SECTION 12 24 13

ROLLER WINDOW SHADES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Manually operated roller shades with single double rollers.
   2. Motor operated roller shades with single double rollers.

1.2 ACTION SUBMITTALS

A. Product Data: Technical data including construction details, material descriptions, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.

B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
   1. Motor Operated Shades: Include details of installation and diagrams for power, signal, and control wiring.

C. Samples for Verification: Submit for each type of roller shade.
   1. Shadeband Material: Not less than 10 inches (250 mm) square. Mark interior face of material if applicable.
   2. 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.
   3. Installation Accessories: Full-size unit, not less than 10 inches (250 mm) long.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: Submit data for Installer.

B. Product Certificates: Submit certificates for each type of shadeband material.

C. Product Test Reports: Submit reports for each type of shadeband material, for tests performed by manufacturer and witnessed by a qualified testing agency or a qualified testing agency.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: Submit data for roller shades to include in maintenance manuals.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. 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 units.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

C. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not install roller shades 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.

B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings.

1. 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.

PART 2 - PRODUCTS

2.1 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Draper Inc.
   2. Hunter Douglas Contract.
   3. Lutron Electronics Co., Inc.
   4. MechoShade Systems, Inc.
   5. Silent Gliss Inc.
   6. Springs Window Fashions; SWFcontract.
   7. TimberBlindMetroShade.

B. Chain and Clutch Operating Mechanisms: With continuous loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
   1. Bead Chains: Stainless steel.
      a. Loop Length: Full length of roller shade.
      b. Limit Stops: Provide upper and lower ball stops.
      c. Chain Retainer Type: Chain tensioner, jamb mounted.
   2. Spring Lift-Assist Mechanisms: Manufacturer's standard for balancing roller shade weight and for lifting heavy roller shades.
      a. Provide for shadebands that weigh more than 10 lb (4.5 kg) or for shades as recommended by manufacturer, whichever criterion is more stringent.

C. Rollers: Corrosion resistant steel or extruded aluminum tubes of diameters and wall thickness 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.
   1. Roller Drive End Location: As indicated on Drawings or selected by Architect.
   2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
   3. Shadeband to Roller Attachment: Removable spline fitting into integral channel in tube.

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

E. Roller Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive end assembly.

F. Shadebands:
   1. Shadeband Material: Light filtering fabric.

2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
   a. Type: Enclosed in sealed pocket of shadeband material.
   b. Color and Finish: Selected by Architect.

G. Installation Accessories:
1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L-shaped.
   b. Height: Height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches (102 mm).
2. Exposed Headbox: Rectangular, extruded aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
   a. Height: Height required to enclose roller and shadeband assembly when shade is fully open, but not less than 4 inches (102 mm).
3. Endcap Covers: To cover exposed endcaps.
4. 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.
   a. Height: Height required to enclose roller and shadeband assembly when shade is fully open, but not less than 6 inches (152 mm) unless otherwise noted.
   b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
5. 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.
   a. Closure Panel Width: As indicated on Drawings.
6. 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.
7. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
8. Installation Accessories Color and Finish: Selected by Architect.

2.2 MANUALLY OPERATED SHADES WITH DOUBLE ROLLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. DFB Sales Inc.
2. Draper Inc.
3. Hunter Douglas Contract.
4. Lutron Electronics Co., Inc.
5. MechoShade Systems, Inc.
6. Silent Gliss Inc.
7. Springs Window Fashions; SWFcontract.

8. TimberBlindMetroShade.

B. Chain and Clutch Operating Mechanisms: With continuous loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
   1. Bead Chains: Stainless steel.
      a. Loop Length: Full length of roller shade.
      b. Limit Stops: Provide upper and lower ball stops.
      c. Chain Retainer Type: Chain tensioner, jamb mounted.
   2. Spring Lift Assist Mechanisms: As necessary for balancing roller shade weight and for lifting heavy roller shades.
      a. Provide for shadebands that weigh more than 10 lb (4.5 kg) or for shades as recommended by manufacturer, whichever criterion is more stringent.

C. 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.
   1. Double-Roller Mounting Configuration: Offset, outside roller over and inside roller under.
   2. Inside Roller:
      a. Drive End Location: As indicated on Drawings or as selected by Architect.
      b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
   3. Outside Roller:
      a. Drive End Location: As indicated on Drawings or as selected by Architect.
      b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
   4. Shadeband to Roller Attachment: Removable spline fitting into integral channel in tube.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

E. Roller Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive end assembly.

F. Inside Shadebands:
   1. Shadeband Material: Light filtering fabric.
   2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
      a. Type: Enclosed in sealed pocket of shadeband material.
      b. Color and Finish: Selected by Architect.

G. Outside Shadebands:
   1. Shadeband Material: Light-blocking fabric.

2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
   a. Type: Enclosed in sealed pocket of shadeband material.
   b. Color and Finish: Selected by Architect.

H. Installation Accessories:
1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L-shaped.
   b. Height: Height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches (102 mm).
2. Exposed Headbox: Rectangular, extruded aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
   a. Height: Height required to enclose roller and shadeband assembly when shade is fully open, but not less than 4 inches (102 mm).
3. Endcap Covers: To cover exposed endcaps.
4. 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.
   a. Height: Height required to enclose roller and shadeband assembly when shade is fully open, but not less than 6 inches (152 mm).
   b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
5. 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.
   a. Closure Panel Width: As indicated on Drawings.
6. 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.
7. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
8. Installation Accessories Color and Finish: Selected by Architect.

2.3 MOTOR OPERATED, SINGLE ROLLER SHADES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Draper Inc.
2. Hunter Douglas Contract.
3. Insolroll Window Shading Systems.
4. Lutron Electronics Co., Inc.
5. MechoShade Systems, Inc.
6. Silent Gliss Inc.
7. Springs Window Fashions; SWFcontract.
8. TimberBlindMetroShade.

B. Motorized Operating System: Provide factory assembled, shade operator system of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.

1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Electric Motor: Tubular, enclosed in roller.
    a. Electrical Characteristics: 110-V ac unless otherwise noted.
    b. Maximum Total Shade Width: Required to operate roller shades indicated.
    c. Maximum Shade Drop: Required to operate roller shades indicated.
    d. Maximum Weight Capacity: Required to operate roller shades indicated.
3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote control activation of shades:
    a. Keyed Control Station: Keyed, momentary contact, three position, switch operated control station with open, close, and off functions. Provide two keys per station.
    b. Individual Switch Control Station: Momentary contact, wall switch operated control station with open, close, and center off functions.
        1) Switch Positions: Three.
        2) Switch Style: Rocker.
    c. Group Control Station: Momentary contact, three position, rocker style, wall switch operated control station with open, close, and center off functions for single switch group control.
    d. Individual/Group Control Station: Momentary contact, three position, rocker style, wall switch operated control station with open, close, and center off functions for individual and group control.
    e. Sun Sensor Control: Adjustable system consisting of digital displays detecting sun intensity and responding by automatically adjusting shades.
    f. Infrared Control: System consisting of concealed receiver complete with external eye and connecting modular cable and two portable, multiple channel transmitters with separate buttons to open and close individual or groups of shades, to open and close shades simultaneously, and to stop shade movement.
        1) Capacity: Up to 12 individual or groups of shades.
    g. Timer Control: Clock timer, 24 hour seven day programmable for regular events.
    h. Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features; isolated from voltage spikes and surges.
    i. Color: Selected by Architect.
4. Crank Operator Override: Crank and gearbox operate shades in event of power outage or motor failure.
5. Limit Switches: Adjustable switches interlocked with motor controls and set to stop shades automatically at fully raised and fully lowered positions.

6. Operating Features:
    a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
    b. Capable of interface with audiovisual control system.
    c. Capable of accepting input from building automation control system.
    d. Override switch.

C. Rollers: Corrosion resistant steel or extruded aluminum tubes of diameters and wall thickness 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.
    1. Roller Drive End Location: As indicated on Drawings or as selected by Architect.
    2. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
    3. Shadeband to Roller Attachment: Removable spline fitting into integral channel in tube.

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

E. 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.

F. Shadebands:
    1. Shadeband Material: Light filtering fabric.
    2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
        a. Type: Enclosed in sealed pocket of shadeband material.
        b. Color and Finish: Selected by Architect.

G. Installation Accessories:
    1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
        a. Shape: L-shaped.
        b. Height: Height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches (102 mm).
    2. Exposed Headbox: Rectangular, extruded aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
        a. Height: Height required to enclose roller and shadeband assembly when shade is fully open, but not less than 4 inches (102 mm).
    3. Endcap Covers: To cover exposed endcaps.
    4. 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.
        a. Height: Height required to enclose roller and shadeband assembly when shade is fully open, but not less than 6 inches (152 mm).

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

5. 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.
   a. Closure Panel Width: As indicated on Drawings.
6. 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.
7. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
8. Installation Accessories Color and Finish: Selected by Architect.

2.4 MOTOR OPERATED, DOUBLE ROLLER SHADES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. BTX Window Automation Inc.
   2. Draper Inc.
   3. Hunter Douglas Contract.
   4. Insolroll Window Shading Systems.
   5. Lutron Electronics Co., Inc.
   6. MechoShade Systems, Inc.
   7. Silent Gliss Inc.
   8. Springs Window Fashions; SWFcontract.
   9. TimberBlindMetroShade.

B. Motorized Operating Systems: Provide factory assembled, shade operator systems of size and capacity and with features, characteristics, and accessories suitable for conditions indicated, complete with electric motor and factory prewired motor controls, power disconnect switch, enclosures protecting controls and operating parts, and accessories required for reliable operation without malfunction. Include wiring from motor controls to motors. Coordinate operator wiring requirements and electrical characteristics with building electrical system.
   1. Electrical Components: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
   2. Electric Motor: Tubular, enclosed in rollers.
      a. Electrical Characteristics: 110-V ac.
      b. Maximum Total Shade Width: As required to operate roller shades indicated.
      c. Maximum Shade Drop: As required to operate roller shades indicated. Maximum Weight Capacity: As required to operate roller shades indicated.
   3. Remote Control: Electric controls with NEMA ICS 6, Type 1 enclosure for recessed or flush mounting. Provide the following for remote-control activation of shades:
      a. Keyed Control Station: Keyed, momentary contact, three position, switch operated control station with open, close, and off functions. Provide two keys per station.

b. Individual Switch Control Station: Momentary contact, wall switch operated control station with open, close, and center off functions.
   1) Switch Positions: Three.
   2) Switch Style: Rocker.
c. Group Control Station: Momentary contact, three position, rocker style, wall switch operated control station with open, close, and center off functions for single switch group control.
d. Individual/Group Control Station: Momentary contact, three position, rocker style, wall switch operated control station with open, close, and center off functions for individual and group control.
e. Sun Sensor Control: Adjustable system consisting of digital displays detecting sun intensity and responding by automatically adjusting shades.
f. Infrared Control: System consisting of concealed receiver complete with external eye and connecting modular cable and two portable, multiple channel transmitters with separate buttons to open and close individual or groups of shades, to open and close shades simultaneously, and to stop shade movement.
   1) Capacity: Up to 12 individual or groups of shades.
g. Timer Control: Clock timer, 24 hour seven day programmable for regular events.
h. Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features; isolated from voltage spikes and surges.
i. Color: Selected by Architect.

4. Crank Operator Override: Crank and gearbox operate shades in event of power outage or motor failure.
5. Limit Switches: Adjustable switches, interlocked with motor controls and set to stop shade movement automatically at fully raised and fully lowered positions.
6. Operating Features:
   a. Group switching with integrated switch control; single faceplate for multiple switch cutouts.
   b. Capable of interface with audiovisual control system.
   c. Capable of accepting input from building automation control system.
   d. Override switch.

C. 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 shades for service.
   1. Double Roller Mounting Configuration: Offset, outside shade over and inside shade under.
   2. Inside Roller:
      a. Drive End Location: Indicated on Drawings or as selected by Architect.
      b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.
   3. Outside Roller:
      a. Drive End Location: As indicated on Drawings or as selected by Architect.

b. Direction of Shadeband Roll: Regular, from back (exterior face) of roller.

4. Shadeband to Roller Attachment: Removable spline fitting into integral channel in tube.

D. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller mounting configuration, roller assemblies, operating mechanisms, installation accessories, and installation locations and conditions indicated.

E. Roller Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive end assembly.

F. Inside Shadebands:

1. Shadeband Material: Light filtering fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
   a. Type: Enclosed in sealed pocket of shadeband material.
   b. Color and Finish: Selected by Architect.

G. Outside Shadebands:

1. Shadeband Material: Light blocking fabric.
2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
   a. Type: Enclosed in sealed pocket of shadeband material Exposed with endcaps and integral light seal where bottom (sill) channels are indicated.
   b. Color and Finish: Selected by Architect.

H. Installation Accessories:

1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
   a. Shape: L shaped.
   b. Height: Height required to conceal roller and shadeband assembly when shade is fully open, but not less than 4 inches (102 mm).
2. Exposed Headbox: Rectangular, extruded aluminum enclosure including front fascia, top and back covers, endcaps, and removable bottom closure.
   a. Height: Height required to enclose roller and shadeband assembly when shade is fully open, but not less than 4 inches (102 mm).
3. Endcap Covers: To cover exposed endcaps.
4. 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.
   a. Height: Height required to enclose roller and shadeband assembly when shade is fully open, but not less than 6 inches (152 mm).
   b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
5. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site constructed ceiling recesses or pockets and for snap in attachment to wall clip without fasteners.

a. Closure Panel Width: Indicated on Drawings.

6. 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.
7. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
8. Installation Accessories Color and Finish: Selected by Architect.

2.5 SHADEBAND MATERIALS

A. Shadeband Material Flame Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light Filtering Fabric: Woven fabric, stain and fade resistant.
1. Source: Roller shade manufacturer
2. Type: PVC coated fiber glass yarns, moisture and heat resistant, nonflammable, complying with NFPA 701; and dimensionally stable to hang flat with buckling or distortion within maximum shift of 1/8" in either direction while rolling.
3. Weave: Dense linear
4. Thickness: 0.030 inch minimum.
5. Openness Factor: 1 percent.
6. Color: as selected by Architect from Manufacturer’s full range.

C. Light Blocking Fabric: Opaque fabric, stain and fade resistant.
1. Source: Roller shade manufacturer.
2. Type: Fiberglass textile with PVC film bonded to both sides.
3. Weight: as selected by Architect from Manufacturer’s full range.
4. Features: Washable with Antistatic treatment.
5. Color: Selected by Architect.

2.6 ROLLER SHADE FABRICATION

A. 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.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 degrees F (23 degrees C):
1. 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).

2. 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.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible, except as follows:

1. Vertical Shades: Where width to length ratio of shadeband is equal to or greater than 1:4, 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.
2. 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.
3. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions for compliance with requirements for installation tolerances, operational clearances, locations of connections to building electrical system, and other conditions affecting performance of the work.

B. Proceed with installation after correcting unsatisfactory conditions.

3.2 ROLLER SHADE INSTALLATION

A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than 2 inches (51 mm) to interior face of glass. Allow clearances for window operation hardware.

B. Electrical Connections: Connect motor operated roller shades to building electrical system.

C. Roller Shade Locations: Indicated on Drawings.

3.3 ADJUSTING

A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION

A. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.

B. 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.

C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

3.5 DEMONSTRATION

A. Engage a factory authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain motor operated roller shades.

END OF SECTION