PART 1 GENERAL

1.01 SECTION INCLUDES
   A. Motorized roller shades.
   B. Shade accessories.
   C. Motorized shade controls.

1.02 RELATED REQUIREMENTS
   A. Section 06.10.00 - Rough Carpentry: Concealed wood blocking for attachment of headrail brackets.
   B. Section 09.51.00 - Suspended Acoustical Ceilings: Shade pockets, pocket closures and accessories.
   C. Section 26.05.53 - Identification for Electrical Systems: Identification products and requirements.

1.03 REFERENCE STANDARDS
   G. NECA 1 - Standard for Good Workmanship in Electrical Construction; 2010.
   I. NEMA WD 1 - General Color Requirements for Wiring Devices; National Electrical Manufacturers Association; 1999 (R 2010).
   J. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

1.04 ADMINISTRATIVE REQUIREMENTS
   A. Coordination:
      1. Where motorized shades are to be controlled by control systems provided under other sections, coordinate the work with other trades to provide compatible products.
      2. Coordinate the work with other trades to provide rough-in for electrical wiring as required for installation of motorized shades.
      3. Notify Architect of any conflicts or deviations from the contract documents to obtain direction prior to proceeding with work.
   B. Preinstallation Meeting: Conduct on-site meeting with shade control system installer prior to commencing work to review:
      1. Low voltage wiring requirements.
      2. Separation of power and low voltage/data wiring.
3. Wire labeling.
4. Control locations.
5. Connections to other equipment.
6. Installer responsibilities.
7. Pocket and/or mounting conditions.

C. Sequencing:
   1. Do not fabricate shades until field dimensions for each opening have been taken.
   2. Do not install shades until final surface finishes and painting are complete.
   3. Do not install wall controls until final surface finishes and painting are complete.

1.05 SUBMITTALS

A. See Section 01.30.00 - Administrative Requirements, for submittal procedures.
B. Product Data: Provide manufacturer's standard catalog pages and data sheets including materials, finishes, fabrication details, dimensions, profiles, mounting requirements, and accessories.
   1. Motorized Shades: Include power requirements and standard wiring diagrams.

C. Shop Drawings:
   1. Include shade schedule indicating size, location and keys to details, head, jamb and sill details, mounting dimension requirements for each product and condition, and operation direction.
   2. Motorized Shades:
      a. Provide schematic system riser diagram indicating component interconnections. Include requirements for interface with other systems.
      b. Provide shade drive layout drawing showing locations of shade drives, power supplies, and sensor modules.

D. Samples:

E. Operation and Maintenance Data: List of all components with part numbers, sources of supply, and operation and maintenance instructions; include copy of shop drawings.

F. Warranty: Submit sample of manufacturer's warranty and documentation of final executed warranty completed in Owner's name and registered with manufacturer.

1.06 QUALITY ASSURANCE

A. Conform to requirements of NFPA 70.
B. Maintain at the project site a copy of each referenced document that prescribes execution requirements.
C. Manufacturer Qualifications:
   1. Company with not less than twenty years of experience manufacturing low voltage motorized shading systems.
   2. Registered to ISO 9001, including in-house engineering for product design activities.
   3. Qualified to supply specified products and to honor claims against product presented in accordance with warranty.
D. Shade Installer Qualifications: Qualified to install and commission specified products by prior factory training, experience, demonstrated performance, and acceptance of any requirement of the manufacturer, subsidiary of the manufacturer, or licensed agent.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Deliver shades in manufacturer's unopened packaging, labeled to identify each shade for each opening.
B. Handle and store shades in accordance with manufacturer's recommendations.
1.08 FIELD CONDITIONS
A. Maintain field conditions within manufacturer’s required service conditions during and after installation.
   1. Basis of Design System Requirements - Lutron, Unless Otherwise Indicated:
      a. Ambient Temperature: Between 32 and 104 degrees F.
      b. Relative Humidity: Less than 90 percent, non-condensing.

1.09 WARRANTY
A. See Section 01.78.00 - Closeout Submittals, for additional warranty requirements.
B. Manufacturer's Warranty; Lutron 8-Year Limited Warranty:
   1. Shade Control System Components (including shade electronic drive units, shade fabric, and shade hardware):
      a. Years 1-5: 100 percent replacement parts coverage, no manufacturer labor coverage.
      b. Years 6-8: 50 percent replacement parts coverage, no manufacturer labor coverage.
      c. Telephone Technical Support: Available 24 hours per day, 7 days per week, excluding manufacturer holidays.
   2. External Shade Control System Components (including control stations, interfaces, and system accessories):
      a. One year 100 percent replacement parts coverage, 100 percent manufacturer labor coverage to troubleshoot and diagnose a shade control issue.
      b. Telephone Technical Support: Available 24 hours per day, 7 days per week, excluding manufacturer holidays.

PART 2 PRODUCTS
2.01 MANUFACTURERS
B. Substitutions: See Section 01.60.00 - Product Requirements.
C. Source Limitations:
   1. Furnish products produced by a single manufacturer and obtained from a single supplier.

2.02 WINDOW SHADE FABRIC APPLICATIONS
A. Fabric for Roller Shades:
   1. Solar Screen Fabric:
      a. Fabric Family Name: Lutron SunScreen.
      b. Color: To be selected.
      c.Facade Orientation/Name: West.
         1) Fabric Performance Requirements - Spec Grade Solar Screen (THEIA Compliant):
            (a) Openness Factor: 15.
            (b) Visible Light Transmittance (Tv): 15.

B. Solar Screen Fabric General Requirements:
   1. Fabric Performance Selection:
      a. Fabrics must be selected based on evaluation using a building model.
      b. Model must incorporate location, facade orientation(s), window size(s), glass properties, and interior layout and properties.
      c. Submit report documenting glare, daylight, and view performance results.
   2. Fabric Performance Assurance - Spec Grade Solar Screen (THEIA Compliant):
      a. Measurement Standards:
         1) Openness Factor: DIN EN 14500.
2) Visible Light Transmittance (Tv): ASTM E903.
   b. Statistical Validation Level:
      1) Verify with a 95 percent confidence level that 95 percent of all fabric from rolls in the manufacturing lot are within the tolerance bounds (stated above).
      2) Equivalent to Statistical PPK greater than or equal to one, when all rolls of fabric in the lot are evaluated using a minimum of twenty samples.
   c. Certification Documentation:
      1) All rolls of fabric must be certified to comply with the Fabric Performance Requirements (stated above).
      2) Provide documentation with each roll verifying that the statistical requirements for fabric tolerance are met for all rolls of fabric in the manufacturing lot.
      3) Upon request, fabric supplier must be able to trace certification and statistical documentation back to the original lot sample.

2.03 ROLLER SHADES
A. Roller Shades: Fabric roller shades complete with mounting brackets, roller tubes, hembars, hardware and accessories; fully factory-assembled.
   1. Drop: Regular roll.
   2. Size: As indicated on drawings.
B. Roller Tube: As required for type of operation.
   1. Size: Manufacturer's standard, selected for suitability for installation conditions, span, and weight of shades.
   2. Fabric Attachment: Utilize double-sided adhesive strip with minimum of one turn of fabric on roller before working section of fabric starts.
C. Hembars: Wall thickness designed for weight requirements and adaptation to uneven surfaces, to maintain bottom of shade straight and flat.
D. Motorized Shades: Electronic drive unit concealed from view inside roller tube, controlling shade movement via motor controls indicated; fully compatible with the controls to be installed.
   1. Product(s):
      a. Low-voltage wired shades with wired (low voltage) communications; Lutron Sivoia QS.
   2. Audible Noise: Capable of operating at or below 38 dBA measured 3 feet from the center of the shade depending on the electronic drive unit selected; no audible clicks when motor starts and stops.
   3. Electronic Drive Units:
      a. Requires connection to NFPA 70, Class 2 power source.
      b. Size and configuration as recommended by manufacturer for the type, size, and arrangement of shades to be operated.
   4. Coupling of Multiple Shades:
      a. Where possible, minimize number of electronic drive units by coupling adjacent shades.
      b. Utilize coupling pin that allows for precision adjustment of bottom bar levels without removing roller from installed point or fabric from roller tube.

2.04 SHADE ACCESSORIES
A. Brackets and Mounting Hardware: Size as recommended by manufacturer for mounting configuration and span indicated.
B. Fasteners: Non-corrosive, and as recommended by shade manufacturer.
C. Fascia with top back cover: Size as required to conceal shade mounting.
   1. Style: Square.
D. Pocket: Manufacturer's standard 0.06 inch thick minimum aluminum pocket for recessed mounting.

2.05 MOTORIZED SHADE CONTROLS

A. Motorized shades to be controlled by control stations and associated accessories as specified below.

B. General Requirements:
   1. Provide products listed, classified, and labeled by Underwriter's Laboratories Inc. (UL) as suitable for the purpose indicated.
   2. Unless specifically indicated to be excluded, provide all required equipment, conduit, boxes, wiring, connectors, hardware, supports, accessories, software, system programming, etc. as necessary for a complete operating system that provides the control intent indicated.
   3. System Capacity:
      a. Supports up to 100 wired devices including shades, control stations, and power supplies.
      b. Supports wireless devices within range of the wireless control.
      c. Supports up to 100 wired zones.
   4. Shade Control Requirements:
      a. Capable of operating shades and recalling shade presets via keypad, contact closure input, infrared receiver, lighting management system software, or other lighting control system interface.
      b. Capable of operating any individual, group, or subgroup of shade electronic drive units within system without requiring separate group controllers.
      c. Capable of assigning and reassigning individual, groups, and subgroups of shades to any control within system without requiring additional wiring or hardware changes.
      d. Capable of controlling shade speed for tracking within plus or minus 0.125 inch throughout entire travel.
      e. Provide 10 year power failure memory for preset stops, open and close limits, shade grouping and subgrouping and system configuration.
      f. Capable of synchronizing multiple shade electronic drive units regardless of drive or tube size to start, stop and move in unison.
      g. Capable of stopping shades within accuracy of 0.125 inch at any point between open and close limits.
      h. Capable of storing up to 250 programmable stop points, including open, close, and any other position.
   5. Design shade 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.
   6. Electrostatic Discharge Tolerance: Design and test equipment to withstand electrostatic discharges without impairment when tested according to IEC 61000-4-2.
   7. Device Finishes:
      a. Standard Colors: Comply with NEMA WD1 where applicable.
      b. Color Variation in Same Product Family: Maximum delta E of 1, CIE L*a*b color units per ASTM E308.
      c. Visible Parts: Exhibit ultraviolet color stability when tested with multiple actinic light sources as defined in ASTM D4674. Provide proof of testing upon request.
   8. Provide all components and connections necessary to interface with other systems as indicated.

C. Keypads:
   1. General Requirements:
      a. Allows control of any devices part of the shade control system.
      b. Allows for easy reprogramming without replacing unit.
      c. Buttons/Engraving:
         1) Engrave keypads with button, zone, and scene descriptions as indicated on the drawings.
2) Borders, logos, and graduations to use laser engraving or silk-screened graphic process that chemically bonds graphics to faceplate, resistant to removal by scratching and cleaning.

d. Software Configuration:
   1) Customizable control station device button functionality:
      (a) Buttons can be programmed to perform single defined action.
      (b) Buttons can be programmed to perform defined action on press and defined action on release.

e. Status LEDs:
   1) Upon button press, LEDs to immediately illuminate.
   2) LEDs to reflect the true system status. LEDs to remain illuminated if the button press was properly processed or LEDs to turn off if the button press was not processed.
   3) Support logic that defines when LED is illuminated:
      (a) Scene logic (logic is true when all zones are at defined levels).
      (b) Last scene (logic is true when spaces are in defined scenes).

2. Wired Keypads; Lutron seeTouch QS Wallstations:
   b. Power: Class 2 (low voltage).
   c. Communications: Utilize RS485 wiring for low-voltage communications link.
   d. Mounting: Wallbox or low-voltage mounting bracket; provide wall plates with concealed mounting hardware.
   e. Button/Engraving Backlighting
      1) Utilize backlighting for buttons and associated engraving to provide readability under all light conditions.
      2) Backlight intensity adjustable via programming software.
   f. Design keypads to allow field-customization of button color, configuration, and engraving using field-changeable replacement kits.
   g. Contact Closure Interface: Provide two contact closure inputs on back of unit which provide independent functions from front buttons; accepts both momentary and maintained contact closures.
   h. Terminal block inputs to be over-voltage and miswire-protected against reversals and shorts.

D. Power Supplies: Provide as indicated or as required to power system devices and accessories.

2.06 SHADE FABRICATION

A. Field measure finished openings prior to ordering or fabrication.
B. Dimensional Tolerances: Fabricate shades to fit openings within specified tolerances.
   1. Vertical Dimensions - Inside Mounting: Fill openings from head to sill with 1/2 inch space between bottom bar and window sill.
   2. Horizontal Dimensions - Inside Mounting: Provide symmetrical light gaps on both sides of shade not to exceed 3/4 inch.
C. At openings requiring continuous multiple shade units with separate rollers, locate roller joints at window mullion centers; butt rollers end-to-end.

2.07 SOURCE QUALITY CONTROL

A. See Section 01.40.00 - Quality Requirements, for additional requirements.
B. Factory Testing; Lutron Standard Factory Testing:
   1. Perform full-function factory testing on all completed assemblies. Statistical sampling is not acceptable.
PART 3 EXECUTION

3.01 EXAMINATION

A. Motorized Shades and Controls: Verify that ratings and configurations of system components are consistent with the indicated requirements.
B. Examine finished openings for deficiencies that may preclude satisfactory installation.
C. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.
D. Start of installation shall be considered acceptance of substrates.

3.02 PREPARATION

A. Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under the project conditions.
B. Coordinate with window installation and placement of concealed blocking to support shades.

3.03 INSTALLATION

A. Install products in accordance with manufacturer's instructions.
B. Shade Installation:
   1. Install in accordance with approved shop drawings, using mounting devices as indicated.
   2. Replace shades that exceed specified dimensional tolerances at no extra cost to Owner.
   3. Adjust level, projection and shade centering from mounting bracket where applicable.
   4. Verify there is no telescoping of shade fabric. Ensure smooth shade operation.
C. Motorized Shade Control Installation:
   1. Perform work in a neat and workmanlike manner in accordance with NECA 1 and, where applicable, NECA 130, except for mounting heights specified in those standards.
   2. Adjust open and closed limits set by the manufacturer as required.
   3. Assign each shade to a shade group and set control functions.
   4. Identify system components in accordance with Section 26.05.53.

3.04 FIELD QUALITY CONTROL

A. See Section 01.40.00 - Quality Requirements, for additional requirements.
B. Manufacturer's startup services will not be required.
C. Correct defective work, adjust for proper operation, and retest until entire system complies with contract documents.

3.05 CLEANING

A. Clean soiled shades and exposed components as recommended by manufacturer.
B. Replace shades that cannot be cleaned to "like new" condition.

3.06 CLOSEOUT ACTIVITIES

A. See Section 01.78.00 - Closeout Submittals, for closeout submittals.
B. Training:
   1. Shade control system installer to perform on-site training of Owner's personnel on operation, adjustment, and maintenance of shade control system.
3.07 PROTECTION

A. Protect installed products from subsequent construction operations.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION