SECTION 26 09 XX
LIGHTING CONTROL SYSTEM

PART 1 - GENERAL

1.01 Summary

A. Section includes Interact, a scalable wireless technology lighting control system consisting of Interact ready luminaires and accessory components designed to provide controllability of lighting levels throughout.
B. Provide Architectural Dimming and Control equipment as specified herein and as shown on the schedules and drawings.

1.02 Administrative Requirements

A. Preconstruction Evaluation: Refer to Division 01 requirements.
B. Project Meetings: Refer to Division 01 requirements.
C. Construction Documentation: Refer to Division 01 requirements.
D. Special Administrative Requirements: Refer to Division 01 requirements.

1.03 Protection and Cleaning

A. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at temperature and humidity conditions recommended by the manufacturer.
B. Touch up, repair, or replace damaged components before Substantial Completion.
C. Remove temporary tags, coverings, and construction debris from interior and exterior surfaces of equipment. Remove construction debris from equipment area and dispose of debris.

1.04 Warranty

A. Signify warrants that its products are free of defects in workmanship and materials for a period of five (5) years from the date of shipment.
B. The manufacturer shall provide a single source warranty for all supplied equipment specified in this section.
C. At its sole option, the manufacturer will repair or replace any supplied product defective in workmanship or materials.
D. Signify will not be responsible for any products subjected to inappropriate application, installed, or modified in any way that is not in accordance with Signify Lighting's instructions.
E. Warranty service shall be defined as any failure to equipment during standard operation as defined by the equipment's specification or user guide.

PART 2 - PRODUCTS

2.01 Product Summary

A. LED luminaires and/or LED retrofit kits with integral ZigBee wireless controls & sensors for smart mesh and group behaviors.
B. Installing contractor shall receive, place, connect, and mount all equipment specified in this Section per the manufacturer's instructions.
C. Installing contractor shall furnish all hardware, wire, conduit, connectors, and other necessary items as required for a complete and functional lighting control system.

2.02 **Acceptable Manufacturers**

A. Signify
B. The listing of a manufacturer as acceptable does not imply automatic approval. It is the sole responsibility of the electrical contractor to ensure compatibility of submitted products to other sections of the specification.
C. Substitutions: No substitutions permitted. Any substitutions shall be at the electrical contractor's expense including design modifications or compatibility complications that may arise from acceptance of unapproved substitutions.
D. Pre-bid approval of substitute product manufacturers does not relieve the contractor and the product manufacturer from compliance with the functional and operational requirements of the Specifications. All products will be carefully evaluated during the submittal review process. If, at that time, any pre-bid approved substitute is found to be unsatisfactory and not in compliance, the contractor then must re-submit and supply the specified product(s) without additional costs to the Owner and/or delay to project.
E. Alternate manufacturer(s) shall furnish a one-line system drawing of the system design upon bid proposal.

2.03 **Manufacturer Qualifications**

A. Manufacturer shall have greater than 100 years of lamp and electrical manufacturing experience.
B. Perform controls manufacturing, sales, and warranty support with fulltime service personal employed by the manufacturer in the United States and Canada.
C. Shall have the ability to package lighting controls, fixtures, lamps, and drivers (ballasts).
D. Shall have deployed over 1 million connected nodes.
E. Shall have deployed projects in 140+ countries.
F. Shall have the capability of providing life-cycle services, including extended warranty and remote monitoring services.

2.04 **Design**

A. Alternate manufacturer(s) shall furnish a one-line system drawing of the system design upon bid proposal.
B. Should commissioning be required per contract, end user training of the maintenance and operation of the equipment shall be provided by the manufacturer or manufacturer's representative following the completion of the commissioning of the project (per contract specification).

2.05 **Interact System Architecture and Behavior**

A. The control system shall consist of LED luminaires with integrated wireless occupancy & daylight controls that can be linked or grouped to one another as a mesh network without any special laptop-based commissioning software.
B. Within the wireless group the system will exchange occupancy information and offer adaptive dimming behavior wherein luminaires that detect occupancy operate at a higher light levels compared to luminaires that have not detected occupancy and therefore operate at a lower background level in the same group. Any system that does not adapt to occupancy patterns for each occupant within a lighting group will not be acceptable.
C. Any system that requires a central wireless coordinator or control gateway for initial setup will not be acceptable.
D. The system must be capable of grouping and zoning lights together without a central

wireless coordinator or control gateway.

E. The system shall be cloud based and no software installation on premise shall be necessary to commission, operate or maintain it.
F. The system shall support multisite, by using one single log in to a web browser dashboard for multiple sites around the globe.
G. The system shall be scalable to support at least 20,000 luminaires in a single building.
H. System to achieve required functionality by utilizing distributed intelligence network architecture. In the event of a luminaire or wireless control device failure the rest of the system will continue to operate as commissioned. Systems where the entire wireless network cease to operate in the event of a single device failure shall not be accepted.
I. The system shall be supplied with basic settings to enable the system to operate in a default way immediately upon installation.
J. When power is restored, without requiring any user intervention the system shall automatically remember its programmed wireless grouping and control settings.
K. The system must be configurable to Manual ON / Auto OFF operations.
L. The system must be configurable to Manual ON / Manual OFF operations.
M. The system must also be configurable for Auto ON level between 5 to 100%.
N. The system must also allow for a background light level to be configured between 0 to 100%.
O. The system must also allow for a task light level to be configured between 0 to 100%.
P. The system must offer Dwell Time capability to ignore passing by motion especially in high occupancy traffic areas. Any system that cannot differentiate between passing by motion and dwelling motion will not be accepted.
Q. The system must offer wireless 0-10V load control module and a plug load control modules rated for 20 amps.
R. The system must offer a wireless 0-10V and phase dimming interface to control generic light fixtures.
S. The system must offer a UL924 shunt device for generator-based emergency application. The shunt device must support both power sense and power interrupt modes.
T. The system must be compatible with wireless TLEDs and PAR lamps. Any system that is not compatible with wireless lamps will not be accepted.
U. The system must be scalable and upgradable to accept the addition of a central wireless coordinator or control gateway any time, without having to re-change the sensors or control devices or re-commission the standalone setup. Any system that requires changing of sensors or re-commissioning of control devices for addition of a gateway will not be accepted.
V. The system shall optionally provide Application Programming Interfaces (APIs) available to connect with and provide access to other systems and allow control of the lighting system. System and sensor data must be shareable via API, the protocol shall be REST-based and allow a minimum of energy and occupancy data to be provided.

2.06 **Interact Network Topology and Protocol**

A. All devices must be capable of operating on a wireless network using the same ZigBee 2.4GHz protocol.
B. All lighting control devices must communicate with each other using ZigBee 2.4GHz protocol while the communication between the configuration App and the lighting control device must be Bluetooth Low Energy protocol.
C. All devices must be capable of being setup without any wireless hub or gateways and should have the option to adding the wireless hub or gateway at a later moment.

D. All devices must be capable of being configured via a Bluetooth enabled App.
E. Luminaire integrated sensor must be powered by the Philips Xitanium SR interface and will communicate with the driver on a DALI protocol.
F. The system shall be cloud based and no software installation on premise shall be necessary to commission, operate or maintain it.
G. The system shall support multisite, by using one single log in to a web browser dashboard for multiple sites around the globe.
H. The system must be certified as per IEC62443-4-1 standard for cyber security.

2.07 **Interact Control Functionality & Devices**

The Control system shall be capable of readily deploying all functionality outlined within this section with a simple handheld commissioning tool like an IR remote or Smartphone App.

A. Luminaire integrated sensor
    1. Sensors shall be integral to a troffer, linear type luminaire, downlight, or a parking fixture to minimize energy consumption through daylight harvesting and occupancy detection control. For downlight type luminaire the sensor can be externally mounted.
    2. The wireless RF antenna must be built inside the sensor. Systems where the wireless antenna is built in a controller or external to the sensor will not be accepted.
    3. The universal sensor shall contain a photoelectric (PE) sensor, a PIR motion detector, Bluetooth radio and an infrared receiver in the same package.
    4. All sensor configuration settings shall be made from a Bluetooth App and an IR based handheld tool. Sensors which incorporate manual adjustments such as potentiometers to set luminance thresholds levels are prohibited. All configuration data required for normal operation including grouping, high end trim, illuminance thresholds, motion detect actions etc. should reside in the sensor's non-volatile memory.
    5. It shall be possible to enable and disable the sensor or change sensor parameters using a configuration App that runs on Android and iOS platforms.
    6. The sensor shall have a built-in masking device which allows to alter the field of view for occupancy detection.
    7. The sensor shall contain an LED indicator to help comply with California Title 20 requirements.
    8. PE monitoring shall be incorporated in all occupancy sensors as a standard feature and must be independent of the occupancy detection function.
    9. In parking applications, the sensor must support Zhaga Book 18 4-pin twist and lock socket.
    10. In parking applications, the sensor must support two lens options for installation heights up to 15 ft and up to 40 ft.
    11. Must have the ability to adjust the integrated sensor settings via the mobile app.
        a. Enable/disable motion on a per-sensor basis.
        b. Adjust occupancy sensing sensitivity on a per-sensor basis.
        c. Enable/disable daylight sensing on a per-sensor basis. When enabled, the sensor daylight regulates within a zone based on its detected light level and can optionally be chosen as the zone master. When disabled, the sensor follows the zone master in the zone for daylight regulation.
        d. Devices equipped with daylight sensors can be designated as the area master, meaning that all other devices without integrated sensors or with disabled daylight regulation will follow the area master.

B. External wireless sensor
   1. External sensor shall contain a photoelectric (PE) sensor, a PIR motion detector and Bluetooth radio in the same package.
   2. All sensor configuration settings shall be made from a Bluetooth App. Sensors which incorporate manual adjustments such as potentiometers to set luminance thresholds levels are prohibited. All configuration data required for normal operation including grouping, high end trim, illuminance thresholds, motion detect actions etc. should reside in the sensor's non-volatile memory.
   3. It shall be possible to enable and disable the sensor or change sensor parameters using a configuration App that runs on Android and iOS platforms.
   4. The sensor shall contain an LED indicator to help comply with California Title 20 requirements.
   5. PE monitoring shall be incorporated in all occupancy sensors as a standard feature and must be independent of the occupancy detection function.
   6. External sensor must be IP65 rated as per IEC standard 60529 and must be ROHS and REACH compliant.
   7. External sensor must be capable of executing a walk test with a button push action to determine the optimal location to place the sensor and quickly testing the occupancy detection coverage.
   8. External sensor must have three sensitivity levels from Low, Medium to High
   9. External sensor must be capable of being installed up to 26 feet mounting height and should provide dual coverage patterns based on minor and major motions. The coverage pattern should be 1.5 times the mounting height for minor motion and 2 times the mounting height for major motion.
   10. External sensor must be battery powered with a battery life of at least 7 years.

C. Wireless relay and 0-10V load controller
   1. The device must be capable of switching up to 20 Amp of electrical load with advanced zero crossing technology and must also be capable of 0-10V dimming.
   2. The device must have universal voltage support from 120V to 347V.
   3. The device must be plenum rated, and Junction box mounted.
   4. The device must have ZigBee and Bluetooth wireless capabilities.
   5. The device must have a built-in safety feature to ensure, upon loss of wireless communication, the connected load switch ON and the dimmer is set to a 70% light level.
   6. The device must be capable of being configured through a Bluetooth App.

D. Occupancy Control
   1. Through sensor-based occupancy detection, enable artificial lighting in the entire wireless lighting group to be turned ON at a configurable light level OR turn ON the entire lighting group at a background level and then automatically ramp up to the task level after a certain dwell time.
   2. Through sensor-based occupancy detection, enable artificial lighting to be turned OFF only when the entire wireless lighting group is vacant for a configurable delay timer.
   3. Delay Timers: dimming lights to a background level for a grace time to notify that the lights will soon switch OFF and then switch all lights OFF after another prolong timeout period.
   4. The system shall offer the functionality to alter delay timers via a Bluetooth App.
   5. Dwell Time: System shall not ramp up the lights automatically unless dwell time

has elapsed. System shall ignore and not alter the light levels when there is a quick passing by motion.
6. System should allow the functionality for Dwell time to be enabled or disabled via a configuration App.
7. Open Plan Background Lighting: the system shall activate or maintain a background lighting level while at least one work island/station is still occupied. When the last work island area becomes unoccupied, the lights in the open plan must switch OFF (with a delay).
8. The system must have the functionality to share occupancy information with another sensor in the wireless group.

E. Daylight level control
1. Through sensor based light level detection, enable individual lights within a wireless group to dim as per a closed loop daylight harvesting algorithm.
2. System must perform daylight calibration sequence at a group level and not at an individual luminaire level.

F. Light Level Control
1. Switching: The system must be capable of implementing basic switching control to turn lights ON and OFF from a wireless user interface device.
2. Dimming: capable of implementing dimming control of lighting from a wireless user interface device.
3. High end trim: System should be capable of offering flexible trim levels for the entire wireless lighting group.
4. Manual Light Control: enable manual user controls to change the behavior of automated functions such as daylight harvesting, occupancy detection or illumination management.
5. Color temperature control: The system must be capable of changing CCT levels and intensity levels of luminaires that support tunable white technology.
6. Demand response: The system must be capable of responding to utility-driven Open ADR 2.0 load shedding commands and reduce light levels for specific groups and zones.

G. User Interface
1. User interfaces shall be designed for manual override of the sensor set light levels and shall communicate with the wireless group using the ZigBee Green Power 2.4GHz frequency.
2. The user interfaces shall be surface mounted on the wall.
3. The user interfaces shall be available in two variants – a 2 button ZigBee Green Power switch version and a 4-button scene recall device.
4. Interface shall be FCC compliant.
5. Interfaces shall also be available in an energy harvesting technology, where it must be possible to operate the interfaces without batteries and line voltage power supply mechanism.

H. Wireless gateways
1. The system should allow addition of a wireless gateway / coordinator for additional functionality.
2. Wireless gateways shall be used in strategic locations to allow for a direct connection to the wireless mesh network.
3. The gateway shall support TCP/IP protocol for a wired connection to the lighting

VLAN and also a ZigBee wireless protocol for the connection to the connected luminaires and sensors.
4. The gateway shall support schedules that can be run without a cloud connection.
5. The wireless mesh network for each gateway shall support a maximum of 200 wireless devices, out of which a minimum of 150 connected luminaires and up to 50 Zigbee Green power devices.
6. The gateway shall have at least 3 service LEDs, one to indicate it has power, one to indicate a local connection to the lighting VLAN and one to indicate access to the cloud.
7. The gateway shall be easily configured by scanning a QR code printed on the device.
8. The gateway shall act as a clock and scheduling device. It shall be able to update the time by using an NTP server based on the building location.
9. The gateway shall have a yearly time program.
10. The gateway shall have network time synchronization.
11. The gateway shall have an automatic summer/winter time changeover.
12. The gateway does not require any additional logic units to run standard schedules.
13. The gateway shall have full UL compliance.

I. Schedules
1. The system shall support recurrent weekly schedules. It shall support central override commands which set fixed light levels, temporarily overriding sensors and switches operation. It shall also support an option to resume automatic behavior.
2. The automatic behavior should be editable using a scheduled event. It shall be possible to set different task levels, change sensor timing, adjust background lighting and a vacant level.
3. Time shall be automatically set and updated using an NTP server.
4. Schedules shall be stored locally on the gateway; cloud connection shall not be needed after initial time synchronization.

J. User dashboard
1. The cloud software shall allow the lighting system to be controlled, monitored and managed. The dashboard shall have functionality that includes energy reports, ability to set up and run schedules, and to manage generated alerts.
2. The cloud software must allow for users to control the light levels for areas across the building at area or floor level.
3. The cloud software shall allow the possibility to divide a tenancy without the need to make changes to the physical wiring infrastructure.
4. The lighting control software shall incorporate user login access security. The system shall be capable of displaying alternate applications in accordance with the user rights profile defined for each user. The system shall automatically log out users after a defined period has elapsed since the last application activity.
5. The cloud software shall display historical occupancy metrics. System shall be able to store occupancy metrics per sensor for no less than 1 year.
6. The cloud software shall be able to display occupancy reports with a percentage of occupancy. The purpose of this feature is to provide clear visibility of occupancy usage of the spaces to encourage decisions or strategies to improve the facility overall usage and reduce real state costs. The cloud software shall be configurable to display occupancy metrics for a building, floor, or area types. The dashboard shall also include heatmaps visualization for an easy display of information.
7. The system shall support the visualization of a 1-day heatmap, where the user can

cycle through a heatmap time-lapse that displays how the occupancy percentage is changing during a selected timeframe.

8. The system shall support the visualization of range heatmap, where the user can select the hours of the day, days of the week, months, and years to get an average for every single sensor. It shall be displayed in both a graph and a heatmap picture.
9. The system shall support a normalization option on the heatmaps view, this option will take the maximum occupancy variation as the complete spectrum to visualize difference in colors mapped on the floorplan.

K. Central override light control
   1. The system shall support a central override light control from the dashboard. Meaning when a light level is set it should override any automatic behavior and disable motion and daylight harvesting functionality.
   2. The system should also support a manual command from the dashboard to go back to automatic mode, enabling the previously configured light behavior.
   3. Central override control shall be possible by individual logical area or complete floor, both in a list view or by graphically selecting the area on the floorplan to be controlled.

L. User management
   1. The system shall provide a defined user role scheme with clear access rights to do the following actions:
      a. Manage new user and project creation and removal in the cloud.
      b. Commission, upgrade and edit light behavior.
      c. Support and monitor failures and system health.
      d. Control the lights and view metrics generated by the sensors.

M. Energy monitoring
   1. The management software shall display historical measured energy consumption data in a dashboard format. Notional calculations will not be accepted.
   2. The purpose of this facility is to provide clear visibility of lighting system energy performance to occupants, to encourage utilization behavior that reduces energy demand.
   3. The cloud software shall be configurable to display energy usage information for a building. The dashboard shall include timeline graphs.
   4. Customizable date ranges shall be included for the user to generate custom graphs and analyze data using the dashboard.

N. BACnet integration or BMS integration
   1. The system shall have a native BACnet interface which can be enabled in the wireless gateways, BACnet should support the following points:
      a. Light control.
      b. Occupancy.
      c. Temperature.
      d. Humidity.
      e. Temperature set point.
   2. BACnet interface should be able to be configured automatically without a manual input for every BACnet point, the system should be able to generate a CSV file with all the relevant BACnet points information, ID, object type and names.

O. Remote operations
    1. The system shall support remote operations using the dashboard.
    2. The following actions should be possible:
        a. System health check of connected devices and components.
        b. Perform firmware upgrade for all devices in a building with the press of a single button.
        c. Check online status and check information about all the connected components.
        d. Edit, delete or create logical areas without having to re-wire or physically do any change. On-site support shall only be required in case of the need to move luminaires to a different gateway. No re-wiring shall be required for this process.

P. Failure visualization
    1. Failures shall be displayed in a graphical floorplan representation of the real devices, making it easy to identify exactly which component is failing and why.
    2. The system must be capable of showing the following failure types:
        a. Light source failure - this failure should happen when the LED module is broken or disconnected from the driver.
        b. Driver failure - this failure should happen when the driver or bridge still has connection to the network, but it cannot operate properly.
        c. No communication from a ZigBee device in the last 30 min.
        d. Firmware upgrade failure.
        e. Deployment failure - this failure should happen when the desired configuration is not properly saved from the cloud to the physical devices.

Q. Security
    1. Corporate:
        a. The company providing the system shall have strong security policies and processes.
        b. It shall be aligned with global standards such as ISO/IEC 2700x—Information Security Management Systems (ISMS) and the ISA/IEC 62443 standards suite for product development.
        c. Through the Standards and Regulation department, the company should comply with many worldwide standardization organizations, such as IEC, ANSI and CENELEC, and with industry alliances such as the IoT Security Foundation. Business processes shall be internally and externally audited on a regular basis.
    2. Cloud:
        a. To ensure cloud security, only defined system connected devices shall be able to use cloud resources.
        b. This shall be ensured via unique security credentials which are assigned to all devices. Their identities shall be maintained into the cloud platform to enable communication between the cloud and lighting network.
        c. Only authorized installers shall be able to link these devices to the software in the cloud using a unique identifier.
    3. Local network devices:
        a. Lighting edge devices and luminaires shall communicate using a wireless Zigbee network, which will use AES encryption with a 128-bit key for protection.
        b. On-site devices shall be regularly updated. From security standpoint, it is

required that all lighting network devices can receive the latest firmware updates via a standard process to keep the system updated and secure, in terms of both security and features.

c. All cloud applications shall be regularly updated to enable new features or solve issues. Fast remote hotfixes shall be possible to be deployed to solve critical issues as soon as possible.

2.08 **System integrations**

A. BACnet integration or BMS integration

1. The system shall have a native BACnet interface which can be enabled in the wireless gateways, BACnet should support the following points:
   a. Light control.
   b. Occupancy.
   c. Temperature.
   d. Humidity.
   e. Temperature set point.
2. BACnet interface should support automatic configuration without a manual input for every BACnet point.
3. The system should be able to generate a CSV file with all the relevant BACnet points information, ID, object type and names.

B. APIs for integration

1. The system shall have web-based APIs based on concepts such as REST and WebSocket to allow for software level integration with other building systems as well as towards software tools for further data analysis and processing. The APIs shall allow at least the following functionality:
   a. Building model API: The Building Model API should provide information about the project, buildings, floors, areas and sensors structure. All those levels should be georeferenced by Lat and Long. The API should also provide the option to download a georeferenced floor plan image per floor so that a third-party software developer can create a graphical representation of the system which does not require manual input to be updated.
   b. Light control API: The Light control API should allow the API client to control the system by doing a central override which disables the automatic behavior, and a manual override which will only be active while there is occupancy detection. The API should be able to set dimming levels from 1 to 100% with increment steps of 1% or smaller.
   c. Occupancy API: The Occupancy API should allow the API client to subscribe to a WebSocket that delivers a specified presence (occupancy) data stream for the requested building. The data stream delivers updates for spaces monitored by PIR sensors and should report only when there is a change on the occupancy status.
   d. Temperature and Humidity API: The Temperature and humidity API should allow the API client to subscribe to a WebSocket that delivers a specified temperature and humidity data stream for the requested building and should report only when there is a change on the temperature status of more than 0,1 degrees Celsius or 5% for the relative humidity value.
   e. Temperature set point API: The Temperature set point API should allow the API client to trigger an offset for the temperature set point of an area of + - 4, by setting it, the system should be able to automatically expose that offset over BACnet to the HVAC system.

f. Energy API: The Energy API should allow the API client to subscribe to a WebSocket that delivers a specified Energy consumption data stream for the requested building with an interval of maximum 15 minutes and with a maximum error of 4%.

2. Developer portal: The manufacturer shall make it easy for users of the API to understand the specifications and use cases via a web portal with examples and playgrounds for testing and training purposes.

C. Demand Response
1. The system must be capable of responding to utility-driven Open ADR 2.0 load shedding commands and reduce light levels for specific groups and zones.

PART 3 - EXECUTION

3.01 Manufacturer's Instructions

A. Compliance: Comply with manufacturer's product data; including product technical bulletins, product catalog, installation instructions, submittal sketches or drawings, and product carton instructions for installation.

3.02 Examination

A. Site Verification of Conditions: Verify that related conditions, including equipment that has been previously installed under other sections, are compatible and acceptable for product installation in accordance with manufacturer's instructions.
B. All devices connected to equipment specified in this section shall bear the UL, cUL, ETL, CSA, or other appropriate Nationally Recognized Testing Laboratory (NRTL) label and comply with all applicable National Electrical Code (NEC) requirements.
C. Verify suitability of any preexisting conditions to accept new work and will permit proper installation/application of new products.

3.03 Preparation

A. All equipment related to the system shall be factory tested before shipment.
B. Existing equipment related to work in this Section shall be protected from physical and electrical damage by installer utilizing best practices.
C. Removal of selective existing work shall be accomplished in such a manner as to maximize reuse of existing infrastructure, including:
1. Existing wiring lengths at junction and device box locations.
2. Enclosures, covers, fastener fittings, strain reliefs, insulators, and their supports items.

3.04 Installation

A. Contractor shall furnish all equipment, labor, system setup, and other services necessary for the proper installation of the products/system as indicated on the drawings and specified herein.
B. Signify will not be responsible for any products subjected to inappropriate application or installed or modified in any way that is not in accordance with Signify Controls' instructions.
C. Install in accordance with all local and pertaining codes and regulations.
D. Utilize an installer with demonstrated experience in projects of similar size and complexity.
E. Equipment shall be ready to use condition at end of installation.

3.05 **System Start-Up**

A. Energize equipment in accordance with manufacturer's instructions.
B. The system should support Bluetooth and Infrared detection process for fast commissioning sequence. Infrared sensing is to be used as a device selection and identification mechanism to allow lights to be grouped and zoned together. Any system that completely relies on RF discovery mechanism and does not support any pointing device for identification shall not be permitted.
C. The system should be fully configured and setup using a smart phone App. Any device that requires laptops and computers to be connected to the setup for commissioning shall not be permitted.
D. Schedule System Commissioning by the contractor in accordance with manufacturer's required commissioning tools sets & procedures.
E. Should commissioning be required per contract, end user training of the maintenance and operation of the equipment shall be provided by the manufacturer or manufacturer's representative following the completion of the commissioning of the project (per contract specification).

3.06 **Sequence of operations**

A. Interact ready luminaires or retrofit kits with integrated wireless occupancy & daylight sensors.
B. Use IR remote and Interact Pro App for configuration.
    1. Up to 200 wireless devices per network
    2. Up to 64 groups and zones
    3. Up to 40 lights & 5 ZigBee Green Power (ZGP) devices per group
    4. Up to 16 scenes per group
C. All lights, switches, sensors and plug load controller grouped together.
D. High end trim
    1. Range 0% to 100%, out of the box, set to 100%.
    2. Option to select alternate value via the App.
    3. Occupancy modes & switch on/off behaviors.
    4. Option to change switch on/off behaviors in the configuration App.
    5. Option to select one of 5 Area based configurations where all lights in the group have the same light level irrespective of occupancy pattern within that group.
        a. Area Manual on Manual off (default)
        b. Area Manual on Auto Off
        c. Area Manual On Auto Off with Daylight Dependent Regulation (DDR): DDR per luminaire in the zone(s) for sensor-based luminaires
        d. Area Auto on Auto Off
        e. Area Auto on Auto Off with Daylight Dependent Regulation (DDR): DDR per luminaire in the zone(s) for sensor-based luminaires
    6. Option to select Individual light-based behaviors for adaptive dimming feature where light levels adapt to occupancy pattern within that group.
        a. Light Auto On Auto Off: adaptive dimming without daylight regulation
        b. Light Auto On Auto Off with DDR: adaptive dimming with daylight regulation
    7. Option to set vacancy level to any value between 0% to 100%.
    8. Configurable sensor timeouts between 0 min to 60 min.
E. UL924 emergency control capabilities via luminaire integrated battery backup or via UL924 emergency shunt relay. Upon emergency, UL924 shunt relay bypasses the sensor and forces the lights to 100% level. Option to select ER100 or GTD UL924 approved devices on the luminaire spec sheet.

F. System bridge accessory with integrated wireless occupancy & daylight sensors and wired to the 0-10V downlight circuits.
G. 20 Amp Interact RF switch relay wired to each 0-10V circuit for integration with generic 0-10V fixtures.
H. 20 Amp Interact RF switch relay wired to dedicated receptacles.
I. Options for Manual Controls
    1. 4 button switch
        a. Button 1 set to ON & ramp up.
        b. Buttons 2 & 3 set as programmable scenes
        c. Button 4 set as OFF & ramp down
    2. 2 button switch
        a. Button 1 set to ON & ramp up.
        b. Button 2 set to OFF & ramp down
J. Scheduling (requires a gateway)
    1. Set specific action (ON / OFF or Scene recall) per lighting group based on specific day and time inputs.
    2. Schedules can be created and managed by using both the app and the portal.
K. Load shedding / Demand Response (requires a gateway)
    1. Requires installation and configuration of an EISS box (EISS Box Set Up - IPKeys Technologies)
    2. Configure load reduction level and active time using the Interact Pro portal.

END OF SECTION