SECTION 115213 - PROJECTION SCREENS

Revise this Section by deleting and inserting text to meet Project-specific requirements.

Verify that Section titles referenced in this Section are correct for this Project's Specifications; Section titles may have changed.

1. GENERAL
	* + 1. SUMMARY
				1. Section Includes:

Manually operated, front-projection screens.

Electrically operated, front-projection screens.

* + - * 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 055000 "Metal Fabrications" for metal support framing for front-projection screens.

**[Section 061000 "Rough Carpentry"] [Section 061053 "Miscellaneous Rough Carpentry"]** for wood backing for screen installation.

Section 064023 "Interior Architectural Woodwork" for **[wood trim] [wood trim and wood ceiling closure panel]** for recessed screen installation.

Section 115213.19 "Rear Projection Screens."

* + - 1. DEFINITIONS

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

* + - * 1. ALR: Ambient-light rejection; for specular reflective viewing surfaces, measured as the percentage of ambient light striking the viewing surface that has equal angles of incidence and reflection.
				2. Gain: Ratio of light reflected from viewing-surface material to that reflected perpendicularly from a magnesium carbonate surface as determined in accordance with SMPTE RP 94.
				3. Half-Gain Angle: The angle, measured from the axis of the viewing surface to the most central position on a perpendicular plane through the horizontal centerline of the viewing surface, where the gain is half of the peak gain.
			1. SUBMITTALS
				1. Submittals for this section are subject to the re-evaluation fee identified in Article 4 of the General Conditions.
				2. Manufacturer’s installation instructions shall be provided along with product data.
				3. Submittals shall be provided in the order in which they are specified and tabbed (for combined submittals).
				4. Submittals Package: Provide all submittals, except samples and closeout submittals, as a single submittal package.
				5. Product Data: For each type of product.
				6. Shop Drawings: Show layouts and types of front-projection screens. Include the following:

Drop heights.

Retain first subparagraph below if seams are necessary for sizes of viewing surfaces required for the Project.

Location of seams in viewing surfaces.

Retain first subparagraph below for electrically operated, front-projection screens with end-mounted motors.

For end-mounted motors, location of screen centerline relative to ends of screen case.

Anchorage details, including connection to supporting structure for suspended units.

Details of juncture of screen case or trim with adjacent finishes.

Retain first subparagraph below for electrically operated units.

For electrically operated units, wiring diagrams and location of wiring connections.

Accessories.

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 Initial Selection: For each type of exposed finish.
				2. Samples for Verification: For each type of exposed finish, in manufacturer's standard sizes.

Retain "Product Schedule" paragraph below if Project requires various types and sizes of screens.

* + - * 1. Product Schedule: For front-projection screens. Use same designations indicated on Drawings.
			1. CLOSEOUT SUBMITTALS
				1. Maintenance Data: For front-projection screens to include in maintenance manuals.
			2. DELIVERY, STORAGE, AND HANDLING
				1. Environmental Limitations: Do not deliver front-projection screens until spaces are enclosed and weathertight, wet-work in installation spaces is complete and dry, and temporary or permanent HVAC system is operating and maintaining ambient temperature and humidity conditions planned for building occupants during the remainder of the construction period.
				2. Store front-projection screens in manufacturer's protective packaging and according to manufacturer's written instructions.
			3. COORDINATION
				1. Coordinate layout and installation of front-projection screens with adjacent construction, including ceiling suspension systems, light fixtures, HVAC system components,[**fire-suppression system,**] and partitions.
1. PRODUCTS

Manufacturers and products listed in SpecAgent and MasterWorks Paragraph Builder are neither recommended nor endorsed by the AIA or Deltek. 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.

* + - 1. MANUFACTURERS
				1. Source Limitations for Projection Screens: Obtain front-projection screens from single manufacturer. Obtain viewing surfaces and accessories, including mounting hardware, from screen manufacturer.
			2. PERFORMANCE REQUIREMENTS
				1. Viewing-Surface and Masking Materials:

Most screen materials are mildew resistant. Before retaining "Mildew-Resistance Rating" subparagraph below, verify that products comply with requirements.

Mildew-Resistance Rating: Zero or 1 when tested in accordance with ASTM G21.

Retain "Flame Resistance" or "Flame-Spread Index" subparagraph below if required by authorities having jurisdiction for occupancy classification of space where screens are installed. Screen manufacturers usually test products in accordance with NFPA 701 rather than ASTM E84. Before retaining either subparagraph, verify that products comply with requirements.

Flame Resistance: Passes NFPA 701.

Flame-Spread Index: Not greater than 75 when tested in accordance with ASTM E84.

* + - 1. MANUALLY OPERATED, FRONT-PROJECTION SCREENS
				1. General Requirements: Manufacturer's standard spring-roller-operated units, consisting of case, flexible screen, mounting accessories, and other components necessary for a complete installation.

Screen Mounting: Top edge securely anchored to a rigid steel roller; bottom edge formed into a pocket holding a tubular metal slat, with ends of slat protected by plastic caps, and with a saddle and pull attached to slat by screws.

Copy first paragraph below and re-edit for each product required. Insert drawing designation. Use these designations on Drawings to identify each product.

* + - * 1. Metal-Encased, Manually Operated Screen **<Insert drawing designation>**: Unit with free-hanging screen; with screen case fabricated from formed-steel sheet or aluminum extrusions with manufacturer's standard finish and matching end caps.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Alltec Screens; a brand of Alltec Pro.

Draper Inc.

Legrand AV; Legrand North America, LLC.

Approved equivalent.

Surface-Mounting Configuration: **[Mounted using manufacturer's standard projecting wall brackets] [Mounted directly to wall or ceiling, as indicated on Drawings, with concealed mounting] [Recessed in ceiling trough indicated on Drawings, with concealed mounting]**.

Screen Case Color: **[As selected by Director’s Representative from manufacturer's standard options] [White] [Black]**.

Retain "Matte Viewing Surface" or "Viewing Surface" subparagraph below to suit Project. Matte-white viewing surface produces even brightness from center to edge of image and is best for low-ambient-light and wide-viewing-angle applications. Matte-gray surfaces are available from some manufacturers; they improve contrast and absorb stray light, but require more projection brightness than matte-white surfaces, to compensate for the lower gain and darker tint. See the Evaluations for further discussion.

Matte Viewing Surface: **[White, 1.0 minimum peak gain and 60-degree minimum half-gain angle] [White, 1.0 minimum peak gain and material does not reach half gain] [Gray, 0.8 minimum peak gain and material does not reach half gain]**.

Retain "Seams" subparagraph below if seams are necessary for viewing-surface sizes required for Project. Verify maximum sizes with manufacturers.

Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at **[top] [bottom]** of viewing surface.

Some manufacturers automatically provide black masking borders on rectangular viewing surfaces unless otherwise indicated.

Edge Treatment: **[Black] [Without black]** masking borders.

Coordinate size of viewing surface with viewing-surface material and media format.

Size of Viewing Surface: **[As indicated in schedule on Drawings] [40 by 64 inches] [50 by 80 inches] [40-1/2 by 72 inches] [57-1/2 by 92 inches] [45 by 80 inches] [52 by 92 inches]**.

Extra Drop Height: **[As indicated in schedule on Drawings] [As needed at top of screen for bottom of screen to be 36 inches above floor] [36 inches at bottom of screen]**.

Color: **[Same as viewing surface] [Black]**.

Retain first paragraph below if required. Copy and re-edit for each product required. Insert drawing designation. Use these designations on Drawings to identify each product.

For a similar effect, surface-mounted, metal-encased screens can be installed with a wood valance specified as architectural woodwork.

* + - * 1. Wood-Finished, Manually Operated Screen **<Insert drawing designation>**: Unit with free-hanging screen; with screen case with flat back, hardwood finish, and concealed mounting brackets for surface mounting on wall or ceiling, as indicated on Drawings.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Draper Inc.

Approved equivalent.

Screen Case Hardwood: **[Oak] [Walnut] [Mahogany] [Cherry] [As selected by Director’s Representative from manufacturer's full range of species]**.

Corners: **[Radiused] [Rectilinear] [Traditional crown trim at top, rectilinear at sides and bottom] [Beveled at top, eased at sides and bottom]**.

Finish: **[As indicated by manufacturer's designations] [Match Director’s Representative's sample] [As selected by Director’s Representative from manufacturer's full range]**.

Retain "Matte Viewing Surface" or "Viewing Surface" subparagraph below to suit Project. Matte viewing surface produces even brightness from center to edge of image. White surface is best for low-ambient-light and wide-viewing-angle applications. Gray surface improves contrast and absorbs stray light and is best for controlled-ambient-light and wide-viewing-angle applications, but requires more projection brightness than white surfaces, to compensate for the lower gain and darker tint. See the Evaluations for further discussion.

Matte Viewing Surface: **[White, 1.0] [Gray, 0.8]** minimum peak gain; material does not reach half-gain.

Retain "Seams" subparagraph below if seams are necessary for viewing-surface sizes required for the Project. Verify maximum sizes with manufacturers.

Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at **[top] [bottom]** of viewing surface.

Edge Treatment: **[Black] [Without black]** masking borders.

Coordinate size of viewing surface with viewing-surface material and media format.

Size of Viewing Surface: **[As indicated in schedule on Drawings] [50 by 80 inches] [57-1/2 by 92 inches] [45 by 80 inches] [52 by 92 inches]**.

Extra Drop Height: **[As indicated in schedule on Drawings] [As needed at top of screen for bottom of screen to be 36 inches above floor] [36 inches at bottom of screen]**.

Color: **[Same as viewing surface] [Black]**.

* + - 1. ELECTRICALLY OPERATED, FRONT-PROJECTION SCREENS

Retain "General Requirements" paragraph below for control, motor, and screen requirements. Not all electrically operated screens are UL-listed as an assembly, although they all use UL-listed electrical components.

* + - * 1. General Requirements: Manufacturer's standard units, consisting of case, screen, motor, controls, mounting accessories, and other components necessary for a complete installation.**[ Provide units that are listed and labeled as an assembly by Underwriters Laboratories Inc. (UL) or another testing and inspecting agency acceptable to authorities having jurisdiction.]**

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

Screen Mounting: Top edge securely anchored to rigid metal roller and bottom edge formed into a pocket holding a metal rod, with ends of rod protected by plastic caps.

Copy first paragraph below and re-edit for each product required. Insert drawing designation. Use these designations on Drawings to identify each product.

Confirm availability of free-hanging and tab-tensioned screens with manufacturers. Methods for hanging screens vary based on viewing-surface composition; see the Evaluations for further discussion. Some manufacturers of surface-mounted, electrically operated screens, such as Alltec Screens, do not offer tab-tensioned screens. Others, such as Screen Innovations and Stewart Filmscreen Corporation, do not offer free-hanging screens.

* + - * 1. Surface-Mounted, Metal-Encased, Electrically Operated Screen **<Insert drawing designation>**: Motor-in-roller unit with screen case fabricated from formed-steel sheet or from aluminum extrusions with manufacturer's standard finish and matching end caps.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Alltec Screens; a brand of Alltec Pro.

Draper Inc.

Legrand AV; Legrand North America, LLC.

Approved equivalent.

Motor in Roller: Instant-reversing motor of size and capacity recommended in writing by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.

Show locations of control switches on Drawings.

Controls: Remote,**[ key-operated,]** three-position control switch installed in recessed device box with flush cover plate**[ matching other electrical device cover plates in room where switch is installed]**.

Retain one option in first subparagraph below or revise to suit Project. Manufacturers normally provide one switch unless otherwise indicated. Indicate switch locations on Drawings.

Provide with **[one control switch] [two control switches] [number of control switches indicated on Drawings]**.

Provide power supply for low-voltage systems if required.

Provisions in first two subparagraphs below help control tampering; item in second subparagraph inactivates remote control and switches.

Provide locking cover plates for switches.

Provide key-operated, power-supply switch.

Provide **[infrared] [radio-frequency]** remote control, consisting of battery-powered transmitter and receiver.

Provide video interface control for connecting to projector. Projector provides signal to raise or lower screen.

Surface-Mounting Configuration: **[Mounted using manufacturer's standard projecting wall brackets] [Mounted directly to wall or ceiling, as indicated on Drawings, with concealed mounting] [Recessed in ceiling trough indicated on Drawings, with concealed mounting]**.

Screen-Case Color: **[As selected by Director’s Representative from manufacturer's standard options] [White] [Black]**.

Four viewing-surface subparagraphs are examples only; retain one and revise to suit Project.

Retain "Free-Hanging, Matte Viewing Surface" subparagraph if required. Matte-white viewing surface produces even brightness from center to edge of image and is best for low-ambient-light and wide-viewing-angle applications. Matte-gray surfaces are available from some manufacturers; they improve contrast and absorb stray light, but require more projection brightness than matte-white surfaces, to compensate for the lower gain and darker tint. See the Evaluations for further discussion.

Free-Hanging, Matte Viewing Surface: **[White, 1.0 minimum peak gain and 60-degree minimum half-gain angle] [White, 1.0 minimum peak gain and material does not reach half gain] [Gray, 0.8 minimum peak gain and material does not reach half gain]**.

Retain "Seams" subparagraph below if seams are necessary for viewing-surface sizes required for Project. Verify maximum sizes with manufacturers.

Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at **[top] [bottom]** of viewing surface.

Edge Treatment: **[Manufacturer's standard] [Black] [Without black]** masking borders.

High-contrast-gray viewing surface improves contrast and absorbs stray light. This surface is best for moderate-ambient-light, but requires more projection brightness than matte-white surfaces, to compensate for the lower gain and darker tint.

Tab-Tensioned, High-Contrast-Gray Viewing Surface: Minimum peak gain of **[0.6 and 60-degree] [0.8 and 45-degree]** minimum half-gain angle[, **with black backing]**.

Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.

Retain "Seams" subparagraph below if seams are necessary for viewing-surface sizes required for the Project. Verify maximum sizes with manufacturers.

Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at [top] [bottom] of viewing surface.

"Tab-Tensioned, Gain-White Viewing Surface" subparagraph below is best for applications with low-ambient-light and where projector brightness is lower than desired. Higher gain usually relates to reduced off-axis performance. First option is best for wide off-axis viewing; second option is best for moderate off-axis viewing; and third option is best for narrow off-axis viewing.

Tab-Tensioned, Gain-White Viewing Surface: Minimum peak gain of **[1.3 and 75-degree] [1.5 and 60-degree] [1.7 and 40-degree]** minimum half-gain angle. Provide viewing surface with black backing and without seams.

Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.

"Tab-Tensioned, ALR Viewing Surface" subparagraph below is best for moderate- to high-ambient-light applications. Retain first option for low-ALR viewing surface, which is best for wide off-axis viewing; retain second option for medium-ALR viewing surface, which is best for moderate off-axis viewing; and retain third option for high-ALR viewing surface, which is best for narrow off-axis viewing.

Tab-Tensioned, ALR Viewing Surface: Minimum peak gain of **[0.8, 57 percent ALR, and 50-degree] [1.0, 73 percent ALR, and 35-degree] [1.0, 82 percent ALR, and 18-degree]** minimum half-gain angle. Provide viewing surface without seams.

Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.

Coordinate size of viewing surface with viewing-surface material and media format.

Size of Viewing Surface: **[As indicated in schedule on Drawings] [50 by 80 inches] [57-1/2 by 92 inches] [87-1/2 by 140 inches] [45 by 80 inches] [52 by 92 inches] [79 by 140 inches]**.

Extra Drop Height: **[As indicated in schedule on Drawings] [As needed at top of screen for bottom of screen to be 36 inches above floor] [36 inches at bottom of screen]**.

Color: **[Same as viewing surface] [Black]**.

Retain first paragraph below if required. Copy and re-edit for each product required. Insert drawing designation. Use these designations on Drawings to identify each product.

For a similar effect, surface-mounted metal-encased screens can be installed with a wood valance specified as architectural woodwork.

* + - * 1. Surface-Mounted, Wood-Finished, Electrically Operated Screen <Insert drawing designation>: Motor-in-roller unit with tab-tensioned screen; with screen case with flat back, hardwood finish, and concealed mounting brackets for surface mounting on wall or ceiling, as indicated on Drawings.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Draper Inc.

Approved equivalent.

Motor in Roller: Instant-reversing motor of size and capacity recommended in writing by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.

Show locations of control switches on Drawings.

Controls: Remote,**[ key-operated,]** three-position control switch installed in recessed device box with flush cover plate**[ matching other electrical device cover plates in room where switch is installed]**.

Retain one option in first subparagraph below or revise to suit Project. Manufacturers normally provide one switch unless otherwise indicated. Indicate switch locations on Drawings.

Provide with **[one control switch] [two control switches] [number of control switches indicated on Drawings] <Insert requirements>**.

Provide power supply for low-voltage systems if required.

Provisions in first two subparagraphs below help control tampering; item in second subparagraph inactivates remote control and switches.

Provide locking cover plates for switches.

Provide key-operated, power-supply switch.

Provide **[infrared] [radio-frequency]** remote control, consisting of battery-powered transmitter and receiver.

Provide video interface control for connecting to projector. Projector provides signal to raise or lower screen.

Screen-Case Hardwood: **[Oak] [Walnut] [Mahogany] [Cherry] [As selected by Director’s Representative from manufacturer's full range of species].**

Corners: **[Radiused] [Rectilinear] [Traditional crown trim at top, rectilinear at sides and bottom] [Beveled at top, eased at sides and bottom]**.

Finish: **[As indicated by manufacturer's designations] [Match Director’s Representative's sample] [As selected by Director’s Representative from manufacturer's full range]**.

Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.

"Matte-White Viewing Surface," "High-Contrast-Gray Viewing Surface," "Gain-White Viewing Surface," and "ALR Viewing Surface" subparagraphs below are examples only; retain one and revise to suit Project.

"Matte-White Viewing Surface" subparagraph below is best for low-ambient-light and wide-viewing-angle applications.

Matte-White Viewing Surface: **[1.0 minimum peak gain; material does not reach half-gain]**. Provide viewing surface **[with] [without]** black backing.

Retain "Seams" subparagraph below if seams are necessary for viewing-surface sizes required for Project. Verify maximum sizes with manufacturers.

Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at **[top] [bottom]** of viewing surface.

"High-Contrast-Gray Viewing Surface" subparagraph below improves contrast and absorbs stray light. This surface is best for moderate-ambient-light and wide-viewing-angle applications, but requires more projection brightness than matte-white surfaces, to compensate for the lower gain and darker tint

High-Contrast-Gray Viewing Surface: **[0.6 minimum peak gain; material does not reach half gain]**. Provide viewing surface **[with] [without]** black backing.

Retain "Seams" subparagraph below if seams are necessary for viewing-surface sizes required for Project. Verify maximum sizes with manufacturers.

Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at **[top] [bottom]** of viewing surface.

"Gain-White Viewing Surface" subparagraph below is best for applications with low-ambient-light and where projector brightness is lower than desired.

Gain-White Viewing Surface: Minimum peak gain of **[1.3] [1.6] [1.8]**; material does not reach half gain. Provide viewing surface without seams and with black backing.

"ALR Viewing Surface" subparagraph below is best for moderate- to high-ambient-light applications. Retain first option for low-ALR viewing surface, which is best for wide off-axis viewing; retain second option for medium-ALR viewing surface, which is best for moderate off-axis viewing; and retain third option for high-ALR viewing surface, which is best for narrow-off axis viewing.

ALR Viewing Surface: Minimum peak gain of **[0.8, 57 percent ALR, and 50-degree] [0.1, 73 percent ALR, and 35-degree] [0.1, 82 percent ALR, and 18-degree]** minimum half-gain angle. Provide viewing surface without seams.

Coordinate size of viewing surface with viewing-surface material and media format.

Size of Viewing Surface: **[As indicated in schedule on Drawings] [50 by 80 inches] [57-1/2 by 92 inches] [45 by 80 inches] [52 by 92 inches]**.

Extra Drop Height: **[As indicated in schedule on Drawings] [As needed at top of screen for bottom of screen to be 36 inches above floor] [36 inches at bottom of screen]**.

Color: **[Same as viewing surface] [Black]**.

Screen in first paragraph below can be suspended over stages, where no ceiling is provided or can be recess mounted in ceiling. Surface-mounted, electrically operated screens can also be used for recessed applications by installing screen case in a trough built into ceiling. Copy and re-edit for each product required. Insert drawing designation. Use these designations on Drawings to identify each product.

Confirm availability of free-hanging and tab-tensioned screens with manufacturers. Methods for hanging screens vary based on viewing-surface composition; see the Evaluations for further discussion. Some manufacturers of surface-mounted, electrically operated screens, such as Stewart Filmscreen Corporation, do not offer free-hanging screens.

* + - * 1. Suspended, Electrically Operated Screen **<Insert drawing designation>**: Unit designed and fabricated for suspended mounting.

Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:

Draper Inc.

Legrand AV; Legrand North America, LLC.

Stewart Filmscreen Corporation.

Approved equivalent.

Retain "Motor in Roller" or "End-Mounted Motor" subparagraph below

Motor in Roller: Instant-reversing motor of size and capacity recommended in writing by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Mount motor inside roller with vibration isolators to reduce noise transmission.

End-Mounted Motor: Instant-reversing, gear-drive motor of size and capacity recommended in writing by screen manufacturer; with permanently lubricated ball bearings, automatic thermal-overload protection, preset limit switches to automatically stop screen in up and down positions, and positive-stop action to prevent coasting. Locate motor in its own compartment **[on right end of screen] [on left end of screen] [on end of screen indicated on Drawings]**. Support roller with self-aligning bearings in brackets.

Wiring Compartment: Metal or metal lined.

Show locations of control switches on Drawings.

Controls: Remote,**[ key-operated,]** three-position control switch installed in recessed device box with flush cover plate**[ matching other electrical device cover plates in room where switch is installed]**.

Retain one option in first subparagraph below or revise to suit Project. Manufacturers normally provide one switch unless otherwise indicated. Indicate switch locations on Drawings.

Provide with **[one control switch] [two control switches] [number of control switches indicated on Drawings]**.

Provide power supply for low-voltage systems if required.

Provisions in first two subparagraphs below help control tampering; item in second subparagraph inactivates remote control and switches.

Provide locking cover plates for switches.

Provide key-operated, power-supply switch.

Provide **[infrared] [radio-frequency]** remote control, consisting of battery-powered transmitter and receiver.

Provide video interface control for connecting to projector. Projector provides signal to raise or lower screen.

Retain one of three options in "Screen Case" subparagraph below.

Screen Case: **[Metal] [Metal and fire-retardant materials] [Metal, wood, wood products, and fire-retardant materials]**.

Retain "Ceiling Aperture" and "Finish on Exposed Surfaced" subparagraphs below for units that are recess mounted in ceiling.

Ceiling Aperture: [Open under screen compartment] **[With closure, hinged to automatically open when screen is lowered and automatically close when screen is fully raised]**.

Provide screen case **[with trim flange to receive ceiling finish] [constructed to be installed with underside flush with ceiling] [constructed to be installed with ceiling finish applied to underside]**.

Finish on Exposed Surfaces: **[Manufacturer's standard] [Prime painted] [Vinyl covering or baked enamel]**.

Free-Hanging, Matte Viewing Surface," "Tab-Tensioned, High-Contrast-Gray Viewing Surface," "Tab-Tensioned, Gain-White Viewing Surface," and "Tab-Tensioned ALR Viewing Surface" subparagraphs below are examples only; retain one and revise to suit Project.

Retain "Free-Hanging, Matte Viewing Surface" subparagraph below if required. Matte-white viewing surface produces even brightness from center to edge of image and is best for low-ambient-light and wide-viewing-angle applications. Matte-gray surfaces are available from some manufacturers; they improve contrast and absorb stray light, but require more projection brightness than matte-white surfaces, to compensate for the lower gain and darker tint. See the Evaluations for further discussion.

Free-Hanging, Matte Viewing Surface: **[White, 1.0 minimum peak gain and 60-degree minimum half-gain angle] [White, 1.0 minimum peak gain and material does not reach half gain] [Gray, 0.8 minimum peak gain and material does not reach half gain]**.

Retain "Seams" subparagraph below if seams are necessary for viewing-surface sizes required for Project. Verify maximum sizes with manufacturers.

Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at **[top] [bottom]** of viewing surface.

Edge Treatment: **[Manufacturer's standard] [Black] [Without black]** masking borders.

"Tab-Tensioned, High-Contrast-Gray Viewing Surface" subparagraph below improves contrast and absorbs stray light. This surface is best for moderate-ambient-light, but requires more projection brightness than matte-white surfaces, to compensate for the lower gain and darker tint.

Tab-Tensioned, High-Contrast-Gray Viewing Surface: Minimum peak gain of **[0.6 and 60-degree] [0.8 and 45-degree]** minimum half-gain angle**[, with black backing]**.

Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.

Retain "Seams" subparagraph below if seams are necessary for viewing-surface sizes required for the Project. Verify maximum sizes with manufacturers.

Seams: Where height of viewing surface exceeds maximum height without seams, locate horizontal seam with full-width material at **[top] [bottom]** of viewing surface.

"Tab-Tensioned, Gain-White Viewing Surface" subparagraph below is best for applications with low-ambient-light and where projector brightness is lower than desired. Higher gain usually relates to reduced off-axis performance. First option is best for wide off-axis viewing; second option is best for moderate off-axis viewing; and third option is best for narrow off-axis viewing.

Tab-Tensioned, Gain-White Viewing Surface: Minimum peak gain of **[1.3 and 75-degree] [1.5 and 60-degree] [1.7 and 40-degree]** minimum half-gain angle. Provide viewing surface with black backing and without seams.

Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.

"Tab-Tensioned ALR Viewing Surface" subparagraph below is best for moderate- to high-ambient-light applications. Retain first option for low-ALR viewing surface, which is best for wide off-axis viewing; retain second option for medium-ALR viewing surface, which is best for moderate off-axis viewing; and retain third option for high-ALR viewing surface, which is best for narrow-off axis viewing.

Tab-Tensioned, ALR Viewing Surface: Minimum peak gain of **[0.8, 57 percent ALR, and 50-degree] [1.0, 73 percent ALR, and 35-degree] [1.0, 82 percent ALR, and 18-degree]** minimum half-gain angle. Provide viewing surface without seams.

Tab Tensioning: Durable low-stretch cord, such as braided polyester, on each side of screen that is connected to edge of entire height of screen by tabs, to pull viewing surface flat horizontally.

Coordinate size of viewing surface with viewing-surface material and media format.

Size of Viewing Surface: **[As indicated in schedule on Drawings] [50 by 80 inches] [57-1/2 by 92 inches] [87-1/2 by 140 inches] [45 by 80 inches] [52 by 92 inches] [79 by 140 inches]**.

Extra Drop Height: **[As indicated in schedule on Drawings] [As needed at top of screen for bottom of screen to be 36 inches above floor] [36 inches at bottom of screen]**.

Color: **[Same as viewing surface] [Black]**.

1. EXECUTION
	* + 1. INSTALLATION
				1. Install front-projection screens at locations indicated on Drawings to comply with screen manufacturer's written instructions.
				2. Install front-projection screens with screen cases in position and in relation to adjoining construction indicated. Securely anchor them to supporting substrate in a manner that produces a smoothly operating screen that, when lowered, has flat viewing surface and plumb vertical edges.

Delete the sentence below if there is a separate electrical work contract

Install low-voltage controls in accordance with NFPA 70 and complying with manufacturer's written instructions.

Delete the sentence below if no electrical work contract

Power supply and connections to be provided by the Electrical Work Contract.

Wiring Method: Install wiring in raceway, except in accessible ceiling spaces and in gypsum board partitions, where unenclosed wiring method may be used. Use UL-listed plenum cable in environmental air spaces, including plenum ceilings. Conceal raceway and cables, except in unfinished spaces.

Test electrically operated units to verify that screen controls, limit switches, closures, and other operating components are in optimum functioning condition.

Test manually operated units to verify that screen-operating components are in optimum functioning condition.

END OF SECTION 115213