

2. Provide independent support from building structure except for cast metal boxes (other than boxes used for fixture support) supported by threaded conduit connections in accordance with NFPA 70. Do not provide support from piping, ductwork, or other systems.
- E. Install boxes as required to preserve insulation integrity.
- F. Install permanent barrier between ganged wiring devices when voltage between adjacent devices exceeds 300 V.
- G. Install firestopping to preserve fire resistance rating of partitions and other elements, using materials and methods specified in Section 07 84 00.

SECTION 26 09 24 LIGHTING CONTROLS - LUTRON VIVE

PART 1 GENERAL

1.01 SUBMITTALS

- A. Design Documents: Where Lighting Control Manufacturer Sensor Layout and Tuning service is specified in Part 2 under "LIGHTING CONTROLS - GENERAL REQUIREMENTS", Lighting Control Manufacturer to provide plans indicating occupancy/vacancy and/or daylight sensor locations.
- B. Samples:
1. Wall Controls:
- 1.02 QUALITY ASSURANCE
- A. Conform to requirements of NFPA 70.
- B. Manufacturer Qualifications:
1. Company with not less than ten years of experience manufacturing lighting control products using wireless communication between devices.
 2. Registered to ISO 9001, including in-house engineering for product design activities.
 3. Provides factory direct technical support hotline available 24 hours per day, 7 days per week.
 4. Qualified to supply specified products and to honor claims against product presented in accordance with warranty.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. Basis of Design Manufacturer: Lutron Electronics Company, Inc; Vive; www.lutron.com/#sle.

2.02 LIGHTING CONTROLS - GENERAL REQUIREMENTS

- A. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.
- B. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, programming, etc. as necessary for a complete operating system that provides the control intent indicated.
- C. Design lighting control equipment for 10 year operational life while operating continually at any temperature in an ambient temperature range of 32 degrees F to 104 degrees F and 90 percent non-condensing relative humidity.
- D. Electrostatic Discharge Tolerance: Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.
- E. Power Failure Recovery: When power is interrupted for periods up to 10 years and subsequently restored, lights to automatically return to same levels (dimmed setting, full on, or full off) as prior to power interruption.
- F. Wireless Devices:
1. Wireless device family includes area or fixture level sensors, area or fixture level load controls for dimming or switching, and load controls that can be mounted in a wallbox, on a junction box, or at the fixture.
 2. Wireless devices including sensors, load controls, and wireless remotes or wall stations, can be set up using simple button press programming without needing any other equipment (e.g. central hub, processor, computer, or other smart device).
 3. Wireless hub adds the ability to set up the system using any smart device with a web browser (e.g. smartphone, tablet, PC, or laptop).
 4. System does not require a factory technician to set up or program the system.
 5. Capable of diagnosing system communications.
 6. Capable of having addresses automatically assigned to them.
 7. Receives signals from other wireless devices and provides feedback to user.
 8. Capable of determining which devices have been addressed.
 9. RF Range: 60 feet line-of-sight or 30 feet through typical construction materials between RF transmitting devices and compatible RF receiving devices.
 10. Electromagnetic Interference/Radio Frequency Interference (EMI/RFI) Limits: Comply with FCC requirements of 47 CFR 15, for Class B application.
- G. Wireless Network:
1. RF Frequency: 434 MHz; operate in FCC governed frequency spectrum for periodic operation; continuous transmission spectrum is not permitted.
 - a. Wireless sensors, wireless wall stations and wireless load control devices do not operate in the noisy 2.4 GHz frequency band where high potential for RF interference exists.
 - b. Wireless devices operate in an uncongested frequency band providing reliable operation.
 - c. Fixed network architecture ensures all associated lights and load controls respond in a simultaneous and coordinated fashion from a button press, sensor signal, or command from the wireless hub (i.e. no popcorning).
 2. Distributed Architecture: Local room devices communicate directly with each other. If the wireless hub is removed or damaged, local control, sensing, and operation continues to function without interruption.
 3. Local room devices communicate directly with each other (and not through a central hub or processor) to ensure:
 - a. Reliability of system performance.
 - b. Fast response time to events in the space (e.g. button presses or sensor signals).
 - c. Independent operation in the event of the wireless hub being removed or damaged.
- H. Device Finishes:
1. Standard Colors: Comply with NEMA WD 1 where applicable.
 2. Color Variation in Same Product Family: Maximum delta E of 1, CIE L*a*b color units.
 3. Visible Parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request.

2.03 WIRELESS SENSORS

- A. General Requirements:
1. Operational life of 10 years without the need to replace batteries when installed per manufacturer's instructions.
 2. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.
 3. Does not require external power packs, power wiring, or communication wiring.
 4. Capable of being placed in test mode to verify correct operation from the face of the unit.
- B. Wireless Occupancy/Vacancy Sensors:
1. General Requirements:
 - a. Provides a clearly visible method of indication to verify that motion is being detected during testing and that the unit is communicating to compatible RF receiving devices.
 - b. Utilize multiple segmented lens, with internal grooves to eliminate dust and residue build-up.
 - c. Sensing Mechanism: Passive infrared coupled with technology for sensing fine motions; Lutron XCT Technology. Signal processing technology detects fine-motion passive infrared (PIR) signals without the need to change the sensor's sensitivity threshold.
 - d. Provide optional, readily accessible, user-adjustable controls for timeout, automatic/manual-on, and sensitivity.
 - e. Turns off lighting after reasonable and adjustable time delay once the last person to occupy the space vacates a room or area.
 - f. Provide adjustable timeout settings of 1, 5, 15, and 30 minutes.
 - g. Capable of turning dimmer's lighting load on to an optional locked preset level selectable by the user. Locked preset range to be selectable on the dimmer from 1 percent to 100 percent.
 - h. Color: White.
 - i. Provide all necessary mounting hardware and instructions for both temporary and permanent mounting.
 - j. Provide temporary mounting means for drop ceilings to allow user to check proper performance and relocate as needed before permanently mounting sensor. Temporary mounting method to be design for easy, damage-free removal.
 2. Sensor lens to illuminate during test mode when motion is detected to allow installer to place sensor in ideal location and to verify coverage prior to permanent mounting.

2.04 LOAD CONTROL MODULES

- A. Provide wireless load control modules as indicated or as required to control the loads as indicated.

2.05 WIRED RECEPTACLES WITH WIRELESS COMMUNICATION INPUTS

- A. Communicates via radio frequency with up to ten compatible occupancy/vacancy sensors and ten wireless control stations.
- B. Relay:
1. Load switched in manner that prevents arcing at mechanical contacts when power is applied to and removed from load circuits.
 2. Rated for switching of general purpose loads.
 3. Motor rating of 0.5 HP at 120 V for 15 A receptacles, and 1 HP at 120 V for 20 A receptacles.
- C. Finish: As specified for wall controls in "Device Finishes" under LIGHTING CONTROLS - GENERAL REQUIREMENTS article above.
- D. Product(s):

2.06 WIRED WALL DIMMERS AND SWITCHES WITH WIRELESS COMMUNICATION INPUTS

A. General Requirements:

1. Provide air gap service switch to disconnect power to load for safe lamp replacement, accessible without removing faceplate.
2. Operates at the rated capacity across the full ambient temperature range including modified capacities for ganged configurations which require removal of fins.
3. Provide radio frequency interference suppression.
4. Surge Tolerance: Designed and tested to withstand surges of 6,000 V, 200 amps according to IEEE C62.41.2 without impairment to performance.
5. Dimmers: Provide full range, continuously variable control of light intensity.
6. Dimmers for Electronic Low Voltage (ELV) Transformers:
 - a. Provide circuitry designed to control the input of electronic (solid-state) low voltage (ELV) transformers. Do not use dimmers that utilize standard phase control.
 - b. Provide resettable overload protection that provides automatic shut-off when dimmer capacity is exceeded. Do not use protection methods that are non-resettable or require device to be removed from outlet box.
 - c. Designed to withstand a short, per UL 1472, between load hot and either neutral or ground without damage to dimmer.
7. Dimmers for Magnetic Low Voltage (MLV) Transformers:
 - a. Provide circuitry designed to control and provide a symmetrical AC waveform to input of magnetic low voltage transformers per UL 1472.
 - b. Magnetic low voltage transformers to operate below rated current or temperature.
8. Electronic Switches:
 - a. Listed as complying with UL 20, UL 508, and UL 1472.

2.07 WIRED WALLBOX OCCUPANCY SENSORS WITH WIRELESS COMMUNICATION INPUTS

- A. 0-10 V Wall Dimmer/Switch Combination Occupancy/Vacancy Sensors with Wireless Communication Inputs; Lutron Maestro Wireless 0-10 V Dimmer Sensor/Maestro Wireless Sensor Switch Series.
1. Communicates via radio frequency with up to ten compatible wireless occupancy/vacancy sensors, ten wireless control stations, and one wireless daylight sensor.
 2. Compatible with sourcing electronic 0-10 V ballasts/drivers, as per IEC 60929 Annex E.2 0-10 V protocol.
 3. Selectable option to enable low light feature (automatic-on when ambient light is below threshold). Ambient light threshold to be selectable as either adaptive utilizing occupant feedback (Lutron Smart Ambient Light Detection) or as fixed (high, medium, low, and minimum presets).
 4. Dimmer Features:
 - a. Adjustable high/low end trims.
 - b. Selectable dimming curve (linear or switched).
 - c. Selectable fade on/fade off times (15, 5, 2.5, or 0.75 sec).
 - d. Adjustable auto-on light level (fully adjustable from one to 100 percent).
 5. Dimmer Control: Multi-function tap switch with small, raised rocker for dimmer adjustment.
 - a. Rocker raises/lowers light level, with new level becoming the current preset level.
 - b. Switch single tap raises lights to preset level or fades lights to off.
 - c. Switch double tap raises light to full on level.
 6. Switch Control: Switch single tap turns lights on/off.
 7. Product(s):

2.08 WIRELESS CONTROL STATIONS

- A. General Requirements:
1. Communicates directly to compatible RF receiving devices through use of a radio frequency communications link.
 2. Allows for easy reprogramming without replacing unit.
 3. Button Programming:
 - a. Single action.
 - b. Toggle action.
 4. Includes LED to indicate button press or programming mode status.
 5. Faceplates: Provide concealed mounting hardware.
 6. Finish: As specified for wall controls in "Device Finishes" under LIGHTING CONTROLS - GENERAL REQUIREMENTS article above.

2.09 LED DRIVERS

- A. General Requirements:
1. Operate for at least 50,000 hours at maximum case temperature and 90 percent non-condensing relative humidity.
 2. Provide thermal fold-back protection by automatically reducing power output (dimming) to protect LED driver and LED light engine/fixture from damage due to over-temperature conditions that approach or exceed the LED driver's maximum operating temperature at calibration point.
 3. Provide integral recording of operating hours and maximum operating temperature to aid in troubleshooting and warranty claims.
 4. Designed and tested to withstand electrostatic discharges incurred during manufacturing, installation, or field troubleshooting without impairment of performance when tested according to IEC 61000-4-2.
 5. Manufactured in a facility that employs ESD reduction practices in compliance with ANSI/ESD S20.20.
 6. UL 8750 recognized or listed as applicable.
 7. UL Type TL rated or UL Class P listed where possible to allow for easier fixture evaluation and listing of different driver series.
 8. Suitable for field replacement as applicable; listed in accordance with UL 1596C or UL 8750, Class P as indicated.
 9. Designed and tested to withstand Category A surges of 4,000 V according to IEEE C62.41.2 without impairment of performance.
 10. Class A sound rating; inaudible in a 27 dBA ambient.
 11. Demonstrate no visible change in light output with a variation of plus or minus 10 percent change in line-voltage input.
 12. LED drivers of the same family/series to track evenly across multiple fixtures at all light levels.
 13. Offer programmable output currents in 10 mA increments within designed driver operating ranges for custom fixture length and lumen output configurations, while meeting a low-end dimming range of 100 to 0.1 percent, 100 to 1 percent or 100 to 5 percent as applicable.
 14. Meet NEMA 410 inrush requirements for mitigating inrush currents with solid state lighting sources.
 15. Employ integral fault protection up to 277 V to prevent LED driver damage or failure in the event of incorrect application of line-voltage to communication link inputs.
 16. LED driver may be remote located up to 100 feet from LED light engine depending on power outputs required and wire gauge utilized by installer.

2.10 WIRELESS HUBS

- A. Product(s):
1. Wireless hub with BACnet; Lutron Vive Premium Hub.
 - a. Flush-mount wireless hub; Model HJS-2-FM; supports up to 700 total paired devices.
- B. Integrated multicolor LED provides feedback on what mode the hub is in for simple identification and diagnosis.
- C. Integrated processor and web server allows hub to set up and operate the system without any external connections to outside processors, servers, or the internet.
- D. Utilizes Ethernet connection for:
1. Networking up to 64 hubs together to create a larger system.
 2. Integration with Building Management System (BMS) via native BACnet; does not require interface (Lutron Vive Premium wireless hub with BACnet only).
 3. Remote connectivity capabilities, including maintaining system date/time and receiving periodic firmware updates (requires internet connection).
- E. A single hub or network of hubs can operate on either a dedicated lighting control only network or can be integrated with an existing building network as a VLAN.
- F. Communicates directly to compatible Lutron Vive RF devices through use of Lutron Clear Connect radio frequency communications link; does not require communication wiring; RF range of 71 feet through walls to cover an area of 15836 square feet (device and hub must be on the same floor).
- G. Communicates directly to mobile device (smartphone or tablet) or computer using built-in Wi-Fi. 2.4 GHz 802.11b/g; wireless range of 71 feet through walls (device and hub must be on the same floor).
1. Does not require Wi-Fi router for connecting to the hub.
- H. Allows for system setup, control, and monitoring from mobile device or computer using Vive web-based software:
1. Supports paired devices up to maximum number indicated including compatible wireless sensors, wireless control stations, and wireless load devices.
 - a. Timeclock is integrated into the unit and does not require a constant internet connection.
 - b. Retains time and programming information after a power loss.
 - c. 365-day schedulable timeclock allows for:
 1. Scheduling of events years in advance.
 2. Setting of recurring events with exceptions on holidays.
 - d. Timeclock events can be scheduled to:
 1. Send lights to a desired level and select the fade rate desired to reach that level.
 2. Adjust level lights go to when occupied.
 3. Adjust level lights go to when unoccupied.
 4. Enable/disable occupancy.
 5. Adjust timeout of sensors (requires Lutron Model FC-SENSOR wired fixture sensor or Lutron Model DFCSJ-OEM-CCC wireless fixture control dongle with integral sensing capabilities).
 2. Daylighting:
 - a. Daylighting can be enabled/disabled. Can be used to override the control currently taking place in the space.

- b. Daylight set point can be adjusted with the software to increase or decrease the electric light level in the room based on the same amount of natural light.
4. Allows for control, monitoring, and adjustment from anywhere in the world (Lutron Vive wireless hub internet connection required).
 5. Uses RF signal strength detection to find nearby devices for quick association and programming without having to climb ladders.
 - a. Association and setup does not require a factory technician to perform.
 6. System using Lutron Vive wireless hub(s) can operate with or without connection to the internet.
 7. Supports energy reporting.
 - a. Reports measured energy data for PowPak fixture control modules at accuracy of plus/minus 2 percent or 0.5 W (whichever is higher).
 - b. Reports calculated energy data for PowPak junction box mounted modules at accuracy of 10 percent.
 8. Supports automatic demand response for load shedding via:
 - a. Local contact closure without need for separate interface.
 - b. OpenADR® 2.0b compliant utility command.
 - c. BACnet (Lutron Vive Premium wireless hub with BACnet only).
 9. Support automatic generation of alerts in Lutron Vive web-based application for designated events/triggers, including:
 - a. Low-battery condition in battery-operated sensors and controls; alert cleared when battery is replaced.
 - b. Missing device (e.g., control or sensor); alert cleared when device is detected.
 10. Wireless hub can be firmware upgraded to provide new software features and system updates.
 - a. Firmware update can be done either locally using a wired Ethernet connection or Wi-Fi connection, or remotely if the wireless hub is connected to the internet.

I. Lutron Vive Web-Based Application:

1. Accessibility and Platform Support:
 - a. Web-based; runs on most HTML5 compatible browsers (including Safari and Chrome).
 - b. Supports multiple platforms and devices; runs from a tablet, desktop, laptop, or smartphone.
 - c. User interface supports multi-touch gestures such as pinch to zoom, drag to pan, etc.
 - d. Utilizes HTTPS (industry-standard certificate-based encryption and authentication for security).
 - e. Multi-level Password Protected Access: Individual password protection on both the integrated Wi-Fi network and web-based software.
 - f. WPA2 security for Wi-Fi communication with wireless hub.
2. System Navigation and Status Reporting:
 - a. Area Tree View: Easy navigation by area name to view status and make programming adjustments through the software.
 - b. Area and device names can be changed in real time.
3. Setup app available for iOS and Android that allows for:
 - a. Job registration to extend product warranty.
 - b. Management of setup for multiple projects in different locations.
 - c. Creation of handoff documents that are sent directly to a facility manager via email once setup is complete.
 - d. Backup of Vive wireless hub database to Lutron cloud for hub replacement.
 - e. Access to native help and instructions to assist user with Vive system setup.

J. BACnet Integration (Lutron Vive Premium wireless hub with BACnet only):

1. Provide ability to communicate by means of native BACnet IP communication (does not require interface) to lighting control system from a user-supplied 10BASE-T or 100BASE-T Ethernet network.
2. Requires only one network connection per hub.
3. BACnet Integrator Capabilities:
 - a. The BACnet integrator can command:
 - 1) Area light output.
 - 2) Area load shed level.
 - 3) Area load shed enable/disable.
 - 4) Enable/Disable:
 - a) Area occupancy sensors.
 - b) Area daylighting.
 - 5) Daylighting level.
 - 6) Area occupied and unoccupied level.
 - 7) Occupancy sensor timeouts (for fixture sensors).
 - b. The BACnet integrator can monitor:
 - 1) Area on/off status.
 - 2) Area occupancy status.
 - 3) Area load shed status.
 - 4) Area instantaneous energy usage and maximum potential power usage.
 - 5) Enable/Disable:
 - a) Area occupancy sensors.
 - b) Daylighting.
 - c) Timedocks.
 - 6) Daylighting level.
 - 7) Light levels from photo sensors.
 - 8) Area occupied and unoccupied level.
 - 9) Occupancy sensor timeouts.
- K. API Integration:
 1. Support communication, without requiring interface, between lighting control system and third-party system via RESTful API.
 2. Requires one network connection per wireless hub.
 3. API Integration Capabilities:
 - a. Control all zones or subset of zones.
 - 1) Set zones in designated area to specific level.
 - 2) Raise/lower dimmable lights in designated area.
 - b. Control individual zones.
 - c. Subscribe to and Monitor:
 - 1) Area status changes (e.g. occupancy, light level, and instantaneous power).
 - 2) Individual zone changes in light level.
 - 3) Alerts (e.g., missing device and low battery).
- L. Scenes:
 1. Support programmable scenes to control individual devices, areas, or groups of areas on demand.
 2. Scenes may be activated via:
 - a. Contact closure input.
 - b. API integration.
 - c. Manual activation in app.
- M. Emergency Mode:
 1. Support emergency mode to, when triggered, send lights to defined levels and lock out controls for PowPak load control modules equipped with emergency mode.
 2. Emergency mode may be activated via:
 - a. Contact closure input.
 - b. API integration.
 - c. Manual activation in app.
- N. Contact Closure Interface: Provide two contact closure inputs; accepts both momentary and maintained contact closures that can be used for automatic demand response.
- O. Rated for use in air-handling spaces as defined in UL 2043.
- P. Meets CAL TITLE 24 P6 requirements.
- Q. Provide Ethernet switch(es) as required for inter-hub network wiring per manufacturer's instructions; do not exceed manufacturer's required maximum wiring segment lengths.

2.11 ACCESSORIES

- A. Emergency Lighting Interface:
1. Product: Lutron Model LUT-ELI-3PH.
 2. Provides total system listing to UL 924 when used with lighting control system.
 3. Senses all three phases of building power.
 4. If power on any phase fails provides output to send lights to defined levels. Lights to return to their previous intensities when normal power is restored.
 5. Accepts contact closure input from fire alarm control panel.

PART 3 EXECUTION

3.01 PREPARATION

- A. System and Network Integration Consultation; Lutron LSC-INT-VISIT: Include as part of the base bid additional costs for Lighting Control Manufacturer to conduct meeting with facility representative and other related equipment manufacturers to discuss equipment and integration procedures.
1. Coordinate scheduling of visit with Lighting Control Manufacturer. Manufacturer recommends that this visit be scheduled early in construction phase, after system purchase but prior to system installation.

3.02 INSTALLATION



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RUSSELLVILLE, AR 72801
PHONE (479) 595-8777

WWW.TERRELLENG.COM

AR FIRM # 3434



FOR PERMIT &
CONSTRUCTION

Revision Schedule		Description
Rev. #	Date	

NEW Arcare MEDICAL OFFICE BUILDING

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FT. SMITH, AR 72903

ARcare
117 S. 2ND ST.
AUGUSTA, AR 72006

DATE	DRAWN BY
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PROJECT #	CHECKED BY
2517	JT

SHEET
E002
ELECTRICAL SPECIFICATIONS

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