

# SECTION 12492 – Automated RB 500 Roller Shade – Intelligent Wired SDN 2.0

1. GENERAL
   * + 1. RELATED DOCUMENTS

Retain or delete this article in all Sections of Project Manual.

* + - * 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
      1. SUMMARY
         1. Section Includes:

Hunter Douglas Architectural RB 500 Motor-operated roller shades with [**single**] [**double**] rollers with [**wired-**][**radio-**][**and** ][**networked-**]controls.

Hunter Douglas Architectural RB 500 Motor-operated roller shades with [**wired-**][**radio-**][**and** ][**networked-**]controls for skylights.

* + - * 1. Related Requirements:

Retain subparagraphs below to cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections.

Section [**061000 "Rough Carpentry"**] [**061053 "Miscellaneous Rough Carpentry"**] for wood blocking and grounds for mounting roller shades and accessories.

Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

Section107113 "Exterior Sun Control Devices" for exterior shade systems.

Section122200 "Curtains and Drapes" for wired-, radio-, and networked-motor-operated soft window coverings.

Section122509 "Window Treatment Motors, Controls, and Networked Automation Systems" for other motor operators and motor controls.

Section260519 "Low-Voltage Electrical Power Conductors and Cables" for power cables.

Section260523 "Control-Voltage Electrical Power Cables" for balanced twisted pair cabling.

Section260943.16 "Addressable-Luminaire Lighting Controls" for lighting integration into digital shading systems.

Section260943.23 "Relay-Based Lighting Controls" for lighting integration into digital shading systems.

Section262726 "Wiring Devices" for accessory electrical wiring devices.

* + - 1. DEFINITIONS

Retain terms that remain after this Section has been edited for a project.

ac motors are available by special order; contact Somfy Systems for additional details.

* + - * 1. AC Line Voltage Motors: A tubular, asynchronous motor, 120Vac (60 Hz) single-phase motor, with an integral capacitor, and a thermally protected, permanently lubricated and maintenance free gearbox with a torque range lifting capacity from a minimum of 35.2 in-lbf (4 Nm) to a maximum of 885 in-lbf (100 Nm). Motor to fit into a tube with an inside diameter of 1.875 inches (48 mm). Minimum audible noise equal between 38 and 60 dBA according to the standards of ISO3741NF31022 in dBA ref.1pW at nominal torque without end product. Controller to be embedded microprocessor type or bus connection using RJ9/RJ45 (Radio and Digital motors). Standard, mechanical limit-switching motors are available through hardwired or plug-in connections.

Battery Operated, WireFreeTM DC Low-voltage FCC Certified Radio Technology Somfy® (RTS) Motor by Somfy Systems.

* + - * 1. Battery Operated, Wire-Free, DC Motors: A tubular or roll-up motor, permanently lubricated gearbox, maintenance free, maximum of 9.7 in-lbf (1.1 Nm) torque lifting capacity, must fit in a minimum tube inside diameter of 1.46 inch (37 mm). Motors must have embedded radio frequency microprocessor-based controller. Solar powered adaptable.

DC Low-voltage Sonesse® 30 Intelligent (RS485-SDN) Motor by Somfy Systems.

* + - * 1. Small Diameter (30 mm - inside end product tube diameter) DC Low-Voltage Motors: A tubular, thermally protected, permanently lubricated gearbox, maintenance free, minimum of 17.7 in-lbf (2 Nm) torque lifting capacity, must fit in a minimum tube inside diameter of 1.46 inch (37 mm). Motors must have embedded microprocessor-based controller and onboard serial communications port.

DC Low-voltage Sonesse® ULTRA 50 Intelligent (RS485-SDN) Motor by Somfy Systems.

* + - * 1. Large Diameter (50 mm - outside end product tube diameter) DC Low-Voltage Motors: Tubular, runtime protected, permanently lubricated gearbox, maintenance free, with a minimum 35.4 in-lbf (4 Nm) torque lifting capacity, and fits in a minimum tube inside diameter of 1.875 inches (48 mm). Motor speed adjustable between 10 and 25 RPM. Motors with a head that allows for a 3/4 inch (19 mm) light gap, three buttons for setup, and LED for feedback, status, and troubleshooting. Minimum audible noise equal to or less than 38 according to the standards of ISO3741NF31022 in dBA ref.1pW at nominal torque without end product. Motors with embedded microprocessor-based controller and onboard serial communications port (Radio or Digital Motors).
        2. DCT: Dry Contact Technology; dry contact (mercury-free) input for basic low-voltage switches via data (communication) cable switching.
        3. IP Rating: International (or Ingress) Protection Rating is defined by IEC60529 and classifies the degrees of protection provided against the intrusion of solid objects (including body parts like hands and fingers), dust, accidental contact, and water in electrical enclosures. The first digit classifies protection against solids (0 to 6) and the second digit (0 to 8) against liquids. The higher the number, the more protected.
        4. PA: Progressive Limit Adjustment motor head style. Ability to set various shade heights.
        5. RA: Rapid Adjustment motor head style. Ability to move between set heights quickly.

Radio Technical Somfy® (RTS) is Radio Technology.

* + - * 1. RT: Radio Technology; wireless radio control of motorized applications.
        2. Radio Technology Tubular Motor: Motor equipped with built-in radio receiver and concealed inside roller tube with 3-wire drive unit inside roller, instantly reversible, and lifetime lubricated.
        3. Roller Shades: Solar, thermal and blackout type shades that roll into a coil and unroll flat.

SDN 2.0 is "Somfy" Digital Network version2.0 of bus distribution devices.

Somfy Digital Network™ (SDN) is Somfy’s intelligent wired shading network. An SDN system is comprised of bus distribution devices that create a network for user interfaces, motorized applications and sensors to be connected. SDN is scalable, and suitable for both small and large projects, and the same components are used whether an SDN system remains standalone, integrated into third-party automation systems, or with Somfy’s animeo® IP automated total solar management system.

* + - * 1. Digital Network (DN); RS485 wired, bi-directional, bus control technology; integrated network automation system protocol allowing communication between devices and building management systems or stand-alone building automation systems.
        2. Tubular Motor: Motor equipped with disconnect plug concealed in aluminum tube; and connected to drive shaft through a reduction box.
        3. WireFree™: A battery-powered motor-operator with plug-in option for window treatments including shades, blinds, and draperies.
        4. WT: Wired Technology; control through standard AC (alternating current) or DC (direct current) via power or polarity switching.

For more Z-Wave® information, see https://www.somfysystems.com/products/controls-integration/z-wave and http://www.z-wave.com/.

* + - * 1. Z-Wave®: An interoperable, two-way RF mesh networking technology used for both residential and light commercial automation applications.

For more ZigBee® information, see https://www.somfysystems.com/products/controls-integration/zigbee and http://www.zigbee.org/.

* + - * 1. ZigBee®: The ZigBee® protocol is a low-powered RF mesh networking technology that uses a 2.4 Ghz standard for both residential and commercial applications.
      1. ADMINISTRATIVE REQUIREMENTS

Retain "Preinstallation Conference" Paragraph below if Work of this Section is extensive or complex enough to justify a conference. Refer to Section122509 for additional preinstallation conference requirements for motors and controls.

* + - * 1. Preinstallation Conference: Conduct conference at [**Project site**] <**Insert location**>.
      1. ACTION SUBMITTALS
         1. Product Data: For each type of product.

Include construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating equipment and instructions for roller shades.

Include motor operator and controls assembly details, material descriptions, dimensions of individual components and profiles, features, finishes, operating equipment, control systems, power and signal types, electrical and communications requirements and connections, wiring diagrams, and installation instructions.

Sustainable design credits can be achievable when using motorized shades, blinds, windows, skylights, and other sun-control devices with networked automation controls, and potentially include LEED 2009, LEEDv4, Green Globes, IgCC, or ASHRAE189.1 credits during design and postconstruction using the following:

LEED v2009 EAc1 Credit: Optimize Energy Performance (1-19 points). Use whole-building energy simulation or calculations using ASHRAE Advanced Energy Design Guide and climate zone to analyze efficiency measures that include applying building management system sensor controlled and networked automation controlled motor-operated solar and thermal shade systems.

LEED v2009 EQ8.1 Credit: Daylight and views - daylight (1 point). Use option 1 "computer simulations" or option 2 "prescriptive" daylighting zone or option 3 "12 consecutive monthly measurements" showing illuminance levels are between 300 lux and 3,000 lux for 9 a.m. and 3 p.m., both on a clear-sky day at the equinox for regularly occupied floor areas, or option 4 "combination" of above methods to document the minimum daylight illumination of applicable spaces.

LEEDv4 EA Credit: Optimize Energy Performance (1-20 points). Use whole-building energy simulation or calculations using ASHRAE Advanced Energy Design Guide and climate zone to analyze efficiency measures that include applying building management system sensor controlled and networked automation controlled motor-operated solar and thermal shade systems.

LEEDv4 EQ Credit: Daylight (1-3 points). Use option 1 "computer simulations" or option 2 "computer modeling" or option 3 "12 consecutive monthly measurements" showing illuminance levels are between 300 lux and 3,000 lux for 9 a.m. and 3 p.m., both on a clear-sky day at the equinox for regularly occupied floor areas.

Green Globes v1.4: 3.3.1 Energy Performance. Meet requirements of Energy Star (0-100 points) or ASHRAE bEQ (30-125 points).

Green Globes v1.4: 3.7.3.1 Daylighting (1-3 points). Shading devices used to eliminate direct sunlight from reaching task areas; percentage of daylit areas with photo-sensors to maintain consistent lighting levels using shading and solar control devices.

IgCC v2.0, November 2010: 602 Energy Performance, Peak Power and Reduced Co2e Emissions.

IgCC v2.0, November 2010: 604: Energy Metering, Monitoring and Reporting. 604.3.3 Energy used for building operations (motorized shading systems).

IgCC v2.0, November 2010: 605: Automated Demand Response (AUTO-DR) Infrastructure.

IgCC v2.0, November 2010: 606 Building Envelope Systems; 606.1.1.1 Permanent shading devices for fenestration.

IgCC v2.0, November 2010: 612 Energy Systems Commissioning and Completion; 612.3.3 Automatic daylight controls.

IgCC v2.0, November 2010: 808 Daylighting; 808.3.2 Daylight performance requirements.

ASHRAE189.1-2014: 7 Energy Efficiency; 7.4.2.5 Permanent Projections, Exception (2) Vertical Fenestration with automatically controlled shading devices.

ASHRAE189.1-2014: 8.4.1 Daylighting; 8.4.1.3 Office Space Shading, a. Shading devices; Exception (3) Vertical Fenestration with automatically controlled shading devices.

ASHRAE 189.1-2014: 10.3.1.1.3 Systems, d. Fenestration control systems, Automatic controls for shading devices.

Sustainability submittals required for bidding/procurement in contract documents include shade control product data for interior lighting and daylighting.

* + - * 1. Sustainable Design Submittals:

Product Data: For interior lighting, submit data sheets for window shade [**and** **building management system interface and networked automation**] controls, including [**stand-alone**] [**and**] [**integrated**] system operation documentation.

Overall [**stand-alone**] [**and**] [**integrated**] system operation description document, Sequence of Operations.

Simulation documentation required for LEED credit accreditation.

Manufacturer must be able to submit Building Simulation Modelling to meet the requirements of Architect or engineer’s performance model of the building prior to receiving the awarded contract.

Building simulation for daylighting and building performance.

* + - * 1. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.

Include plans, elevations, sections, and [**mounting**] details.

Include details of equipment assemblies. Indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

Motor-Operated Shades: Include details of installation and diagrams for power, signal, wiring and [**standard motors**][**,**][**radio motors**] [**and**] [**networked motors**].

Retain "Samples" Paragraph below for single-stage Samples, with a subordinate list if applicable. Retain "Samples for Initial Selection" and "Samples for Verification" paragraphs for two-stage Samples.

* + - * 1. Samples: For each exposed product and for each color and texture specified, 10 inches (250 mm) long.
        2. Samples for Initial Selection: For each type and color of shadeband material.

Include Samples of accessories involving color selection.

* + - * 1. Samples for Verification: For each type of roller shade.

Shadeband Material: Not less than [**10 inches (250 mm)**] [**3 inches (76 mm)**] square. Mark interior face of material if applicable.

Roller Shade: Full-size operating unit, not less than 16 inches (400 mm) wide by 36 inches (900 mm) long for each type of roller shade indicated.

Installation Accessories: Full-size unit, not less than 10 inches (250 mm) long.

* + - * 1. Product Schedule: For roller shades, motor operators, [**network**] controls, and controllers.[**Use same designations indicated on Drawings.**]
      1. INFORMATIONAL SUBMITTALS

Coordinate "Qualification Data" Paragraph below with qualification requirements in Section 014000 "Quality Requirements" and as may be supplemented in "Quality Assurance" Article.

* + - * 1. Qualification Data: For manufacturer and Installer.

Retain "Product Certificates" Paragraph below to require submittal of "UL," "c TUV us," "CCC," or "CE" product certificates from motor operator and control system manufacturer.

All Somfy motors are UL recognized or listed and can be found by searching "Somfy" under "Company Name" in the UL database at http://database.ul.com/cgi-bin/XYV/cgifind/LISEXT/1FRAME/index.html.

* + - * 1. Product Certificates: For each type of shadeband material, motor operator and control system.

Retain Zigbee® option below for wired motors; delete for WireFree.

[**BACnet® MS/TP**] [**BACnet® IP**] [**Modbus™**] [**Z-Wave®**] [**Zigbee®**] BMS or other third-party certification.

Submit functional description for data points required by BMS system.

Submit documentation that line voltage components are UL listed or UL recognized.

* + - * 1. Sample Warranty: For manufacturer's warranty.
      1. CLOSEOUT SUBMITTALS
         1. Operation and Maintenance Data: For roller shades, motor operators, and control systems to include in maintenance manuals.
         2. Warranty: For manufacturer's executed warranty documentation.
      2. MAINTENANCE MATERIAL SUBMITTALS
         1. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than [**two**] <**Insert number**> units.

* + - 1. QUALITY ASSURANCE

dc (direct current) powered motor-operators that are UL recognized or listed. DC powered motors offer very high torque capability compared to their weight and size. AC motors have the advantage of not having brushes to maintain, but are heaver and larger sized and require sophisticated controllers capable of inverting DC to AC at varying frequencies.

Somfy has over 40 years’ experience manufacturing tubular motors and natural light control systems with over 150 million motors sold worldwide.

* + - * 1. Manufacturer Qualifications: Motor operators, controls, and controllers certified by an NRTL to provide UL recognized or listed wired AC and DC powered motors.

ISO9001 certified including in-house engineering and product design activities.

Controls manufacturer capable of supplying commissioning services for control systems.

Motor manufacturer capable of supplying a full range of wirefree (12Vdc - battery and solar powered) direct voltage DC (24Vdc), main or line-voltage (120Vac) motor and control products.

* + - * 1. Installer Qualifications: Trained[ **and certified**] by manufacturer of motor-operator and control system products.
        2. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, to verify operation[**with** **standalone** **control**][**with** **networked** **control**], and to set quality standards for fabrication and installation.

Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

Retain subparagraph below if the intention is to make an exception to the default requirement in Section 014000 "Quality Requirements" for demolishing and removing mockups.

Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

* + - 1. DELIVERY, STORAGE, AND HANDLING
         1. Deliver roller shades, motor operators, control systems and accessories in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.
         2. Store equipment indoors in clean, dry space with uniform temperature to prevent condensation. Protect from exposure to dirt, fumes, water, corrosive substances, and physical damage.
      2. FIELD CONDITIONS
         1. Environmental Limitations: Do not install roller shades, motor operators, and control systems until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
         2. Field Measurements: Where roller shades, motor operators and control systems are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings.

Allow clearances for operating hardware of operable glazed units through entire operating range.

Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

* + - 1. WARRANTY

When warranties are required, verify with Owner's counsel that warranties stated in this article are not less than remedies available to Owner under prevailing local laws.

Somfy motors have a life expectancy of 10 years or more. Refer to Somfy Systems Warranty information at the following link www.somfysystems.com/about-us/warranty/.

* + - * 1. Special Warranty for Motor and Control Systems: Manufacturer agrees to repair or replace motor and control units that are not free from defects in material and workmanship under normal and proper use within specified full warranty period, not prorated.

Warranty Period: Five years from date of manufacture.

1. PRODUCTS

Manufacturers and products listed in SpecAgent and Masterworks Paragraph Builder are neither recommended nor endorsed by the AIA or ARCOM. Before inserting names, verify that manufacturers and products listed there comply with requirements retained or revised in descriptions and are both available and suitable for the intended applications. For definitions of terms and requirements for Contractor's product selection, see Section 016000 "Product Requirements."

* + - 1. MANUFACTURERS

For Somfy motors, see https://www.somfysystems.com/commercial/motors.

For Somfy control systems, see https://www.somfysystems.com/commercial/control-systems.

* + - * 1. Source Limitations: Obtain roller shades from single source from single manufacturer.
      1. MOTOR-OPERATED, SINGLE-ROLLER SHADES

1. ACCEPTABLE MANUFACTURER
2. Hunter Douglas Architectural Window Coverings – 13915 Danielson Street, Suite 100, Poway, CA 92064; Phone 800.727.8953 x1; Fax 800.205.9819; Website [www.hunterdouglasarchitectural.com/windowcoverings](http://www.hunterdouglasarchitectural.com/windowcoverings); or architect approved equivalent.
3. Request for substitutions must be approved by architect minimum of 30 days prior to close of bid.
4. Find a representative: [http://www.hunterdouglasarchitectural.com/contacts/index.jsp#](http://www.hunterdouglasarchitectural.com/contacts/index.jsp)

Retain "Standard Motors with Wired Controls," "Radio Controlled Motors," or "Networked Automation Controlled Motors" Paragraph below

Motor sound ratings determined according to ISO3741 (http://www.iso.org/iso/home/store/catalogue\_tc/catalogue\_detail.htm?csnumber=52053).

Select Stand-Alone or System-Wide Master Controller Systems. Stand-Alone Systems are applicable for smaller, less feature-rich applications. System-Wide Master Controller Systems (animeo® IP) are to be used on larger jobs requiring advanced features.

The **Somfy Digital Network™ (SDN)** system is able to operate with or without a system-wide master controller.

Systems with or without a system-wide master controller utilize a communication infrastructure comprised of:

1) Wired Technology:

a) A network of intelligent devices (including but not limited to motors, keypads, sensors) with individual unique addresses.

b) Digital messages on a twisted-pair bus line, utilizing unshielded Category5 wire or higher.

c) Differential signaling method defined by the RS485 standard.

d) Network reliability is enhanced by low baud rate and high impedance devices allowing free wiring topology without the need for termination resistors.

e) Utilization of unshielded wire allowing flexibility in wire choices and reduced cost.

f) Bus connected control devices such as keypads, sensors, adaptors, repeaters, and receivers powered directly from the bus line utilizing a 24Vdc Class2 power supply.

g) Wire terminated with low-cost, field-installable, RJ-45 connectors terminated in the EIAT-568B standard.

2) Wireless Technology: Multiple addresses, no interference.

a) A network of intelligent devices (including but not limited to motors, keypads, sensors) with individual unique addresses.

b) Operating in the 433.42 MHz FCC unlicensed ISM (Industrial, Scientific, and Medical) frequency band to enhance reliable wireless communication.

c) Adapt wired to wireless devices and wireless to wired devices on the same network, allowing flexibility during design and installation.

d) Devices must be able to communicate to industry wireless standards (including but not limited to ZigBee, Z-Wave, infiNET, Radio Technology Somfy).

e) Stand-alone scalable shading systems without a system-wide master controller, and comprised of intelligent motors and controls utilizing Somfy Digital Network™ (SDN) to have the ability to do the following:

(1) Network Characteristics:

(i) Manage the intelligent motors and controls on an RS485 network.

(ii) Manage unique addresses for each intelligent motor.

(iii) Allow the operation of both AC line-voltage motors and DC low-voltage intelligent motors on a single common intelligent network without requiring gateway devices.

(iv) Allow for upper and lower motor limits to be pre-set by window covering manufacturer and adjustable on site via hand-held device or PC, without the need to access the roller assembly or external, mechanical limit wheels or buttons.

(v) Allow for intelligent keypads, schedules, motor grouping and virtual switches to be configurable and managed from any point in the system’s wiring network via the Somfy software suite.

(vi) Be comprised of multiple bus segments, with each segment up to 4000 feet (1.219 km) long with up to 255 devices per bus segment.

(vii) Expand system capacity from one bus segment to multiple through the use of SDN system repeaters.

(viii) Allow for each motor to be a member of up to 16 groups with a total system capacity of up to 65,000 groups.

(ix) Allow for each motor to automatically align itself to a referenced shade position upon receiving a command from the network.

(x) Operate without the need of a dedicated PC.

(2) Automated Direction of System Components:

(i) Provide automatic sun-based control.

(ii) Utilize input levels from sun sensors to automatically adjust window coverings to pre-configured positions.

(iii) Perform time-based scheduled events.

(3) Integration of System with other Building Systems:

(i) Communicate to Building Management Systems.

(4) Communicate to third-party automation systems through RS485 and RS232 serial protocols as well as dry contact closure, with the ability to do the following:

(i) Enact an event within the automation system.

(ii) Have the automation system directly control a single motor.

(iii) Have the automation system simultaneously control a pre-programmed group of motors.

f) Stand-alone scalable shading system with a system-wide master controller (animeo IP), comprised of intelligent motors and controls utilizing Somfy Digital Network™ (SDN), to have the ability to do the following:

(1) Network Characteristics:

(i) Manage the intelligent motors and controls on an RS485 network.

(ii) Manage unique addresses for each intelligent motor.

(iii) Allow the operation of both AC Line-Voltage Motors and DC Low-Voltage SDN (RS485) motors on a single common intelligent shade network without requiring gateway devices.

(iv) Allow for upper and lower limits to be pre-set by shade manufacturer and adjustable on site via hand-held device or PC, without the need to access the roller assembly or external mechanical limit wheels or buttons.

(v) Allow for intelligent keypads, schedules, motor grouping and virtual switches to be configurable and managed from its own internal IP network, from the building’s internal network, or remotely over the Internet.

(vi) Provide an isolated RS485 communication bus input for sensor information to ensure motor and keypad data integrity.

(vii) Include integrated IP networking infrastructure hardware to allow for stand-alone operation, separated from building IP network.

(viii) Be comprised of multiple bus segments, with each segment up to 4000 feet (1.219 km) long with up to 255 devices per bus segment.

(ix) Expand system capacity from one bus segment to multiple through the use of SDN system devices, or animeo® IP Sub Controllers.

(x) Allow for each motor to automatically align itself to a referenced shade position upon receiving a command from the network.

(xi) Provide automated direction of system components

(xii) Provide two methods of automated sun-based control.

(2) Methods:

(i) Sun Control: Threshold-based control of daylight shading. Move daylight shading systems to a pre-determined location upon passing beyond a programmable light level threshold. The system is to be able to enact multiple configurations based on time-of-day.

(ii) Daylight Entrance Depth Management: Automatic management of light entrance into the building space. Move daylight shading system based on the following user-defined parameters, including but not limited to the following:

- Building location, precise

longitude/latitude.

- Window’s cardinal direction.

- Time of year.

- Time of day.

- Size of window.

- Allowable distance of sunlight entrance into the space.

- Portion of window to be unshaded at all times.

- Shade position if light level drops below programmed threshold.

- Sun position based on astronomic timeclock with programmable offset.

(iii) Method1 or Method2 of automated sun-based control to provide for on-and-off delays to account for momentary changes of cloud cover.

(iv) Method1 or Method2 of automated sun-based control to provide for override timers to turn sun control on-and-off at a programmable time.

(v) Perform astronomic and real-time scheduled events.

(vi) Keep precise time using a self-calibrating real-time clock (RTC) with battery backup.

(vii) Provide the ability to cascade multiple events for the same motor or group.

(viii) Provide integration of system with other building systems.

(ix) Communicate to Building Management Systems through HTTP commands via IP.

g) Communicate to third-party automation systems through HTTP commands via IP and dry relay closure, with the ability to do the following:

(1) Enact an event within the automation system.

(2) Have the automation system directly control a single motor.

(3) Have the automation system simultaneously control a pre-programmed group of motors.

(4) Provide a master input from alarm system to position shades in a predetermined position.

(5) Allow for firmware and configuration upgrades both from within the building and remotely over the internet

(6) Allow for an interface to the building LAN for remote connectivity for software upgrades and remote troubleshooting.

(7) Building and Sub Controller to have fail-safe firmware backup to ensure ongoing operation after low level failure.

(8) Provide a GUI for motor commissioning and system configuration.

(9) Allow for the auto-discovery of motors, intelligent keypads and weather sensors present on the SDN Network.

(10) Allow visual identification and assignment of motor location to specific window location within a building.

(11) Have a GUI allowing for "drag-and-drop" programming of the system based on Microsoft Windows7 programming conventions.

(12) Provide setting of parameters in US or Metric units of measurement.

(13) Provide a GUI for system building management operation and maintenance.

(14) Provide multilevel administrator system account access allowing building management control without the ability to adjust system configuration.

(15) Provide status and real-time values for all weather sensors.

(16) Provide visual status of motor position and status in both graphical and tabular formats.

(17) Provide real-time status for system’s current mode of control: auto, timer, manual, or system override.

(18) Provide an optional floor plan view of motor placement and status, with the ability to import standard AutoCAD files.

(19) Provide the ability to lock shades at specific position for maintenance.

(20) Provide a lock-out timer to disable local control overrides during periods where energy saving performance is a priority.

(21) Provide GUI for user operation.

(22) Allow for account-based end user password access that provides each individual user a customized virtual keypad for pre-assigned shades and zones.

(23) Allow user access from most popular Web browsers on a PC, Mac, smartphone, or tablet.

h) Ancillary support equipment for the Somfy Digital Network™ (SDN) system includes the following:

(1) Power Panel for SDN: A bus distribution component used to add 10 isolated motor ports and two isolated device ports to an SDN bus segment.

(2) SDN Low-voltage Motor Power and Data Cable: Power and communication backbone that connects low-voltage Somfy Digital Network™ (SDN) motors to the Power Panel for SDN.

i) Data Panel is a bus distribution component device that adds four isolated bus segments to an SDN system.

j) Extender is a bus distribution component that is used to refresh a segment’s capacity or to create a new bus segment in the middle of an existing bus segment.

k) Data Hub adds five device-ports to the SDN bus line with maximum wiring stub lengths up to 30 ft. (9.14 m).

l) Data Hub Plus adds five isolated device ports to an SDN Bus line and supports longer wire stubs beyond the 30 ft. (9.14 m) standard Data Hub.

m) Bus (and Sensor Station) Power Supply provides 24Vdc power to the SDN bus. Each Power Supply can provide power to up to 100 bus line devices (excluding motors).

Each network connection topology device shall come from the Somfy Digital Network™ (SDN) product line. For more details on product range, please refer Section122509 and the following link: www.somfysystems.com/sdn-2-0.

* + - * 1. Networked Automation Controlled Motors: Provide factory-assembled, shade-operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors or radio controls to motors. Coordinate operator [**wiring requirements**] [**radio controls**] and electrical characteristics with building electrical system.

Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

If required, insert manufacturers' description of alternative motor that is available (for example, "quiet operation" motor, and so forth) in "Basis-of-Design Electric Motor" Subparagraph below.

Sonesse motors have an adjustable speed capability that is regulated and adjustable by 1 rpm (+/- 0.5 rpm) increments between 10 and 25 rpm.

Basis-of-Design Electric Motor: Hunter Douglas Architectural Window Coverings; [**Sonesse® 30 RS485**] [**Sonesse® 50 RS485**] [**Sonesse® ULTRA 50 AC RS485**] [**Sonesse® ULTRA 50 DC RS485**] [**LT-50 RS485**]; tubular, enclosed in roller.

Motor Electrical Characteristics: [**120-V ac**] [**24-V dc**] <**Insert requirements**>.

Power Cable: [**3-wire cable (hard wired)]** [**3-wire cable with molded NEMA 5-15P plug**] [**2-wire (hard wired)**].

Shade Characteristics of Motor:

Total shade widths are contingent upon shade hardware.

Maximum Total Shade Width: [**As required to operate roller shades indicated**] <**Insert requirements**>.

Max shade drops are contingent upon shade hardware and maximum turns on the limit switch.

Maximum Shade Drop: [**As required to operate roller shades indicated**] <**Insert requirements**>.

Motor manufacturer to offer a motor capable of handling shade manufacturer hardware.

Maximum Weight Capacity: Motor range to provide 17.7 to 443 in-lbf (2 to 50 Nm) lifting capacity options. [**As required to operate roller shades indicated**] <**Insert requirements**>.

Retain "Minimum Audible Noise" Subparagraph below to meet more stringent project noise requirements. Use Somfy ULTRA motors to meet requirements.

Minimum Audible Noise: Minimum audible noise of equal to or less than 38 dBA according to the standards of ISO3741NF31022 in dBA ref.1pW at nominal torque without end product.

Radio Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for [**surface**] [**recessed or flush**] <**Insert type**> mounting. Provide the following for remote-control activation of shades:

Retain one or more of first seven subparagraphs below and revise to suit Project.

RTS Receiver:

Basis-of-Design Product: Hunter Douglas Architectural Window Coverings; [**RTS Receiver for SDN**] [**RTS Receiver for animeo® IP**].

Open Air Range: 65 ft. (20 m) radius through two concrete walls 11.81-inch- (30-cm-) thick or less, or 100 ft. (30.48 m) through open-air.

Electrical Characteristics: 24Vdc (powered by Somfy Digital Network™ (SDN) bus).

Frequency: 433.42 MHz

Hand-held remote for blinds and shades can also control motors in awnings (107313), curtains and drapes (122200), exterior screens (107113), projection screens (115213), and rolling shutters (083323).

Hand-Held Radio Control Remote: [**LCD Display**] [**Scroll wheel**] [**Tactile button**]; 433.32 MHz.

Basis-of-Design Product: Hunter Douglas Architectural Window Coverings; [**Telis 16**] [**Telis 1 Chronis**] [**Telis**] [**Telis Modulis**].

Electrical Characteristics: Battery; [**2-AAA (LR3) lithium**] [**CR 2430 Lithium 3V**].

Do not use rechargeable batteries.

Transmitter: [**Sixteen-**][**Five-**][**Single-**]channel.

Open Air Range: 65 ft. (20 m) radius through two concrete walls 11.81-inch- (30-cm-) thick or less, or 100 ft. (30.48 m) through open-air.

Index Protection Rating: IP 30.

Accessories: Wall mount holder with screw cover and screw kit.

Radio Control [**Wall Switch**][**and**][**Table Top**]: Button-operated station.

Wirefree "Table Top" accessory option incorporates "Wirefree Wall Switch."

Basis-of-Design Product: Hunter Douglas Architectural Window Coverings; Decoflex Wirefree™ RTS [**Table Top**].

[**Five-**][**Four-**][**Three-**][**Two-**][**Single-**]channel wireless transmitter.

Electrical Characteristics: Battery; CR2450 Lithium 3V.

Open Air Range: 65 ft. (20 m) radius through two concrete walls 11.81-inch- (30-cm-) thick or less, or 100 ft. (30.48 m) through open-air.

FCC Approval: Part15, ClassB.

Exterior Sensor Station: Adjustable system consisting of digital displays detecting sun and rain intensity, responding by automatically adjusting shades. Wireless, solar-powered, LED indicator lights, optical rain-sensor and sun-level sensor with user-selected thresholds that automatically operate networked motors.

Basis-of-Design Product: Hunter Douglas Architectural Window Coverings; Complete Sensor Station.

Basis-of-Design Product: Hunter Douglas Architectural Window Coverings; Compact Sensor Station.

Sensor Types: Wind speed, heated rain, temperature, and sun intensity.

Basis-of-Design Product: Hunter Douglas Architectural Window Coverings; [**Large wind speed**][**Small wind speed**][**Wind direction**][**Rain Sensor Ondeis**] [**Ondeis WireFree™**] [**Outside temperature**] [**Inside temperature**] [**and**] [**Sun intensity**] <**Select individual sensor type(s)**>.

Timer Control: Clock timer based on astronomic timeclock with 60-minute offset, [**24-hour**] [**seven-day**] <**Insert period**> programmable for regular events.

Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features; isolated from voltage spikes and surges.

Basis-of-Design Product: Hunter Douglas Architectural Window Coverings; animeo® IP.

Control Unit Color: [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

Digital Communications Network: Balanced multi-point digital actuators integrated into [**stand-alone system**] [**building management system**].

Somfy Digital NetworkTM (SDN) system architecture consists of a digital network of serial interconnected intelligent devices to include SDN RS485 motors with both line and low-voltagepower options rated for interior and exterior applications, wired and wireless intelligent keypads, intelligent drapery track motors, sun sensors, and timers.

Retain "animeo® IP" option below to include centralized automated network controls in lieu of a stand-alone system. Refer to Section122509 for further detailed information. To include a dedicated Daylight Management System, add Somfy animeo**®** IP to the Somfy Digital NetworkTM (SDN). Somfy animeo**®** IP provides advanced solar automation features such as sun tracking, solar entrance depth management, auto discovery of components, time/calendar event scheduling, comfort timers, facility manager graphical user interface for global system status updates and control, self-contained weather station, virtual keypads, remote management for configuration and control, and BMS system integration.

Basis-of-Design Product: Hunter Douglas Architectural Window Coverings; Somfy Digital Network™ (SDN) RS485[**and** **animeo® IP**].

Linear Bus Wiring: ANSI/TIA/EIA-568-B (RS-485) standard, capacitance controlled, balanced twisted pair cable.

Maximum Bus Segment Length: 4000 ft. (1218 m).

Maximum Number of Connected Devices: 255 per bus segment.

Electrical Characteristics: Bus-connected control devices such as keypads, sensors and receivers powered directly from bus line using a 24Vdc class2 power supply.

Wire and Connectors: Category5 balanced twisted pair cable, ethernet patch cables, RJ45 connectors and splitters.

Retain subparagraph below when using a dedicated daylight management system.

Daylight Management System: Digital network system integrating daylight entry management, timed events, intelligent motorized window coverings, digital keypads and weather sensors.

Edit subparagraphs below to meet project requirements. An unlimited number of motors can be networked through Sub-Building Controllers for each new group of 200 motors per Sub-Building Controllers. System allows for unlimited, large networks to be built using RS485 or IP, and then operated as stand-alone system or integrated into building management system.

Interface System Views are Floor plan, List, Facade, and Group(s) including Timer Configuration, Sun Tracking, and Drag & Drop Interface.

Maximum Networked Motors: [**200**] [**1000**] [**5000**] <**Insert number (unlimited)**>.

Interface Control(s):

Retain one or more of the Interface Controls below.

[**Wall-mounted wireless keypad** **and RTS receiver**].

[**Tabletop wireless keypad and RTS receiver**].

[**Hand-held radio remote control and RTS receiver**].

[**Wall-mounted digital keypad**].

[**Personal computer**].

[**Intelligent bus distribution network device**].

[**Smart tablet**].

[**Smart phone**].

[**Third-party lighting system integration**].

[**Third-party AV system integration**].

<**Select control types**>.

Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.

Operating Features:

Group switching with integrated switch control; single faceplate for multiple switch cutouts.

Capable of interface with [**audiovisual**] [**multiroom**] [**building management system**] <**Insert description**> control system.

Capable of accepting input from networked building automation control system.

Retain subparagraph below for sensor- or timer-controlled systems.

Override switch.

Accessories:

<**Insert accessory**>.

* + - * 1. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.

Roller Drive-End Location: [**Right side of interior face of shade**] [**Left side of interior face of shade**] [**As indicated on Drawings**] <**Insert requirements**>.

Coordinate direction of roll with fascia, headbox, or shade-pocket design.

Direction of Shadeband Roll: [**Regular, from back (exterior face) of roller**] [**Reverse, from front (interior face) of roller**].

Shadeband-to-Roller Attachment: [**Manufacturer's standard method**] [**Adhesive strip**] [**Removable spline fitting into integral channel in tube**] <**Insert description**>.

Types and sizes of mounting hardware vary among manufacturers. Revise "Mounting Hardware" Paragraph below if specific types of hardware (for example, extended brackets or slim-profile brackets) are required. Where hardware dimensions are critical, indicate installation conditions and size constraints on Drawings.

* + - * 1. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

If retaining "Roller-Coupling Assemblies" Paragraph below, indicate locations and quantities of rollers joined with coupling assemblies on Drawings or in a window-treatment schedule.

* + - * 1. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers that are operated by one roller drive-end assembly.
        2. Shadebands:

Coordinate option retained in "Shadeband Material" Subparagraph below with requirements specified in "Shadeband Materials" Article.

Shadeband Material: [**Light-filtering fabric**] [**Light-blocking fabric**] <**Insert requirements**>.

Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.

Bottom bars vary among manufacturers; insert requirements for specific type and shape in "Type" Subparagraph below.

Methods of sealing light gaps at bottoms of shades vary among manufacturers. Exposed bottom bars with integral light seals are available from many of the manufacturers.

Type: [**Enclosed in sealed pocket of shadeband material**] [**Exposed with endcaps**] [**Exposed with endcaps and integral light seal at bottom where it meets the sill**] <**Insert description**>.

Retain "Color and Finish" Subparagraph below for exposed bottom bars.

Color and Finish: [**As selected by Architect from manufacturer's full range**] <**Insert color and finish**>.

* + - * 1. Installation Accessories:

Retain "Front Fascia" or "Exposed Headbox" Subparagraph below for exposed roller enclosures. Retain "Exposed Headbox" Subparagraph for light-blocking shades.

Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.

Shapes and heights of fasciae vary among manufacturers.

Shape: [**L-shaped**] [**Curved**] <**Insert requirements**>.

Height: Manufacturer's standard height required to conceal roller and shadeband assembly when shade is fully open, but not less than [**4 inches (102 mm)**] [**3 inches (76 mm)**] <**Insert dimension**>.

Exposed Headbox: Rectangular, extruded-aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.

Height: Manufacturer's standard in height required to enclose roller and shadeband assembly when shade is fully open, but not less than [**4 inches (102 mm)**] [**3 inches (76 mm)**] [**as indicated on Drawings**] <**Insert dimension**>.

If retaining "Endcap Covers" Subparagraph below, verify availability with manufacturers.

Endcap Covers: To cover exposed endcaps.

Retain "Recessed Shade Pocket" Subparagraph below for roller enclosure installed above the ceiling.

Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.

Height: Manufacturer's standard height required to enclose roller and shadeband assembly when shade is fully open, but not less than [**6 inches (152 mm)**] [**5 inches (127 mm)**] [**4 inches (102 mm)**] [**height indicated on Drawings**] <**Insert dimension**>.

Provide pocket with lip at lower edge to support acoustical ceiling panel.

Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.

Widths of closure panels vary among manufacturers.

Closure-Panel Width: [**As indicated on Drawings**] [**2 inches (51 mm)**] <**Insert dimension**>.

Retain "Side Channels" and "Bottom (Sill) Channel or Angle" subparagraphs below for light-blocking shades.

Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.

Methods of sealing light gaps at bottoms of shades vary among manufacturers. Shadeband bottom bars fit into bottom channels or butt against bottom angles to seal light leaks.

Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.

Installation Accessories Color and Finish: [**As selected from manufacturer's full range**] <**Insert color and finish**>.

* + - 1. SHADEBAND MATERIALS
         1. Shadeband Material Flame-Resistance Rating: Comply with [**NFPA 701**] <**Insert requirement**>. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

If more than one light-filtering or light-blocking shadeband fabric is required, copy and re-edit applicable paragraph below and insert a unique designation for each fabric.

* + - * 1. Light-Filtering Fabric: Woven fabric, stain and fade resistant.

Source: [**Roller shade manufacturer**] <**Insert source for custom fabrics**>.

Type: [**PVC-coated fiberglass**] [**PVC-coated polyester**] [**Woven PVC-coated fiberglass and PVC-coated polyester**] [**Woven polyester and PVC-coated polyester**] [**Acrylic-coated fiberglass**] [**PVC-coated fiberglass with silver backing**] <**Insert description**>.

Weave: [**Mesh**] [**Basketweave**] <**Insert description**>.

Thickness: <**Insert thickness**>.

Weight: <**Insert oz./sq. yd. (g/sq. m)**>.

Roll Width: [**36 inches (914 mm)**] [**48 inches (1229 mm)**] [**60 inches (1524 mm)**] [**72 inches (1829 mm)**] [**84 inches (2134 mm)**] <**Insert dimension**>.

Coordinate requirements retained in "Orientation on Shadeband" Subparagraph below with requirements in "Roller Shade Fabrication" Article. See "Shadebands" Article in the Evaluations for a discussion of up-the-bolt and railroaded fabrics.

Orientation on Shadeband: [**Up the bolt**] [**Railroaded**] [**As indicated on Drawings**] <**Insert requirements**>.

Openness Factor: [**1**] [**3**] [**5**] [**10**] [**11**] [**22**] <**Insert number**> percent.

Color: [**As indicated on Drawings**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

* + - * 1. Light-Blocking Fabric: Opaque fabric, stain and fade resistant.

Source: [**Roller shade manufacturer**] <**Insert source for custom fabrics**>.

Type: [**Fiberglass textile with PVC film bonded to both sides**] [**Fiberglass with acrylic backing**] [**Acrylic-coated fiberglass**] [**Polyester-cotton blend**] [**Polyester with foamed-acrylic backing**] [**PVC-coated fiberglass with bonded PVC film**] <**Insert description**>.

Thickness: <**Insert thickness**>.

Weight: <**Insert oz./sq. yd. (g/sq. m)**>.

Roll Width: [**36 inches (914 mm)**] [**48 inches (1229 mm)**] [**60 inches (1524 mm)**] [**72 inches (1829 mm)**] [**84 inches (2134 mm)**] <**Insert dimension**>.

Coordinate requirements retained in "Orientation on Shadeband" Subparagraph below with requirements in "Roller Shade Fabrication" Article. See "Shadebands" Article in the Evaluations for a discussion of up-the-bolt and railroaded fabrics.

Orientation on Shadeband: [**Up the bolt**] [**Railroaded**] [**As indicated on Drawings**] <**Insert requirements**>.

Features: [**Washable**] [**Antistatic treatment**] <**Insert requirements**>.

Outside face of light-blocking fabrics are often white.

Color: [**As indicated on Drawings**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <**Insert color**>.

If required, insert requirements for dual-fabric shadebands made of two layers of different, loosely layered material.

* + - 1. ROLLER SHADE FABRICATION
         1. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.
         2. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F (23 deg C):

Retain "Between (Inside) Jamb Installation" or "Outside of Jamb Installation" Subparagraph below. Alternatively, retain both subparagraphs and indicate locations of each on Drawings or in a window-treatment schedule. Coordinate clearance requirements with distance between shades and glass, glass type, and placement of heating/cooling air supplies to avoid heat buildup and possible damage to glass.

If retaining "Between (Inside) Jamb Installation" Subparagraph, see "Product Characteristics" Article in the Evaluations for a discussion of GANA recommendations.

Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch (6 mm) per side or 1/2-inch (13-mm) total, plus or minus 1/8 inch (3.1 mm). Length equal to head-to-sill or -floor dimension of opening in which shade is installed less 1/4 inch (6 mm), plus or minus 1/8 inch (3.1 mm).

If retaining "Outside of Jamb Installation" Subparagraph below, indicate locations of shades relative to openings and widths and lengths of shades on Drawings or in a window-treatment schedule.

Outside of Jamb Installation: Width and length as indicated, with terminations between shades of end-to-end installations at centerlines of mullion or other defined vertical separations between openings.

* + - * 1. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than [**1:4**] <**Insert ratio**>, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

Skylight Shades: Provide battens and seams at uniform spacings along shadeband as required to ensure shadeband tracking and alignment through its full range of movement without distortion or sag of material.

Coordinate requirements in "Railroaded Materials" Subparagraph below with requirements in "Shadeband Materials" Article and with requirements indicated on Drawings or in a window-treatment schedule.

Railroaded Materials: Railroad material where material roll width is less than the required width of shadeband and where indicated. Provide battens and seams as required by railroaded material to produce shadebands with full roll-width panel(s) plus, if required, one partial roll-width panel located at top of shadeband.

* + - 1. SOURCE QUALITY CONTROL
         1. Motor Manufacturer Factory Quality Control Process:

Testing and approval of motors to be completed by one or more global safety testing laboratories including, but not limited to: UL, CUL, TUV, ETL, CE, and VDE.

Prior to being shipped, each motor to pass testing for having no defects in wiring and operation including:

Assembled motor test design specifications when installed in various end products.

Product installation testing.

Product safety tests.

Product performance tests.

Life cycle testing for endurance and reliability.

Embedded software tests.

Heat and fire resistance tests.

Water and oxidation resistance tests.

Climate tests (temperature and humidity).

Acoustic tests (sound level and quality).

Radio frequency tests (transmission and reception).

Electromechanical capability (CEM).

1. EXECUTION
   * + 1. EXAMINATION

Retain option in first paragraph below for motorized operators.

* + - * 1. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, operational clearances, blocking, [**locations of connections to building electrical system,**]and other conditions affecting performance of the Work.
        2. Proceed with installation only after unsatisfactory conditions have been corrected.
      1. ROLLER SHADE INSTALLATION
         1. Install roller shades, motor operators, and stationary control systems level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

Coordinate requirements for distance between roller shades and glass with glass type and placement of heating/cooling air supplies to avoid heat buildup and possible damage to glass. Generally, retain first option in "Opaque Shadebands" Subparagraph below. See "Product Characteristics" Article in the Evaluations.

Opaque Shadebands: Located so shadeband is not closer than [**2 inches (51 mm)**] <**Insert dimension**> to interior face of glass. Allow clearances for window operation hardware.

* + - * 1. Comply with NECA 1 and NECA 130.
        2. Comply with FCC guidelines.

Retain "Electrical Connections" Paragraph below for hard wired motor-operated roller shades.

* + - * 1. Electrical Connections: Connect each roller shade motor operator and stationary control system to building electrical system.

Grounding: Provide electrical grounding in accordance with NFPA70.

Retain “Networked Building Management System” Paragraph below when BMS is included in project.

* + - * 1. Networked Building Management System: Connect networked automation controls for motorized equipment to building management system.
        2. Roller Shade Locations: [**At exterior windows**] [**As indicated in window-covering schedule**] [**As indicated on Drawings**] <**Insert requirements**>.
        3. Sun, Rain, and Wind Sensor Locations: Mount on exterior according to manufacturer's written instructions.
      1. ADJUSTING
         1. Adjust and balance roller shades and motorized equipment to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

Program each motor-operator control system to [**manufacturer’s standard settings**] [**Owner-provided program settings**].

* + - * 1. Commissioning Control Systems: Perform commissioning of integrated automation control systems[**and connection to building management system**].

Managed by [**shade manufacturer/supplier**] [**motor and control manufacturer**] [**digital network integrator**] <**Insert name of commissioning agency**>.

Contact manufacturer for fee-based window treatment control system commissioning support.

System should be commissioned and operation based on pre-project planning and optimal system performance led by occupant comfort or energy savings.

Control systems to be commissioned on a per-floor basis followed by complete system programming of the window treatment network.

* + - 1. CLEANING AND PROTECTION
         1. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.
         2. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
         3. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.
      2. CLOSEOUT ACTIVITIES

Retain this article for motorized roller shades.

* + - * 1. Demonstration and Training: Engage a factory-authorized service representative to demonstrate and train Owner's maintenance personnel to adjust, operate, and maintain motor-operated roller shades and[**networked automation**] motor control systems.

**END OF SECTION 12492**