SECTION 089116 - OPERABLE WALL LOUVERS

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

MasterSpec includes provisions for LEED 2009, LEED v4, IgCC, and Green Globes. Sustainable design requirements may be inserted in the Section Text using the hypertext links.

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

Operable, [**extruded-aluminum**] [**and**] [**formed-metal**] louvers.

Operable, [**extruded-aluminum**] [**and**] [**formed-metal**] insulated louvers.

Blank-off panels for louvers.

Refer to sections listed below for cross-reference requirements Contractor might expect to find in this Section but are specified in other Sections. Sections listed below are for spec editor’s and design team coordination and are to remain as Editor’s Notes. Remove referenced specification sections within the body of the specification if not applicable to the project.

Section 099114 "Exterior Painting" for field painting exterior louvers.

Section 099123 "Interior Painting" for field painting interior louvers.

Section 221513 "General-Service Compressed-Air Piping" for connecting pneumatic-operated louvers.

* + - 1. DEFINITIONS

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

* + - * 1. Louver Terminology: Definitions of terms for metal louvers contained in AMCA 501 apply to this Section unless otherwise defined in this Section or in referenced standards.
				2. Drainable-Blade Louver: Louver with blades having gutters that collect water and drain it to channels in jambs and mullions, which carry it to bottom of unit and away from opening.
			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. Product Data: For each type of product indicated.

For louvers specified to bear AMCA seal, include printed catalog pages showing specified models with appropriate AMCA Certified Ratings Seals.

Include manufacturer’s installation instructions.

* + - * 1. Sustainable Design Submittals:
				2. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.

Show weep paths, gaskets, flashings, sealants, and other means of preventing water intrusion.

Show mullion profiles and locations.

Wiring Diagrams: For power, signal, and control wiring for motorized operable louvers.

* + - * 1. Samples: For each type of metal finish required.

Retain "Delegated Design Submittal" paragraph below if design services have been delegated to Contractor.

* + - * 1. Delegated Design Submittal: For louvers indicated to comply with structural[**and seismic**] performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
				2. Quality Control Submittals:

Reports are generally unnecessary if product data bearing an AMCA Certified Ratings Seal are required.

Product Test Reports: Based on evaluation of comprehensive tests performed in accordance with AMCA 500-L by a qualified testing agency or by manufacturer and witnessed by a qualified testing agency, for each type of louver and showing compliance with performance requirements specified.

Sample Warranties: For manufacturer's special warranties.

* + - 1. QUALITY ASSURANCE

Delete "Welding Qualifications" paragraph below if no welding is required or if weld strength is not critical.

* + - * 1. Welding Qualifications: Qualify procedures and personnel in accordance with the following:

AWS D1.2, "Structural Welding Code - Aluminum."

AWS D1.3, "Structural Welding Code - Sheet Steel."

AWS D1.6, "Structural Welding Code - Stainless Steel."

* + - 1. FIELD CONDITIONS
				1. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.
			2. WARRANTY

Verify available special finish warranties with manufacturers. Extended 20-year finish warranties are sometimes available for 70 percent fluoropolymer coatings.

* + - * 1. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of baked enamel, powder coat, or organic finishes within specified warranty period.

Retain first subparagraph below for factory-painted finishes. Coordinate color fading and chalking limits with finishes retained in Part 2.

Deterioration includes, but is not limited to, the following:

Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.

Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.

Cracking, checking, peeling, or failure of paint to adhere to bare metal.

Coordinate "Warranty Period" subparagraph below with "Aluminum Finishes" Article. AAMA 2604 is intended to represent five years of performance; AAMA 2605 is intended to represent 10 years of performance. Some manufacturers also offer a 20-year warranty. Verify available warranties and warranty periods for finishes.

Warranty Period: [**Five**] [**10**] [**20**] <**Insert number**> years from date of Substantial Completion.

* + - * 1. Special Finish Warranty, Anodized Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of anodized finishes within specified warranty period.

Retain first subparagraph below for anodized finishes. Coordinate color fading and chalking limits with finishes retained in Part 2.

Deterioration includes, but is not limited to, the following:

Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.

Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.

Cracking, peeling, or chipping.

Coordinate "Warranty Period" subparagraph below with "Aluminum Finishes" Article. Five years is standard for Class I anodized finishes, although several manufacturers offer a 10- or 20-year warranty. Class II anodized finishes often carry less than a five-year warranty. Verify available warranties and warranty periods for finishes.

Warranty Period: [**Five**] [**10**] <**Insert number**> years from date of Substantial Completion.

1. PRODUCTS

Manufacturers and products listed in this Section are neither recommended nor endorsed by the AIA or Deltek. Before selecting manufacturers and products, verify availability, suitability for intended applications, and compliance with minimum performance requirements.

Product options commonly available from manufacturers are included in square brackets throughout the Section Text. Not every manufacturer listed can provide every option offered; verify availability with manufacturers.

* + - 1. MANUFACTURERS
				1. Source Limitations: Obtain operable [**and fixed**] louvers from single source from single manufacturer[**where indicated to be of same type, design, or factory-applied color finish**].
			2. PERFORMANCE REQUIREMENTS

Retain "Delegated Design" paragraph below if Contractor is required to assume responsibility for design. Most louver manufacturers do not have an Engineer on staff who is legally authorized to practice in the jurisdiction where Project is located. For this reason, deleting below is advisable unless using large or custom louvers. If specifying large or structurally complex louvers and relying on manufacturer for information about their structural performance, below can be retained and louver manufacturer or Contractor can engage a local Engineer to prepare the required calculations.

* + - * 1. Delegated Design: Design louvers, including comprehensive engineering analysis by a qualified professional engineer, using structural[**and seismic**] performance requirements and design criteria indicated.
				2. Structural Performance: Louvers withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures to the face of the building are considered to act normal.

Wind Loads:

Retain one of three subparagraphs below. If retaining first, indicate pressures on appropriate elevation Drawings. Requirements in second and third are examples only. Revise to suit Project. Consult a structural engineer to quantify design loads applicable to Project. Verify compliance with codes. See the Evaluations.

Determine loads based on pressures as indicated on Drawings.

Determine loads based on a uniform pressure of [**20 lbf/sq. ft.**] [**30 lbf/sq. ft.**] <**Insert value**>, acting inward or outward.

Determine loads based on pressures indicated below:

Corner Zone: Within <**Insert distance**> of building corners, uniform pressure of <**Insert design wind pressure**>, acting inward, and <**Insert design wind pressure**>, acting outward.

Other Than Corner Zone: Uniform pressure of <**Insert design wind pressure**>, acting inward, and <**Insert design wind pressure**>, acting outward.

* + - * 1. Seismic Performance:

Retain one of two subparagraphs below to refer to loads indicated on Drawings or to indicate specific loads determined by Project's structural engineer. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Coordinate requirements with structural engineer.

As indicated on Drawings.

Louvers, including attachments to other construction, withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.

Design earthquake spectral response acceleration, short period (Sds) is determined by Project's location and site classification. This information is usually provided in structural notes on Drawings.

Design earthquake spectral response acceleration, short period (Sds) for Project is <**Insert value**>.

Component Importance Factor is generally 1.0 unless the structure is in Seismic Use Group III and louver is necessary for continued operation of facility or failure of louver could impair continued operation of facility, in which case the Component Importance Factor is 1.5.

Component Importance Factor: [**1.5**] [**1.0**].

Delete "Louver Performance Ratings" paragraph below and performance ratings in Part 2 if louvers are sufficiently oversized that performance is not critical.

* + - * 1. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width in accordance with AMCA 500-L.

"Thermal Movements" paragraph below may not be needed for most louvers, but should be retained if using continuous louver assemblies.

* + - * 1. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

* + - * 1. SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

Delete "UL and NEMA Compliance" paragraph below if not using motor-operated louvers.

* + - * 1. UL and NEMA Compliance: Provide motors and related components for motor-operated louvers that are listed and labeled by UL and comply with applicable NEMA standards.
			1. OPERABLE EXTRUDED-ALUMINUM LOUVERS

Retain "Louver Construction and Operation" paragraph below for either single-blade or dual-blade louvers.

* + - * 1. Louver Construction and Operation: Provide operable louvers with extruded-aluminum frames and blades of not less than 0.080-inch nominal thickness, and with operating mechanisms to suit louver sizes.

Retain one operation method in five subparagraphs below; delete others. Revise to suit Project requirements.

Hand operation with push bars.

Crank operation with removable-crank operator in sill or jamb.

Chain operation with tension spring, wall clip, pull chain, and 160 deg F fusible link.

Options in first subparagraph below are examples of available motor operators and control features.

Motor operation with [**two-position, spring-return application (with power on, motor opens louver; with power off, spring closes louver); 110-V, 60-Hz motor and limit switch**] [**two-direction, 110-V, 60-Hz motor and limit switches**]; equipped with [**frame-mounted switch**] [**remote-mounted switch with indicator light**] [**terminals for controlling devices**].

Subparagraph below is an example of pneumatic operators available from one louver manufacturer.

Pneumatic piston operation for use with 80- to 100-psi compressed air for [**two-position**] [**modulating**] operation; power open, power close[**with spring-return fail-safe**].

* + - * 1. Operable, Extruded-Aluminum, Single-Blade Louver <**Insert drawing designation**>:

Louver Depth: [**4 inches**] [**6 inches**] **<Insert dimension>.**

Blade Type: [**Drainable**] [**Plain**].

Accessories: Equip louvers as follows:

Vinyl blade-edge gaskets for each louver blade.

Retain first subparagraph below (not recommended by Airolite, with removable crank or concealed motor operator) only after verifying suitability with actuator type specified. Revise to suit products of manufacturers.

[**Stainless steel jamb seals**] [**or**] [**vinyl blade-end gaskets**].

Louver Performance Ratings:

Requirements in "Free Area," "Point of Beginning Water Penetration," and "Air Performance" subparagraphs below are based on products available from listed manufacturers. If more than one choice is given for a requirement, the most lenient choice allows many products in the category to comply, resulting in competitive pricing; the most restrictive choice limits products to high-performance designs, potentially with higher costs.

Free Area: Not less than [**6.5 sq. ft.**] [**7.0 sq. ft.**] [**7.5 sq. ft.**] [**8.0 sq. ft.**] <**Insert value**> for 48-inch-wide by 48-inch-high louver.

Coordinate options in "Point of Beginning Water Penetration" subparagraph below with blade type selected; for plain-blade operable louvers, point of beginning water penetration ranges from 500 to 800 fpm; for drainable-blade operable louvers, from 600 to 1250 fpm.

Point of Beginning Water Penetration: Not less than [**500 fpm**] [**600 fpm**] [**700 fpm**] [**800 fpm**] [**900 fpm**] [**1000 fpm**] <**Insert value**>.

Do not specify free-area velocity in "Air Performance" subparagraph below that is greater than point of beginning water penetration specified in "Point of Beginning Water Penetration" subparagraph above.

Air Performance: Not more than [**0.10-inch wg**] <**Insert value**> static pressure drop at [**500-fpm**] [**600-fpm**] [**700-fpm**] [**800-fpm**] [**900-fpm**] <**Insert value**> free-area [**exhaust**] [**intake**] velocity.

Only several manufacturers offer AMCA performance-rated operable louvers. If nonrated units are acceptable, delete "Air Leakage" subparagraph below.

Air Leakage: Not more than [**3.5 cfm/sq. ft.**] <**Insert value**> of louver gross area at a differential static pressure of 0.15-inch wg with operable louver blades closed.

Verify availability of seal in "AMCA Seal" subparagraph below for louver sizes indicated. Delete if not required. Coordinate with product data submittal requirement.

AMCA Seal: Mark units with AMCA Certified Ratings Seal.

* + - * 1. Operable, Extruded-Aluminum, Dual-Blade Louver <**Insert drawing designation**>: Fixed drainable blades and operable plain blades combined in single frame.

Louver Depth: [**4 inches**] [**6 inches**] **<Insert dimension**>, overall.

Fixed Drainable-Blade Angle: [**30**] [**35**] [**37.5**] [**45**] <**Insert number**> degrees.

Louver Performance Ratings:

Requirements in "Free Area," "Point of Beginning Water Penetration," and "Air Performance" subparagraphs below are based on products available from listed manufacturers. If more than one choice is given for a requirement, the most lenient choice allows many products in the category to comply, resulting in competitive pricing; the most restrictive choice limits products to high-performance designs, potentially with higher costs.

Free Area: Not less than [**6.0 sq. ft.**] [**6.5 sq. ft.**] [**7.0 sq. ft.**] [**7.5 sq. ft.**] [**8.0 sq. ft.**] <**Insert value**> for 48-inch-wide by 48-inch-high louver.

Point of Beginning Water Penetration: Not less than [**750 fpm**] [**800 fpm**] [**850 fpm**] [**900 fpm**] [**950 fpm**] [**1000 fpm**] <**Insert value**>.

Do not specify free-area velocity in "Air Performance" subparagraph below that is greater than point of beginning water penetration specified in "Point of Beginning Water Penetration" subparagraph above.

Air Performance: Not more than [**0.10-inch wg**] <**Insert value**> static pressure drop at [**750-fpm**] [**800-fpm**] [**850-fpm**] [**900-fpm**] <**Insert value**> free-area [**exhaust**] [**intake**] velocity.

Air Leakage: Not more than [**1.5 cfm/sq. ft.** ] <**Insert value**> of louver gross area at a differential static pressure of 0.15-inch wg with operable louver blades closed.

Verify availability of seal in "AMCA Seal" subparagraph below for louver sizes indicated. Delete if not required. Coordinate with product data submittal requirement.

AMCA Seal: Mark units with AMCA Certified Ratings Seal.

* + - 1. OPERABLE FORMED-METAL LOUVERS

Retain "Louver Operation" paragraph below for either single-blade or dual-blade louvers.

* + - * 1. Louver Operation: Provide operable louvers with operating mechanisms to suit louver sizes.

Retain one operation method in five subparagraphs below; delete others. Revise to suit specific requirements.

Hand operation with push bars.

Crank operation with removable-crank operator in sill or jamb.

Chain operation with tension spring, wall clip, pull chain, and 160 deg F fusible link.

Options in first subparagraph below are examples of available motor operators and control features.

Motor operation with [**two-position, spring-return application (with power on, motor opens louver; with power off, spring closes louver); 110-V, 60-Hz motor and limit switch**] [**two-direction, 110-V, 60-Hz motor and limit switches**]; equipped with [**frame-mounted switch**] [**remote-mounted switch with indicator light**] [**terminals for controlling devices**].

Subparagraph below is an example of pneumatic operators available from one louver manufacturer.

Pneumatic piston operation for use with 80- to 100-psi compressed air for [**two-position**] [**modulating**] operation; power open, power close[**with spring-return fail-safe**].

* + - * 1. Operable, Formed-Metal, Single-Blade Louver <**Insert drawing designation**>:

Louver Depth: [**4 inches**] [**6 inches**] <**Insert dimension**>.

Blade Type: [**Drainable**] [**Plain**].

Frame and Blade Material and Nominal Thickness:

Galvanized-steel sheet, not less than [**0.052 inch for frames and 0.040 inch for blades**] [**0.052 inch**] [**0.064 inch**].

Stainless steel sheet, not less than [**0.050 inch**] [**0.062 inch**].

Accessories: Equip louvers as follows:

Vinyl blade-edge gaskets for each louver blade.

Retain first subparagraph below (not recommended by Airolite, with removable crank or concealed motor operator) only after verifying suitability with actuator type specified. Revise to suit products of manufacturers.

[**Stainless steel jamb seals**] [**or**] [**vinyl blade-end gaskets**].

Louver Performance Ratings:

Requirements in "Free Area," "Point of Beginning Water Penetration," and "Air Performance" subparagraphs below are based on products available from listed manufacturers. If more than one choice is given for a requirement, the most lenient choice allows many products in the category to comply, resulting in competitive pricing; the most restrictive choice limits products to high-performance designs, potentially with higher costs.

Free Area: Not less than [**6.5 sq. ft.**] [**7.0 sq. ft.**] [**7.5 sq. ft.**] [**8.0 sq. ft.**] <**Insert value**> for 48-inch-wide by 48-inch-high louver.

Coordinate options in "Point of Beginning Water Penetration" subparagraph below with blade type selected; for plain-blade operable louvers, point of beginning water penetration ranges from 500 to 800 fpm; for drainable-blade operable louvers, from 600 to 1250 fpm.

Point of Beginning Water Penetration: Not less than [**500 fpm**] [**600 fpm**] [**700 fpm**] [**800 fpm**] [**900 fpm**] [**1000 fpm**] <**Insert value**>.

Do not specify free-area velocity in "Air Performance" subparagraph below that is greater than point of beginning water penetration specified in "Point of Beginning Water Penetration" subparagraph above.

Air Performance: Not more than [**0.10-inch wg** ] <**Insert value**> static pressure drop at [**500-fpm**] [**600-fpm**] [**700-fpm**] [**800-fpm**] [**900-fpm**] <**Insert value**> free-area [**exhaust**] [**intake**] velocity.

Only several manufacturers offer AMCA performance-rated operable louvers. If nonrated units are acceptable, delete "Air Leakage" subparagraph below.

Air Leakage: Not more than [**3.5 cfm/sq. ft.**] <**Insert value**> of louver gross area at a differential static pressure of 0.15-inch wg with operable louver blades closed.

Verify availability of seal in "AMCA Seal" subparagraph below for louver sizes indicated. Delete if not required. Coordinate with product data submittal requirement.

AMCA Seal: Mark units with AMCA Certified Ratings Seal.

* + - * 1. Operable, Formed-Metal, Dual-Blade Louver <**Insert drawing designation**>: Fixed drainable blades and operable plain blades combined in single frame.

Louver Depth: [**4 inches**] [**6 inches**] **<Insert dimension>**, overall.

Fixed Drainable-Blade Angle: [**30**] [**35**] [**37.5**] [**45**] <**Insert number**> degrees.

Frame and Blade Material and Nominal Thickness:

Galvanized-steel sheet, not less than [**0.052 inch for frames and 0.040 inch for blades**] [**0.052 inch**] [**0.064 inch**].

Stainless steel sheet, not less than [**0.050 inch**] [**0.062 inch**].

Louver Performance Ratings:

Free Area: Not less than <**Insert value**> for 48-inch-wide by 48-inch-high louver.

Point of Beginning Water Penetration: Not less than <**Insert velocity**>.

Do not specify free-area velocity in "Air Performance" subparagraph below that is greater than point of beginning water penetration specified in "Point of Beginning Water Penetration" subparagraph above.

Air Performance: Not more than <**Insert pressure**> static pressure drop at <**Insert velocity**> free-area [**exhaust**] [**intake**] velocity.

Air Leakage: Not more than [**1.5 cfm/sq. ft.**] <**Insert value**> of louver gross area at a differential static pressure of 0.15-inch wg with operable louver blades closed.

Verify availability of seal in "AMCA Seal" subparagraph below for louver sizes indicated. Delete if not required. Coordinate with product data submittal requirement.

AMCA Seal: Mark units with AMCA Certified Ratings Seal.

* + - 1. OPERABLE INSULATED LOUVERS

Retain "Louver Operation" paragraph below for either extruded-aluminum or formed-metal louvers.

* + - * 1. Louver Operation: Provide operable louvers with operating mechanisms to suit louver sizes.

Retain one operation method in five subparagraphs below; delete others. Revise to suit specific requirements.

Hand operation with push bars.

Crank operation with removable-crank operator in sill or jamb.

Chain operation with tension spring, wall clip, pull chain, and 160 deg F fusible link.

Options in first subparagraph below are examples of available motor operators and control features.

Motor operation with [**two-position, spring-return application (with power on, motor opens louver; with power off, spring closes louver); 110-V, 60-Hz motor and limit switch**] [**two-direction, 110-V, 60-Hz motor and limit switches**]; equipped with [**frame-mounted switch**] [**remote-mounted switch with indicator light**] [**terminals for controlling devices**].

Subparagraph below is an example of pneumatic operators available from one louver manufacturer.

Pneumatic piston operation for use with 80- to 100-psi compressed air for [**two-position**] [**modulating**] operation; power open, power close[**with spring-return fail-safe**].

* + - * 1. Operable, Insulated, Extruded-Aluminum Louver <**Insert drawing designation**>: Single-blade, operable louver with gasketed, insulated blades. Frames and blade frames have urethane thermal break. Frames are made of extruded aluminum, not less than 0.080-inch nominal thickness. Blade facings are made of aluminum sheet, not less than 0.032-inch nominal thickness.

Louver Depth: [**6 inches**] [**9 inches**].

Insulation: [**Extruded-polystyrene foam, 2 inches thick**] [**Foamed-in-place polyurethane**].

Insert performance requirements, if required, after verifying with manufacturers.

* + - * 1. Operable, Insulated, Formed-Metal Louver <**Insert drawing designation**>: Single-blade, operable louver with gasketed, insulated blades.

Louver Depth: [**6 inches**] [**8 inches**] **<Insert dimension**>.

Frame Material and Nominal Thickness:

Galvanized-steel sheet, not less than [**0.052 inc**] [**0.064 inch**].

Stainless steel sheet, not less than [**0.050 inch**] [**0.062 inch**].

Blade Material and Nominal Thickness:

Galvanized-steel sheet, not less than [**0.028 inch**] [**0.040 inch**] [**0.052 inch**] [**0.064 inch**].

Stainless steel sheet, not less than [**0.025 inch**] [**0.038 inch**] [**0.050 inch**] [**0.062 inch**].

Louver manufacturers do not all provide the same insulation. Deleting "Insulation" subparagraph below will allow maximum competition.

Insulation: [**Extruded-polystyrene foam, 1 inch thick**] [**Rigid, glass-fiber-board insulation, 1 inch thick**] [**Foamed-in-place polyurethane, 1/2 inch thick**] <**Insert insulation description and thickness**>.

Insert performance requirements, if required, after verifying with manufacturers.

* + - 1. LOUVER SCREENS

Retain one of two options in "General" paragraph below. If retaining second option, indicate locations on Drawings.

* + - * 1. General: Provide screen at [**each exterior louver**] [**louvers indicated**].

Retain applicable requirements in "Screen Location" and "Screening Type" subparagraphs below. See the Evaluations.

Screen Location: [**Interior**] [**Exterior**] face unless otherwise indicated.

Retain one of three options in "Screening Type" subparagraph below. The International Mechanical Code requires that openings in louvers or screens for exhaust openings, or intake openings in residential occupancies, be 1/4 to 1/2 inch; for intake openings in nonresidential occupancies, 1/4 to 1 inch.

Screening Type: [**Bird screening**] [**Bird screening, except where insect screening is indicated**] [**Insect screening**].

* + - * 1. Secure screen frames to louver frames with [**stainless steel machine screws**] [**machine screws with heads finished to match louver**], spaced a maximum of 6 inches from each corner and at 12 inches o.c.
				2. Louver Screen Frames: Fabricate with mitered corners to louver sizes indicated.

Metal: Same type and form of metal as indicated for louver to which screens are attached.[**Reinforce extruded-aluminum screen frames at corners with clips.**]

Finish: [**Same finish as louver frames to which louver screens are attached**] [**Mill finish unless otherwise indicated**].

Retain one of two options in "Type" subparagraph below. First allows screen mesh to be replaced without replacing frame, which is wanted for insect screen. Second requires frame to be replaced when replacing screen mesh, which is typical for bird screen.

Type: [**Rewirable frames with a driven spline or insert**] [**Non-rewirable, U-shaped frames**].

Retain "Louver Screening for Aluminum Louvers," "Louver Screening for Galvanized-Steel Louvers," or "Louver Screening for Stainless Steel Louvers" paragraph below for louver material selected. If more than one screen type is required, coordinate selection with Drawings and with mechanical engineer for required percentage of open area. Delete all three if manufacturer's standard screening is acceptable.

* + - * 1. Louver Screening for Aluminum Louvers:

Retain one or more of five subparagraphs below, or insert another mesh or wire size. If both bird and insect screening are required, indicate location of each on Drawings.

Bird Screening, Aluminum: 1/2-inch-square mesh, 0.063-inch wire.

Bird Screening, Stainless Steel: 1/2-inch-square mesh, 0.047-inch wire.

Bird Screening, Flattened, Expanded Aluminum: 3/4 by 0.050 inch thick.

Insect Screening, Aluminum: 18-by-16 mesh, 0.012-inch wire.

Insect Screening, Stainless Steel: 18-by-18 mesh, 0.009-inch wire.

* + - * 1. Louver Screening for Galvanized-Steel Louvers:

Retain one or more of four subparagraphs below, or insert another mesh or wire size. If both bird and insect screening are required, indicate location of each on Drawings.

Bird Screening, Galvanized Steel: 1/2-inch-square mesh, 0.041-inch wire.

Bird Screening, Stainless Steel: 1/2-inch-square mesh, 0.047-inch wire.

Insect Screening, Galvanized Steel: 18-by-14 mesh, 0.011-inch wire.

Insect Screening, Stainless Steel: 18-by-18 mesh, 0.009-inch wire.

* + - * 1. Louver Screening for Stainless Steel Louvers:

Retain one of or both subparagraphs below, or insert another mesh or wire size. If both bird and insect screening are required, indicate location of each on Drawings.

Bird Screening, Stainless Steel: 1/2-inch-square mesh, 0.047-inch wire.

Insect Screening, Stainless Steel: 18-by-18 mesh, 0.009-inch wire.

Insert other screening materials as required, including bronze and glass fiber.

* + - 1. BLANK-OFF PANELS
				1. Uninsulated Blank-Off Panels: Metal sheet attached to back of louver.

Retain applicable metal and thickness requirements in five subparagraphs below. Thicknesses indicated are examples only; revise to suit louver conditions.

Aluminum sheet for aluminum louvers, not less than 0.050-inch nominal thickness.

Galvanized-steel sheet for galvanized-steel louvers, not less than [**0.040-inch**] [**0.052-inch**] nominal thickness.

Stainless steel sheet for stainless steel louvers, not less than [**0.038-inch**] [**0.050-inch**] nominal thickness, with grain running in same direction as grain of louver blades.

Panel Finish: [**Same finish applied to louvers**] [**Same finish type applied to louvers, but black color**].

Retain one of two options in subparagraph below, or revise to suit Project. Other methods include slide bolts and cam latches with or without hinges. Delete subparagraph if not important. Some manufacturers may also offer removable blank-off panels. Verify with manufacturer and add to Section Text if desired.

Attach blank-off panels with [**clips**] [**sheet metal screws**] <**Insert method**>.

* + - * 1. Insulated Blank-Off Panels: Laminated panels consisting of an insulating core surfaced on back and front with metal sheets and attached to back of louver.

Thickness: [**1 inch**] [**2 inches**].

Retain one of three subparagraphs below. Verify availability of stainless steel sheet with manufacturers.

Metal Facing Sheets, Aluminum: Not less than 0.032-inch nominal thickness.

Metal Facing Sheets, Galvanized-Steel Sheet: Not less than 0.028-inch nominal thickness.

Metal Facing Sheets, Stainless Steel Sheet: Not less than 0.031-inch nominal thickness.

Insulating Core: [**Rigid, glass-fiber-board insulation**] [**or**] [**extruded-polystyrene foam**] <**Insert insulation material**>.

"Edge Treatment" subparagraph below is an example only; revise to suit Project.

Edge Treatment: Trim perimeter edges of blank-off panels with louver manufacturer's standard [**extruded-aluminum-channel frames, not less than 0.080-inch nominal thickness**] [**channel frames**], with corners mitered and with same finish as panels.

Seal perimeter joints between panel faces and louver frames with gaskets or sealant.

Panel Finish: [**Same finish applied to louvers**] [**Same finish type applied to louvers, but black color**].

Retain one of two options in subparagraph below, or revise to suit Project. Other methods include slide bolts and cam latches with or without hinges. Delete subparagraph if not important.

Attach blank-off panels with [**clips**] [**sheet metal screws**] <**Insert method**>.

* + - 1. MATERIALS
				1. Aluminum Extrusions: ASTM B221, Alloy 6063-T5, T-52, or T6.
				2. Aluminum Sheet: ASTM B209, Alloy 3003 or 5005, with temper as required for forming, or as otherwise recommended by metal producer for required finish.
				3. Galvanized-Steel Sheet: ASTM A653, [**G60**] [**G90**] zinc coating, mill phosphatized.
				4. Stainless Steel Sheet: ASTM A240, Type 304, [**No. 2B finish**] [**No. 2D finish**] [**No. 4 finish, with grain running parallel to length of blades and frame members**] [**No. 4 finish, with grain running perpendicular to length of blades and frame members**] [**No. 4 finish, with grain running perpendicular to length of blades and parallel to length of frame members**] [**No. 6 finish**].
				5. Fasteners: Use types and sizes to suit unit installation conditions.

First option in first subparagraph below specifies flush heads; second option specifies raised heads.

Use [**Phillips flat-head**] [**hex-head or Phillips pan-head**] [**tamper-resistant**] screws for exposed fasteners unless otherwise indicated.

For fastening aluminum, use aluminum or 300 series stainless steel fasteners.

For fastening galvanized steel, use hot-dip-galvanized-steel or 300 series stainless steel fasteners.

For fastening stainless steel, use 300 series stainless steel fasteners.

For color-finished louvers, use fasteners with heads that match color of louvers.

* + - * 1. Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, fabricated from stainless steel components, with allowable load or strength design capacities calculated in accordance with Uniform Code-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing in accordance with ASTM E488 conducted by a qualified testing agency.

Design Consultant to review code references and verify that the referenced sections/tables are current. Note that code references shall be based on the current version of the Uniform Code.

* + - * 1. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.
			1. FABRICATION
				1. Factory assemble louvers to minimize field splicing and assembly. Disassemble units as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
				2. Vertical Assemblies: Where height of louver units exceeds fabrication and handling limitations, fabricate units to permit field-bolted assembly with close-fitting joints in jambs and mullions, reinforced with splice plates.

Usually retain "Continuous Vertical Assemblies" or "Horizontal Mullions" subparagraph below. If both conditions are required, retain one subparagraph as default requirement and indicate exceptions on Drawings.

Continuous Vertical Assemblies: Fabricate units without interrupting blade-spacing pattern [**unless horizontal mullions are indicated**] [**where indicated**].

Horizontal Mullions: Provide horizontal mullions at joints [**unless continuous vertical assemblies are indicated**] [**where indicated**].

* + - * 1. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

Retain one of three options in "Frame Type" subparagraph below as default and indicate other frame types required, if any, on Drawings.

Frame Type: [**Channel**] [**Exterior flange**] [**Interior flange**] unless otherwise indicated.

* + - * 1. Include supports, anchorages, and accessories required for complete assembly.

Coordinate first paragraph below with Drawings and product descriptions.

* + - * 1. Provide vertical mullions of type and at spacings indicated, but not more than is recommended by manufacturer, or 72 inches o.c., whichever is less.

Indicate subsill and extended sill locations on Drawings.

* + - * 1. Provide [**subsills made of same material as louvers**] [**or**] [**extended sills**] for recessed louvers.
				2. Join frame members to each other and to fixed louver blades with fillet welds [**concealed from view**] [**, threaded fasteners, or both, as standard with louver manufacturer**] unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.
			1. ALUMINUM FINISHES

Many louvers are made from prefinished extrusions or coil-coated metal sheet and are touched up after assembly. Before retaining "Finish louvers after assembly" paragraph below, verify availability and cost with manufacturers.

* + - * 1. Finish louvers after assembly.

Retain finishes in paragraphs below to suit Project. If retaining more than one, indicate location of each on Drawings or by inserts.

Retain one of two options in "Clear Anodic Finish" paragraph below. Class II finish is standard with many manufacturers; Class I finish is heavy anodized. Verify availability with manufacturers.

* + - * 1. Clear Anodic Finish: AAMA 611, [**AA-M12C22A41, Class I, 0.018 mm**] [**AA-M12C22A31, Class II, 0.010 mm**] or thicker.

Retain one of two options in "Color Anodic Finish" paragraph below. Verify availability with manufacturers.

* + - * 1. Color Anodic Finish: AAMA 611, [**AA-M12C22A42/A44, Class I, 0.018 mm**] [**AA-M12C22A32/A34, Class II, 0.010 mm**] or thicker.

Color: [**Champagne**] [**Light bronze**] [**Medium bronze**] [**Dark bronze**] [**Black**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from full range of industry colors and color densities**] <**Insert color**>.

* + - * 1. Conversion-Coated Finish: AA-C12C42, nonetched, cleaned with inhibited chemicals, and chemical conversion coated with acid chromate-fluoride-phosphate.

Delete "Conversion-Coated Finish" paragraph above and retain "Factory-Primed Finish" paragraph below if extended delay in field painting is anticipated.

* + - * 1. Factory-Primed Finish: AA-C12C42R1x with air-dried primer of not less than 2-mil dry film thickness.

"Baked-Enamel or Powder-Coat Finish" paragraph below references AAMA standard for pigmented organic coating on aluminum extrusions and panels.

* + - * 1. Baked-Enamel or Powder-Coat Finish: AAMA 2603. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

Retain "High-Performance Organic Finish, Two-Coat PVDF," "Superior-Performance Organic Finish, Three-Coat PVDF," "Superior-Performance Organic Finish, Four-Coat PVDF," "Superior-Performance Organic Finish, Single-Coat FEVE," or "Superior-Performance Organic Finish, Two-Coat FEVE" paragraph below; if more than one finish is required, indicate location of each system on Drawings, in schedules, or by inserts. Coordinate finish system selected with special finish warranty period specified in Part 1 "Warranty" Article.

In "High-Performance Organic Finish, Two-Coat PVDF" paragraph below, retain AAMA 2604 with 50 percent resin content by weight in color coat or AAMA 2605 with 70 percent resin content by weight in color coat for high-performance organic coatings on extrusions and panels. If specific products are required, name coating manufacturers and products.

* + - * 1. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.

Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions [**for seacoast and severe environments**].

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

* + - * 1. Superior-Performance Organic Finish, Three-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.

Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions [**for seacoast and severe environments**].

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

* + - * 1. Superior-Performance Organic Finish, Four-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in both color coat and clear topcoat.

Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions [**for seacoast and severe environments**].

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

"Superior-Performance Organic Finish, Single-Coat FEVE" paragraph below is not suitable for seacoast and severe environments.

* + - * 1. Superior-Performance Organic Finish, Single-Coat FEVE: Fluoropolymer finish complying with AAMA 2605.

Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

* + - * 1. Superior-Performance Organic Finish, Two-Coat FEVE: Fluoropolymer finish complying with AAMA 2605.

Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions for seacoast and severe environments.

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

* + - 1. GALVANIZED-STEEL SHEET FINISHES

Some louvers are made from coil-coated metal sheet and are touched up after assembly. Finishing galvanized steel after fabrication provides better corrosion protection. Usually retain "Finish louvers after assembly" paragraph below unless cost is primary consideration.

* + - * 1. Finish louvers after assembly.
				2. Surface Preparation: Clean surfaces of oil and other contaminants. Use cleaning methods that do not leave residue. After cleaning, apply a conversion coating compatible with the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and apply galvanizing repair paint, complying with SSPC-Paint 20, to comply with ASTM A780.
				3. Baked-Enamel or Powder-Coat Finish: After cleaning and pretreating, apply manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat to a minimum dry film thickness of 2 mils.

Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Director’s Representative's sample**] [**As selected by Director’s Representative from manufacturer's full range**] <**Insert color and gloss**>.

For exact finish, insert names of coating manufacturers and products.

* + - 1. STAINLESS STEEL SHEET FINISHES

Delete this article if not using stainless steel, formed-metal louvers.

* + - * 1. Repair sheet finish by grinding and polishing irregularities, weld spatter, scratches, and forming marks to match surrounding finish.
1. EXECUTION
	* + 1. EXAMINATION
				1. Examine substrates and openings, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
				2. Proceed with installation only after unsatisfactory conditions have been corrected.
			2. PREPARATION
				1. Coordinate setting drawings, diagrams, templates, instructions, and directions for installation of anchorages that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.
			3. INSTALLATION
				1. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
				2. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
				3. Form closely fitted joints with exposed connections accurately located and secured.
				4. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
				5. Protect unpainted galvanized- and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.
				6. Install concealed gaskets, flashings, joint fillers, and insulation as louver installation progresses, where weathertight louver joints are required. Comply with Section 079200 "Joint Sealants" for sealants applied during louver installation.
			4. ADJUSTING AND CLEANING
				1. Test operable louvers and adjust as needed to produce fully functioning units that comply with requirements.
				2. Clean exposed louver surfaces that are not protected by temporary covering, to remove fingerprints and soil during construction period. Do not let soil accumulate during construction period.
				3. Before final inspection, clean exposed surfaces with water and a mild soap or detergent not harmful to finishes. Thoroughly rinse surfaces and dry.
				4. Restore louvers damaged during installation and construction, so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Director’s Representative, remove damaged units and replace with new units.

Delete subparagraph below if not using factory-applied finish coatings.

Touch up minor abrasions in finishes with air-dried coating that matches color and gloss of, and is compatible with, factory-applied finish coating.

END OF SECTION 089116