZ -SWPD5BZ	Galleon LED Area/Site Luminaire

Typical Wiring Detail





GLEON-AF-04-LED-E1-5MQ-BZ-ZW-SWPD5BZ Galleon LED Area/Site Luminaire

Energy Codes application notes

Energy Codes application notes

Lighting Brands Ametrix AtLite Corelite Ephesus Fail-Safe HALO HALO Commercial Invue iО Iris Lumark Lumière McGraw-Edison Metalux MWS Neo-Ray Portfolio PrentaLux - 3D Printed Lighting RSA Shaper Streetworks Sure-Lites Telensa

Controls Brands

Greengate Fifth Light Intelligent Lighting Controls

Connected Lighting Systems and Smart Spaces Platform WaveLinx



Cooper Lighting Solutions 1121 Highway 74 South Peachtree City, GA 30269 P: 770-486-4800 www.cooperlighting.com

Canada Sales 5925 McLaughlin Road Mississauga, Ontario L5R 1B8 P: 905-501-3000 F: 905-501-3172 © 2023 Cooper Lighting Solutions All Rights Reserved Printed in USA Publication No. BR503070EN October 2023 Cooper Lighting Solutions is a registered trademark.

All other trademarks are property of their respective owners.

Product availability, specifications, and compliances are subject to change without notice.