

SECTION 122416
CELLULAR WINDOW SHADES

CSI 3-PART GUIDE SPECIFICATION: EDIT TO SUIT PROJECT

PART 1 - GENERAL

1.1 SUMMARY

NOTE: Edit the following if all shades are manual only to eliminate references to motorized operators and controls.

- A. Work of this Section includes manually operated and motorized, cellular window shades including motor operator, controls, mounting hardware, side tracks, and other accessories.
- B. Related Documents and Sections: Examine Contract Documents for requirements that directly affect or are affected by Work of this Section. A list of those Documents and Sections include, but is not limited to the following:
 - 1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and DIVISION 01 General Requirements, Specification Sections, apply to this Section.
 - 2. SECTION 061000, ROUGH CARPENTRY: Wood blocking for support of window shade brackets and pocket assemblies.
 - 3. SECTION 122413, ROLLER WINDOW SHADES

1.2 REFERENCES

- A. Abbreviations and Acronyms per SECTION 011000, SECTION 014000, and as follows:
 - 1. AHJ. Authority Having Jurisdiction from local, state and federal regulatory agencies.
 - 2. GC. General Contractor.
 - 3. Per. In accordance with.

NOTE: Edit Definitions and References below to suit project.

- B. Definitions per SECTION 011000, SECTION 014000, and as follows:
 - 1. Light Transmittance. The fraction of radiant energy or incident light at a specified wavelength that passes through a material.
 - 2. Shading Coefficient. Percentage of solar heat gain.
 - 3. Visual Opacity. The degree to which a material is transparent, allowing images or views behind to visually show through.
- C. Referenced Standards per SECTION 014000 and as follows:
 - 1. ANSI. American National Standards Institute; www.ansi.org
 - a. ANSI / WCMA A100.1
 - 2. ASTM. ASTM International; www.astm.org
 - a. ASTM A228: Standard Specification for Steel Wire, Music Spring Quality.
 - b. ASTM A666: Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - c. ASTM A1008: Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 - d. ASTM A1010: Standard Specification for Higher-Strength Martensitic Stainless Steel Plate, Sheet and Strip.

- e. ASTM D5034: Standard Test Method for Breaking Strength and Elongation of Textile Fabrics (Grab Test)
- f. ASTM D5035: Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip Method)
- g. ASTM G21: Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- 3. ATCC. American Type Culture Collection; www.atcc.org
- 4. CFR. Code of Federal Regulations; <http://www.gpoaccess.gov/CFR/INDEX.HTML>
- 5. NFPA. National Fire Protection Association; www.nfpa.org
- 6. USGBC. United States Green Building Council; www.usgbc.org
- 7. ISO/IEC. International Organization for Standardization, International Electrotechnical Commission; www.iec.ch/
- 8. USGBC. United States Green Building Council; www.usgbc.org

1.3 ADMINISTRATIVE REQUIREMENTS

NOTE: Coordinate and edit to the correct Section number below. The two numbers shown indicate relevant broad-scope and medium-scope numbers of the CSI MasterFormat® system.

- A. Coordination per SECTION 013000 or 013100, and as follows:

- 1. SECTION 061000, ROUGH CARPENTRY: Wood blocking.

NOTE: Delete the following if all shades are manual only.

- 2. SECTION 019100, COMMISSIONING: Building energy management system.
- 3. DIVISION 26, ELECTRICAL
- 4. DIVISION 27, COMMUNICATIONS

NOTE: Coordinate and edit to the correct Section number below.

- B. Preinstallation Meetings per SECTION 013100 or 013100, and as follows:

- 1. Review site conditions, installation requirements, schedules, coordination with other work, and warranty requirements.

NOTE: Coordinate and edit to the correct Section number below.

- C. Scheduling per SECTION 010000 or 011100, and SECTION 013000 or 013200, and as follows:

- 1. GC shall provide job elevator, lift, and scaffold access during construction up to Final Completion.

1.4 SUBMITTALS

NOTE: Coordinate and edit to the correct Section number below.

- A. Submit per SECTION 013000, or SECTION 013300, unless noted otherwise.

- B. Product Data: List of proposed products and manufacturer's printed information including:

- 1. Preparation instructions and recommendations
- 2. Storage and handling requirements and recommendations
- 3. Installation and maintenance instructions
 - a. Typical blocking detail requirements
- 4. Fabric solar and optical performance

NOTE: Delete the following if all shades are manual only.

- 5. Panel, power, wiring, cabling, j-box, outlet, and conduit requirements

NOTE: Edit the following if all shades are manual only.

- C. Shop Drawings: Submit indicating window rough openings, sill, jamb & head-frame section, details, shade type, location, dimensions, clearance requirements, attachment method, blocking requirements, and motor system housing.
 - 1. Field Measurements: Verify actual measurements for openings prior to fabrication, and after finish work is complete including window, window frame, trim installation.
 - a. Coordinate field measuring just prior to finish painting.
 - b. Indicate verified field measurements on Shop Drawings or Schedule.
 - 2. Window Shade Schedule: Submit shade schedule coordinated with room numbers and window types, containing field verified window interior rough opening dimensions, shade type, controls, quantities, fabric, and color.
 - 3. Wiring Diagrams: Electrical and control systems including wiring, cabling, conduit, motors, and connections.
- D. Samples: Submit minimum 3 x 5 inch (76mm x 127mm) samples of fabrics and metal finishes for initial and final selections by Architect.
 - 1. Submit finish choices for each system component exposed to view including, but not limited to, wall switches, hand controls, fascias, shade pockets, side channels.
- E. Quality Assurance Submittals per SECTION 014000, and as follows:
 - 1. Certificates: Submit a certificate with manufacturer's signature certifying that each product and/or system meets the requirements of the performance characteristics, physical criteria, and applicable standards specified.
 - a. Lead-free fabric products

NOTE: Delete the following if all shades are manual only.

- b. Motorized systems UL or ETL rated.
 - 2. Qualification Statements: Submit a letter, on printed letterhead and signed by an officer of the firm, for each listed quality assurance qualification listed, attesting to meeting each requirement called out.

GREEN NOTE: Edit LEED Requirements below to suit project.

GREEN NOTE: For maximum possibility of LEED credits specify double-celled cellular blinds with sidetrack system, remotely operated and controlled through a building management system.

- F. Sustainable Design (LEED) Submittals: Submit the following in accordance with the requirements of SECTION 018113, and as follows:
 - 1. LEED Credit EA, Energy & Atmosphere. Submit completed LEED-NC 2.2 Submittal Templates and required paperwork as follows:
 - a. EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems (Lighting and daylighting controls; energy systems)
 - b. EA 1: Optimize Energy Performance (Building energy management system tied to operable shades)
 - c. EA 5: Measurement & Verification (Building energy management system tied to operable shades)

NOTE: Delete item MR 5.1 and 5.2 below if project site is not within 500 miles of fabrication plant.

- 2. LEED Credit MR, Materials & Resources. Submit completed LEED-NC 2.2 Submittal Templates, and other required paperwork as follows:

NOTE: Select MR 5.1 or MR 5.2 or delete both.

- a. MR 5.1: Regional Materials, Regionally Extracted, Processed & Manufactured Products, 10 Percent
- b. MR 5.2: Regional Materials, Regionally Extracted, Processed & Manufactured Products, 20 Percent
 - 1). Submit product data indicating name of the manufacturer, product cost, distance between the project site and the manufacturer, and the distance between the project site and the extraction site for each raw material
3. LEED Credit EQ, Indoor Environmental Quality. Submit completed LEED-NC 2.2 Submittal Templates and required paperwork as follows:
 - a. EQ 6.1: Controllability of Systems. Lighting controls
 - 1). Submit proof of shading devices.
 - b. EQ 6.2: Controllability of Systems: Thermal Comfort
 - 1). Submit proof of building energy management system tied to operable shades.
 - c. EQ 8.1, Daylight and Views: Submit proof of daylight redirection and/or glare control devices; exterior and interior permanent shading devices; automatic photocell-based controls.)
 - d. EQ 8.2, Daylight and Views: Submit proof of interior shading devices, automatic photocell-based controls.

1.5 CLOSEOUT SUBMITTALS

NOTE: Coordinate and edit to the correct Section number below.

- A. Closeout Submittals per SECTION 017000 or 017800, and as follows:
1. Operation & Maintenance Manuals
 2. Executed Warranty Documentation.
 3. Record Documents

GREEN NOTE: Edit LEED Requirements below to suit project.

4. Sustainable Design Closeout Documentation including completed USGBC LEED® Templates for the following credits:
 - a. EA Prerequisite 1, EA Credit 1, EA Credit 5

Select MR 5.1 or MR 5.2 or delete both.

- b. MR 5.1, MR 5.2
- c. EQ 6.1, EQ 6.2, EQ 8.1, EQ 8.2

B. Maintenance Material Submittals

1. Spare Parts: Submit no less than one (1) percent additional clutches, brackets, motors, remotes, controls and other furnished items, plus two (2) percent additional for each cellular fabric type, with each item wrapped and labeled.

1.6 QUALITY ASSURANCE

NOTE: Coordinate and edit to the correct Section number below.

- A. Qualifications per 014000 or 014300 and as follows:
1. Manufacturer Qualifications: Firms experienced a minimum ten (10) years in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance.
 2. Fabricator / Installer Qualifications: A firm certified by manufacturer and experienced a minimum ten (10) years in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

- a. Installation shall be performed with skilled, experienced and trained workmen supervised by trained personnel who shall have a minimum three (3) years successful experience in installations of similar size and scope.
 - b. Fabricator shall be a subsidiary or licensed agent of the manufacturer approved to supply products specified and honor claims against product presented in accordance with warranty.
3. Testing Agency: An independent testing agency with the experience and capability to conduct the testing indicated, meeting requirements of ISO/IEC 17025 or ASTM E699 and ASTM E329.

- B. Certifications: Provide textile mill qualifications indicating shade cloths are manufactured by a company with one of the following current certifications:

NOTE: Edit to suit project. Delete if not used.

1. ISO-9001

NOTE: Coordinate and edit to the correct Section number below.

- C. Field Samples per SECTION 014000 or 014300, and as follows: Provide field samples of each different cellular shade fabric selected by the Architect to demonstrate aesthetic effects of materials in situ, assisting in making final selections prior to fabrication.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. General: Strictly follow manufacturer's recommendations, SECTION 016000, and as follows:

1. Delivery and Acceptance Requirements
 - a. Do not deliver window shades until building is enclosed and construction within spaces where shades will be installed is substantially complete.
 - b. Deliver products in manufacturer's original, unopened, clean, dry and undamaged containers with labels intact.
 - c. Label containers and shades according to Window Shade Schedule and approved Shop Drawings.
2. Storage and Handling Requirements
 - a. Protect materials, products and accessories during shipping, handling, storage and installation from exposure to soiling, damage, deterioration or other harmful conditions.
 - b. Store and dispose of solvent-based materials, and materials to be used with solvent-based materials, in accordance with requirements of local AHJ.
3. Packaging Waste Management
 - a. Request that manufacturers, fabricators, suppliers and shippers provide least amount of packaging that adequately and properly protects, supports and contains the items shipped, and is reusable, returnable or recyclable.

1.8 WARRANTY

- A. Manufacturer's Warranty per SECTION 016000, and as follows:

1. Material Warranties. Provide manufacturer's and/or fabricator's material warranty as follows:
 - a. Cellular Shade Fabric and Components: Manufacturer's limited lifetime warranty against defects in materials and workmanship.
 - b. Shade Fabrication: Provide fabricator's standard supplemental five (5) year limited "fit for use" warranty covering all failures, including cord breakage, excepting willful misuse.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Fabricator/Supplier List: Double Honeycomb Cellular Shades

1. **EcoSmart Insulating Cellular Shades** by Gordon's Window Décor; Essex Junction, VT;
http://gordonswindowdecor.com/cellular_shades.html

B. Window Shade Motors & Controls Manufacturer List:

1. Somfy Systems; 800.64 SOMFY; 609-395.1300; <http://www.somfy.com/nam/index.cfm>

NOTE: Select one of the following Substitution Limitations paragraphs, deleting the one not used.

- #### C. Substitution Limitations: Manufacturers of equivalent products shall be considered when submitted in accordance with CSI Substitution Request Form 1.5C (During the Bidding Phase) or Form 13.1 (After the Bidding Phase.)

NOTE: Coordinate and edit to the correct Section numbers below.

- #### D. Substitution Limitations: Manufacturers of equivalent products shall be considered when submitted in accordance with SECTION 013000 or SECTION 013300, and SECTION 016000.

NOTE: When bidding public work requiring a minimum three equivalent products, add the language for the two manufacturers listed below.

Properly submitted equivalent products by the following manufacturers will be considered:

1. Hunter Douglas; www.hunterdouglas.com
2. Lafayette Interior Fashions; www.lafvb.com

E. Product Options:

NOTE: Select options and edit below as needed.

1. Cellular Shade Type
 - a. Light Filtering
 - b. Light Filtering with Side Track
 - c. Room Black Out
 - d. Room Black Out with Side Track
2. Cellular Shadecloth:
 - a. PVC-free polyester
 - b. Aluminum metalized polyester
3. Operating hardware mechanism
 - a. Manual
 - 1). Standard Pull Cord (Universal)
 - 2). Continuous Cord Loop Clutch
 - 3). Cordless (Child Safe)
 - 4). Top and Bottom Opening (Top Down/Bottom Up / Duofold)
 - b. Motorized
 - 1). Controls

NOTE: Select option(s) desired and delete the remainder.

- a). Single control station (podium or wall)
 - b). Remote control (radio hand-held unit)
 - c). Remote control (Internet or intranet)
- 2). Controllers

- a). Gang relay/controller for universal action
- b). Separate relay/controller for each window shade unit
- 3). Building management software (incorporates charted annual sun path, weather station sensor information, automated command logic, tie-in to HVAC controls)
- 4). Sun Sensors
- 5). Timer
- 4. Multiple windows
 - a. Multiple shades, single operation
 - b. Individual operation for each shade
 - c. Multiple sets of ganged shades with each multiple set operating individually
- 5. Cellular shadecloth finish treatments
 - a. Flame retardant
 - b. Antistatic

2.2 DESCRIPTION

- A. General System Description: Cellular shade systems shall operate with a spring wrap mechanism, capable of accommodating a wide variety of shade sizes and fabric types. System shall be chain operated with spring assist when required to reduce pull force to lift heavy or large shades. Provide quality motors for automatic motorized operation in conjunction with cellular shade system.
- 1. Light Filtering, double cell construction
 - a. Fabric: Non-woven polyester
 - 1). Color: Two-tone with (neutral) uniform off-white color to the outside.
 - b. Construction: Double honeycomb cellular fabric with a concealed internal cord.
 - 1). Roller cord cleat lock design
 - 2). Pressure set equalizer provided to keep cords aligned and act as a cord stop outside mounts.
 - 3). Low profile head rail color coordinated to match fabric.
 - 4). Compact stacking height
 - c. Mounting Bracket: Spring-grip
 - 2. Room Black Out
 - a. Fabric: Aluminum metalized polyester
 - 1). Color: Two-tone with (neutral) uniform gray color to the outside.
 - b. Construction: Double honeycomb cellular fabric with a concealed internal cord.
 - 1). Roller cord cleat lock design; reversible
 - 2). Easy set cord tassel
 - 3). Pressure set equalizer provided to keep cords aligned and act as a cord stop outside mounts.
 - 4). Low profile head rail color coordinated to match fabric.
 - 5). Compact stacking height
 - c. Mounting Bracket: Spring-grip
 - 3. Cellular Honeycomb Shade Types
 - a. Double cell
 - b. Single cell
 - c. 'Perfect Pitch' Cellular
 - d. Cellular Verticals
 - 1). Cord or Wand Tilt
 - 2). Split or Side Stack

NOTE: R-Value set by shade, fabric and sidetrack selection.

Edit below as selected in line with project requirements.

- 4. R-Value: 3.5 to 5.0
- 5. Operating Hardware Mechanisms.

- a. Pull Cord
- b. Continuous Cord
- c. Cordless
- d. Motorized
- 6. Features
 - a. Light Filtering
 - b. Room Black Out
 - c. Insulating
 - d. Energy efficient
 - e. Pleat Retention
 - f. Washable Fabric
 - g. White to the Exterior
 - h. Gray to Exterior
 - i. Flame Resistant

B. Regulatory Requirements

- 1. Flame Retardance:
 - a. Passes NFPA 701 Small Scale vertical burn. Materials installed must be identical in composition and comparable structure to those tested.
 - b. California Administrative Code Title 19, Section [1237](#)
 - c. Passes U.S. Dept. of Transportation Motor Vehicle Safety Standard Part 571-[302](#).
- 2. Shadecloth Total Lead Content per 16 CFR 1303: Below limits.

GREEN NOTE: Edit below to suit project.

C. Sustainability Characteristics

- 1. Sustainable design requirements per AHJ.
 - a. State and municipal Energy Codes
- 2. Owner designated sustainable design requirements.
 - a. This is a USGBC LEED® registered project. Comply with requirements of:

NOTE: Each LEED Version requires a different credit total to achieve the desired LEED Rating.

NOTE. Select one of the following Ratings:

- b. Rating: Certified
- c. Rating: Silver
- d. Rating: Gold
- e. Rating: Platinum

NOTE. Select one of the following Versions:

- f. Version: [LEED-NC](#) v. 2.2 (New Construction)
- g. Version: [LEED-EB](#) v. 2.0 (Existing Building)
- h. Version: [LEED-C&S](#) v. 2.0 (Core & Shell)
- i. Version: [LEED-CI](#) v. 2.0 (Commercial Interiors)
- j. Version: [LEED for Schools](#), Version 2007
- k. Version: [LEED for Health Care](#)
- l. Version: [LEED for Homes](#) v. 1.72

NOTE: LEED Credits below are the most commonly used. Edit to suit project.

NOTE: Most relevant LEED credits are tied to sensor controlled motorized shading systems.

NOTE: If LEED for Homes is selected edit below to the proper and different LEED for Homes Credit designations.

- 3. LEED NC v. 2.2 Credits: Meet the performance requirements of the following LEED

Categories and Credits:

- a. Energy & Atmosphere (EA):
 - 1). EA Prerequisite 1: Fundamental Commissioning of the Building Energy Systems (Lighting and daylighting controls; energy systems)
 - 2). EA Credit 1: Optimize Energy Performance (Building energy management system tied to operable shades)
 - 3). EA Credit 5: Measurement & Verification (Building energy management system tied to operable shades)
- b. Materials & Resources (MR):
 - 1). MR Credit 5.1, Regional Materials, 10% Extracted, Processed & Manufactured Regionally (within 500 miles of project site)

NOTE: Select MR 5.1 or MR 5.2 deleting 5.1 or both if not applicable.

- 2). MR Credit 5.2, Regional Materials, 20% Extracted, Processed & Manufactured Regionally (within 500 miles of project site)
- c. Indoor Environmental Quality (EQ):
 - 1). EQ Credit 6.1, Controllability of Systems: Lighting (Building energy management system tied to operable shades)
 - 2). EQ Credit 6.2: Controllability of Systems: Thermal Comfort (Building energy management system tied to operable shades)
 - 3). EQ Credit 8.1, Daylight and Views: Daylight 75% of Spaces (Daylight redirection and/or glare control devices; exterior and interior permanent shading devices; automatic photocell-based controls.)
 - 4). EQ Credit 8.2, Daylight and Views: Views for 90% of Spaces (Interior shading devices, automatic photocell-based controls.)

2.3 PERFORMANCE / DESIGN CRITERIA

A. Performance Requirements

NOTE: Review and set performance requirements below to suit each shaded opening and material specified.

- 1. Stretch Certification: Shading materials shall be tested in accordance with UFS (Woven Upholstery Fabric Standards) 1979-12 at 27 pounds of no greater than 2.0 percent on the warp and 2.2 percent on the fill.
- 2. UV Stability on all colors should be on a Xenotest grade with a passing rating of at least "6" on the scale of 1-8.
- 3. Dimensional Stability tolerance must be under 0.5 percent to ensure long-term stability.

NOTE: Click on [Shading](#) link below for a design criteria overview PDF of shading strategy.

NOTE: Document takes a minute to download.

B. Design Criteria: [Shading](#)

NOTE: Select shade type(s) to suit project and delete items not selected.

- 1. Cellular Shade Applications for each exterior window of rooms and spaces shown on the Drawings with related mounting systems and accessories.
 - a. Shade Type 1: Manual cord-up operation with light filtering double cell honeycomb fabric.
 - b. Shade Type 2: Manual cord up-operation with blackout double cellular fabric.
 - c. Shade Type 3: Manual continuous cord up-operation with light filtering cellular fabric.
 - d. Shade Type 4: Manual continuous cord up-operation with blackout double cellular fabric.
 - e. Shade Type 5: Manual cord top-down and bottom-up operation with light filtering double cellular fabric.

- f. Shade Type 6: Manual cord top-down and bottom-up operation with blackout double cellular fabric.
- g. Shade Type 7: Manual spring assisted, cordless up-operation with light filtering double cellular fabric.
- h. Shade Type 8: Manual spring assisted, cordless up-operation with blackout double cellular fabric.
- i. Shade Type 9: Motorized light filtering cellular shades, and related motor control systems.
- j. Shade Type 10: Motorized black out cellular shades, and related motor control systems.

2.4 OPERATION

A. Controls

- 1. Manual, Bottom Bar
 - a. Cord
 - b. Continuous Cord Loop
- 2. Manual, Top-Down and Bottom-Up (Duofold)
- 3. Cordless, Spring-assisted, Bottom Bar
- 4. Motorized with Remote Control
 - a. Hand-held remote using Infra-red (IR)
 - b. Hand-held remote using Radio Frequency (RF)
 - c. Wall switch using Radio Frequency (RF)
 - d. Wall switch connected using RS232 / RS485 cable
 - e. Building automation software using Infra-red (IR)
 - 1). Sunlight sensor
 - 2). Timer
 - f. Building automation software connected using RS232 / RS485 cable
 - 1). Sunlight sensor
 - 2). Timer

B. Operation Sequences

- 1. Light Filtering
- 2. Room Black Out

2.5 MANUAL WINDOW SHADE SYSTEMS

A. Universal Shade Hardware: Provide for all manually operated under 72 inch (1.83m) in height or width.

- 1. Head and Sill Rails shall be 0.040 inch (1mm) thick aluminum alloy 6063, 0.535 x 1.430 inch (13.6mm x 36.3mm).
 - a. Finish: Baked on enamel, color coordinated to the fabric.
- 2. End Caps and Cord Lock Cover shall be ABS plastic color coordinated to the fabric.
- 3. Cord Locking Mechanism shall be made from natural glass filled engineering plastic, operated by a free swinging pawl (440-A Stainless Steel and ABS plastic) to allow gravity and cord directional force to cause locking and releasing action.
- 4. Cord re-direction into the cord lock using a Delrin force distribution bearing.
- 5. Self leveling sill rail and cording design.
- 6. Installation Brackets shall be 304 Stainless Steel, with holes positioned so they can be mounted to ceiling, soffit or wall.
- 7. Lift Cord shall be minimum 0.04 inch (1.2mm) diameter white tightly braided polyester.

B. Continuous Cord Loop Heavy Duty Operating System: Provide for all manually operated shades over 72 inch (1.83m) in width or length or where cord control is important

1. Head Rail shall be 1.165 x 1.185 inch (29.6mm x 30.1mm) aluminum alloy 6063, with baked on enamel, and with a color insert strip coordinating the color of the fabric.
2. Bottom Rail shall be aluminum alloy 6063 with baked-on enamel color coordinated to the fabric with polycarbonate end caps color coordinated to the fabric.
3. Clutch Mechanism shall be white engineering plastic, operated by a spring-tensioned rotary clutch that moves the shade when the continuous cord loop is pulled and that holds the shade in place unless force is applied.
4. Continuous Cord Loop shall be braided polyester 0.105 inch (2.7mm) in diameter.
 - a. Cord length approximately 2/3's the length of the window.
5. Lift Cord shall be 0.0305 inch (0.775mm) diameter white braided polyester, completely hidden by threading through the center of the shade.

C. Top-Down Bottom-Up Shade Operation. Provide Universal Hardware and the following:

1. Traveling Intermediate Rail: Head rail, sill and middle rails shall be minimum 0.040 inch (1mm) thick aluminum alloy 6063, 0.535 x 1.430 inch (13.6mm x 36.3mm)
 - a. Finish: Baked on enamel, color coordinated to the fabric.
2. Second Cord Lock: Two Cord Locking Mechanisms which shall be made from natural glass filled engineering plastic, operated by a free swinging pawl (440-A Stainless Steel and ABS plastic) to allow gravity and cord directional force to cause locking and releasing action.
 - a. Positioned on right and left sides of shade.
 - b. Right to operate sill rail and left to operate middle rail.
3. Width: Minimum 12 inch (305mm), maximum 72 inch (1.83m)
4. Length: Minimum 12 inch (305mm), maximum 96 inch (2.44m)

GREEN NOTE: Use of sidetracks reduces drafts by 22+/- percent.

D. Side Tracks: Two-part finned sidetracks mounted inside window jams.

1. Room Darkening: Notch fabric and provide special grooved end caps for shades to ride on finned sidetracks.
 - a. Color: White or oak as selected by Architect.

2.6 MANUAL AND MOTORIZED WINDOW SHADE SYSTEMS

A. Window Shade System: Manual system modified with an electrically operated motor, controls, sensor & timer low voltage inputs, software, PC (by others), controllers, and hand-held transmitters.

1. Product: Louvolite mechanical shade systems with various cellular shade fabrics modified with Somfy motors as fabricated by Gordon's Window Décor to accommodate each window shade application.

B. Motorized Shade System: Concealed motor made for intermittent use and rated per UL.

1. Manufacturer (for use in Skylights): Techniku Systems

NOTE: Select from items listed below to suit project and delete those not selected.

2. Lift Automation Assembly for Cellular / Cellular at ANY Angle or Shape: **LCR200**; Automated stack-top or stack-bottom operation with motor and stationary rails.
 - a. Receiver / Communication Type:
 - 1). Intelligence Interface for Integration (I3) w/ Extended IR Receiver
 - 2). Intelligence Interface for Integration (I3) w/ Dry Contact
 - 3). Electronic Interface
 - 4). Direct Connect TIR Receiver: Eagle Eye™ IR Receiver
 - 5). Extended TIR Receiver w/ LED
 - 6). TRF1 Module

- 7). TRF2 / Z-Wave™ RF Module
- 8). Dry Contact: Standard 20-26 gage / 3 conductor wire
- b. Power Supply:
 - 1). Single Battery Tube with (8) AA batteries (alkaline or lithium)
 - 2). Dual Battery Tube with (16) AA batteries (alkaline or lithium)
 - 3). Individual Power Supply: 12V / 1.5A (1.25A)
 - 4). Multi-Power Supply w/ Power Distribution Box: 24V / 6A (5.5A)
- c. User Interface
 - 1). TIR Remote Control: 6 Channel
 - 2). Momentary Switch / Dry Contact: Standard 20-26 gage / 3 conductor wire
 - 3). TRF1 Remote Control: 1 or 4 Channel
 - 4). TRF1 Wall Switch: 1 or 4 Channel
 - 5). TRF2 / Z-Wave User Interface

NOTE: Select products from either Techniku Systems (for skylights) above or Somfy (for windows) below, and delete items not chosen.

- C. Motorized Shade System: Sprocket motor concealed inside each shade head rail made for intermittent use and rated per UL.
1. Manufacturer: Somfy
 2. Motor: Cord Lift WireFree™ RTS Motor
 3. Control: Built-in radio
 4. Power: AA Batteries (rated for 1 year of operation prior to replacement)

D. Individual and Group Control (Somfy)

NOTE: Select from all of the wireless radio remote control products listed below to suit project and delete those not selected.

1. Wireless Radio Wall Switch:
 - a. Customizable five (5) channel wireless radio wall switch.
 - 1). Manufacturer / Product: Somfy / DecoFlex WireFree™ RTS 5 Wall Switch
 - 2). Up, down and stop functions, and one specifically programmed position on each channel
 - 3). Finish: As selected by the Architect from manufacturer's standard colors.

NOTE: Select above Finish language or one of the standard colors below, deleting items not chosen.

- 4). Finish:
 - a). White
 - b). Ivory
 - c). Black
- b. Customizable single (1) channel wireless radio wall switch.
 - 1). Manufacturer / Product: Somfy / DecoFlex WireFree™ RTS 1 Wall Switch
 - 2). Function: Up, down and stop functions, and one specifically programmed position on one channel
 - 3). Finish: As selected by the Architect from manufacturer's standard colors.

NOTE: Select above Finish language or one of the standard colors below, deleting items not chosen.

- 4). Finish:
 - a). White
 - b). Ivory
 - c). Black

2. Wireless Radio Remote Control

- a. Single (1) Channel: Push button control for one (1) window covering or one (1) group of window coverings. Up, down and stop functions, and one specifically programmed position.
 - 1). Manufacturer / Product: Somfy / Telis 1 RTS Remote
 - 2). Finish: As selected by the Architect from manufacturer's standard colors.

NOTE: Select above Finish language or one of the standard colors below, deleting items not chosen.

- 3). Finish:
 - a). Pure
 - b). Silver
 - c). Lounge
 - d). Patio
- b. Five (5) Channel: Push button control for five (5) window coverings or five (5) groups of window coverings. Up, down and stop functions, and one specifically programmed position.
 - 1). Manufacturer / Product: Somfy / Telis 5 RTS Remote
 - 2). Finish: As selected by the Architect from manufacturer's standard colors.

NOTE: Select above Finish language or one of the standard colors below, deleting items not chosen.

- 3). Finish:
 - a). Pure
 - b). Silver
 - c). Lounge
 - d). Patio
- c. Five (5) Channel with Sun/Wind Function: Push button control for five (5) window coverings or five (5) groups of window coverings with a sun sensor. Up, down and stop functions and one specifically programmed position on each channel. Ability to turn sun sensor off, to control lights and heat bar.
 - 1). Manufacturer / Product: Somfy / Telis Soliris 5 RTS Remote
 - 2). Finish: As selected by the Architect from manufacturer's standard colors.

NOTE: Select above Finish language or one of the standard colors below, deleting items not chosen.

- 3). Finish:
 - a). Pure
 - b). Silver
 - c). Lounge
 - d). Patio
- d. Twenty (20) Channel with On-Screen Display: Control individual window coverings or groups of window coverings. Centralized remote control of opening shade movements according to predefined zones or surfaces with simultaneous group action capability.
 - 1). Manufacturer / Product: Somfy / Telis Composio RTS Remote
 - 2). Finish: As selected by the Architect from manufacturer's standard colors.

NOTE: Select above Finish language or one of the standard colors below, deleting items not chosen.

- 3). Finish:
 - a). Silver
 - b). Lounge

NOTE: Select product below to use the same universal remote that controls the TV to also adjust the window coverings.

- e. Somfy Universal RTS Interface: Controls motorized window coverings using standard universal programmable remote control units.
 - 1). Universal remote control (by Others)
- 3. Programmable Timer
 - a. Four (4) function individual or group timer with optional sun sensor interface
 - 1). Manufacturer / Product: Somfy / Chronis Comfort Timer
 - 2). Functions:
 - a). Multiple daily and weekday timed functions
 - b). Secure rolling code that minimizes radio interference
 - c). On-screen menu for date and time configuration

NOTE: Select product below when creating programmed recurrent scenarios and running them in manual or automatic mode.

- b. Multi-channel timer with on-screen display
 - 1). Manufacturer / Product: Somfy / Impresario Chronis RTS Timer
 - 2). Functions:
 - a). Simultaneous programmed independent motorized shade action to go up or down or return to one specifically programmed position.
 - b). Maximum sixteen (16) possible scenarios using up to forty (40) motorized products selected according to time of day, season or activity.
 - c). Maximum four (4) pre-defined daily scenarios can be scheduled
 - d). Automatic/Manual override function capability
 - 3). Finish: As selected by the Architect from manufacturer's standard colors.

NOTE: Select above Finish language or one of the standard colors below, deleting items not chosen.

- 4). Finish:
 - a). Silver
 - b). Lounge
- 4. Sun Sensor: Battery powered indoor wireless sun sensor
 - a. Manufacturer / Product: Somfy / Sunis Indoor WireFree™ RTS Sun Sensor
 - b. Function: Allows one group per sensor to automatically move up and down at programmed sun levels via radio control.
 - 1). 3-position setting signal
- 5. Automation Controls: Software running on a standard personal computer. Software computes sun angles through global positioning, interfaces with remote sensors, as applied to window size, location and angle. System can be maintained and updated remotely. Automatic function reads sensor and preprogrammed data every second, resetting shades as needed for conditions.
 - a. Solar Activated Automation Control Software: PILOTpc automation by ESI / Electronic Solutions Inc.
 - b. Somfy Universal RTS Interface
 - c. Somfy Internet Interface (via MS Internet Explorer)

2.7 MATERIALS – SHADECLOTH FABRIC

NOTE: Edit below to suit project deleting items not selected.

A. List of Fabric Types:

- 1. Insulating Double Honeycomb Cellular Shades
 - a. Manufacturer / Product: Gordon's Window Décor / EcoSmart
 - b. Fabric Types:
 - 1). Light filtering
 - 2). Room back out
 - c. Fabric Performance:

- 1). Non-rated
- 2). Class 1 or A flame retardance
- d. Fabric Thickness: 16mm +/- 2mm
- e. Fabric Weight: 40 g/m² +/- 5 g/m²
- f. Shaded Double-Glazed Window Unit R-Value: 4.6 +/- 0.2
- g. Shaded Double-Glazed Window Unit w/ Side Tracks R-Value: 5.6 +/- 0.2

B. Light-Filtering Fabric: PVC-Free Polyester

- 1. General Performance Characteristics:
 - a. Light Transmission: 11 percent visible and <1 percent UV light
 - b. Absorbency: None
 - c. Stain Resistance: Grease, oil, grass, pop, coffee, chocolate, ketchup, shoe polish
 - d. Total Lead Content per 16 CFR 1303: Below limits
 - e. Fire Rating: Meets or exceeds NFPA-701
 - f. Microbiological: No fungal growth per ATCC 9642, 15233, 6205, 11797 and 9645.
- 2. Fabric Color: As selected by Architect from manufacturer's standard colors.

C. Room Black Out Fabrics

- 1. Aluminum metallized polyester film core, paint coated where exposed.
 - a. Light Transmission: <1 percent of visible and 0.01 percent UV light w/ side tracks
 - b. Color: Same both sides; As selected by Architect from manufacturer's standard colors.
 - c. Absorbency: None
 - d. Stain Resistance: Grease, oil, grass, pop, coffee, chocolate, ketchup, shoe polish

2.8 MOTOR FABRICATION

- A. General: Fabricate using field dimensions as noted on approved Shop Drawings.

2.9 SOURCE QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Manufacturer shall perform batch-to-batch random ten (10) year cycle tests on shade system to confirm complete compliance with manufacturer's operating matrix and to ensure longevity of use in application.
 - 2. Electrical Components Testing: Per NFPA Article 100 listed and labeled by UL, ETL or other testing agency acceptable to AHJ, marked for intended use, and tested as a system.

PART 3 - EXECUTION

3.1 FIELD CONDITIONS

NOTE: Coordinate and edit to the correct Section number when multiple numbers are presented. The three numbers shown indicate broad-format, medium-format and narrow-format numbers from CSI MasterFormat® 2004.

- A. Field Measurements: Per SECTION 017000 or 017100 or 017123.

3.2 EXAMINATION

- A. Examination per SECTION 017000 or 017100 or 017116, and as follows: Carefully examine installation areas with Installer present, for compliance with requirements affecting Work performance.

1. Verification of Conditions: Verify that field measurements, surfaces, substrates, structural support, utility connections, tolerances, levelness, plumbness, humidity, moisture content level, cleanliness and other conditions are as required by the manufacturer, and ready to receive Work.
 - a. Verify each shade assembly will fit within its corresponding window shade pocket.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- A. Preparation per SECTION 017000 or 017100 or 017123, and as follows:
 1. Coordinate requirements for wood blocking structural support to ensure proper shade system installation.
 2. Where applicable coordinate interface and installation of window shades with provisions of HVAC system, lighting system, motorized projection screens, motorized projector lift, or video projector.
 3. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions. Clean surfaces thoroughly prior to installation.
 4. Prior to installation, verify type and location of power supply. Coordinate requirements for power supply, conduit, and wiring required for window shade motors and controls. Wire consecutive shades in parallel from shade to power source (transformer/controller.)

3.4 INSTALLATION

- A. Installation per SECTION 017000 or 017300 or 017316, and as follows:
 1. Comply with shade manufacturer's written installation instructions and approved submittals.
 2. Install window shades at locations indicated on Drawings, approved Shop Drawings and Window Shade Schedule.
 - a. Window treatment shall be installed plumb, square, level and within allowable tolerances.
 - b. Allow proper clearances for window hardware and operation.
 3. Do not use exposed fasteners.

NOTE: Edit below to suit project.

4. Install closure panels to conceal operating mechanism.
5. Motorized window shade system controls: Wireless radio wall switch
 - a. Install independently of light switches
 - b. Install adjacent to and with same cover plate as light switches
 - 1). Toggles shall be a different color from light switches as selected by the Architect from standard colors.
6. Sun Sensor: Battery powered indoor wireless sun sensor
 - a. Window installation
 - b. Table mount installation

3.5 FIELD QUALITY CONTROL

- A. Field Tests, Inspection: Per SECTION 014000 or 014500 or 014523, and as follows:
 1. Test each motorized window shade to verify that controls, limit switches, interface to other building systems, and other operating components to function as required. Adjust and correct each deficiency.
- B. Correction of Non-Conforming Work per General Conditions, and as follows:
 1. Remove, Repair and Reinstall or Restore in Place damaged items.

- a. Finish touch-up damaged surface finishes.
2. Replace damaged materials or items with New if repair not acceptable to Architect.

3.6 PROTECTION

- A. Clean shade assemblies and protect from damage during construction operations.
 1. Remove temporary coverings and protection of adjacent work areas.
 2. If damage occurs, remove and replace damaged components or entire unit as required to provide units in their original, undamaged condition.
 3. Touch-up any areas damaged during shade installation.
 4. Clean up debris that resulted from shade installation

3.7 CLOSEOUT ACTIVITIES

- A. Substantial Completion Requirements per SECTION 017000 or 017700, and as follows:
 1. Provide Final Cleaning immediately prior to Substantial Completion inspection per SECTION 017000 or 017400 or 017423.
 - a. Protection: Remove manufacturer's and other installed protection immediately prior to Substantial Completion inspection, unless manufacturer requires otherwise.
 2. Perform required Demonstration and Training with Owner's designated staff per SECTION 017900.
 - a. Demonstrate operation of each shade system, proper adjustment, programming, usage, cleaning and maintenance procedures.

END OF SECTION