SECTION 088300 - MIRRORS

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:

Silvered flat glass mirrors.

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 088000 "Glazing" for glass with reflective coatings used for vision and spandrel lites.

Section 102800 "Toilet, Bath, and Laundry Accessories" for metal-framed mirrors.

* + - 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.

Most mirror manufacturers do not publish standard Product Data and have to prepare the description required in "Mirrors" subparagraph below. Nevertheless, if requirements are inserted for either double-coated mirrors or mirrors with a copper-free silver coating, retaining below is needed to verify compliance with such requirements.

Mirrors: Include description of materials and process used to produce each type of silvered flat glass mirror specified that indicates sources of glass, glass coating components, edge sealer, and quality-control provisions.

Include manufacturer’s installation instructions.

* + - * 1. Sustainable Design Submittals:
				2. Shop Drawings: Include mirror elevations, edge details, mirror hardware, and attachment details.
				3. Samples: For each type of the following:

Mirrors: 12 inches square, including edge treatment on two adjoining edges.

Mirror Clips: Full size.

Mirror Trim: 12 inches long.

* + - * 1. Quality Control Submittals:

Qualification Data: For Installer.

Retain "Product Certificates" paragraph below to require submittal of product certificates from manufacturers.

Product Certificates: For each type of mirror[**and mirror mastic**].

Retain "Preconstruction Test Reports" paragraph below if mirror mastics are specified for installation of mirrors.

Preconstruction Test Reports: From mirror manufacturer indicating that mirror mastic was tested for compatibility and adhesion with mirror backing and substrates on which mirrors are installed.

Sample Warranty: For special warranty.

* + - * 1. Contract Closeout Submittals:

Maintenance Data: For mirrors to include in maintenance manuals.

* + - 1. QUALITY ASSURANCE

Usually delete "Installer Qualifications" paragraph below. If retaining, verify with prospective installers that they can comply with certification requirements referenced.

* + - * 1. Installer Qualifications: A qualified Installer, who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
			1. PRECONSTRUCTION TESTING

Retain this article if adhesive applications of mirrors is required.

* + - * 1. Preconstruction Mirror Mastic Compatibility Test: Submit mirror mastic products to mirror manufacturer for testing to determine compatibility of mastic with mirror backing.

Retain subparagraph below if previous testing is acceptable.

Testing is not required if data are submitted based on previous testing of mirror mastic products and mirror backing matching those submitted.

* + - 1. DELIVERY, STORAGE, AND HANDLING
				1. Protect mirrors in accordance with mirror manufacturer's written instructions and as needed to prevent damage to mirrors from moisture, condensation, temperature changes, direct exposure to sun, or other causes.
				2. Comply with mirror manufacturer's written instructions for shipping, storing, and handling mirrors as needed to prevent deterioration of silvering, damage to edges, and abrasion of glass surfaces and applied coatings. Store indoors.
			2. FIELD CONDITIONS
				1. Environmental Limitations: Do not install mirrors until ambient temperature and humidity conditions are maintained at levels indicated for final occupancy.
			3. WARRANTY

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

* + - * 1. Special Warranty: Manufacturer agrees to replace mirrors that deteriorate within specified warranty period. Deterioration of mirrors is defined as defects developed from normal use that are not attributed to mirror breakage or to maintaining and cleaning mirrors contrary to manufacturer's written instructions. Defects include discoloration, black spots, and clouding of the silver film.

Before retaining requirement that warranty begins on date of Substantial Completion, verify available warranties and warranty periods. Manufacturers offer standard warranties for mirrors that begin on date of manufacture, which is typically stamped on back of mirror.

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

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

Some of the manufacturers listed may offer mirrors only in stock sheets for fabrication into cut sizes, while others provide both stock sheets and cut sizes.

* + - * 1. Source Limitations for Mirrors: Obtain mirrors from single source from single manufacturer.
				2. Source Limitations for Mirror Accessories: Obtain mirror-glazing accessories from single source.
			1. SILVERED FLAT GLASS MIRRORS

Retaining option in "Mirrors, General" paragraph below may limit available products. See the Evaluations.

* + - * 1. Mirrors, General: ASTM C1503[**; manufactured using copper-free, low-lead mirror coating process**].

Mirror Select Quality grade may be available only for clear mirrors, 6 mm thick.

* + - * 1. Annealed Monolithic Glass Mirrors: Mirror [**Select**] [**Glazing**] Quality, [**clear**] [**low-iron (low-iron) float glass with a minimum 91 percent visible light transmission**] [**tinted**].

See ASTM C1503 for intended use recommendations based on thickness.

Nominal Thickness: [**3.0 mm**] [**4.0 mm**] [**5.0 mm**] [**6.0 mm**] [**As indicated**] <**Insert thickness**>.

Before specifying color in "Tint Color" subparagraph below, verify availability with manufacturers.

Tint Color: [**Blue**] [**Black**] [**Bronze**] [**Gold**] [**Gray**] [**Green**] [**Peach**] [**Pink**] <**Insert color**>.

See the Evaluations for discussion on effect of tempering on mirror distortion.

* + - * 1. Tempered Glass Mirrors: Mirror Glazing Quality for blemish requirements and complying with ASTM C1048 for Kind FT, Condition A, tempered float glass before silver coating is applied; [**clear**] [**tinted**].

Nominal Thickness: [**3.0 mm**] [**4.0 mm**] [**5.0 mm**] [**6.0 mm**] [**As indicated**] <**Insert thickness**>.

Before specifying color in "Tint Color" subparagraph below, verify availability with manufacturers.

Tint Color: [**Blue**] [**Black**] [**Bronze**] [**Gold**] [**Gray**] [**Green**] [**Peach**] [**Pink**] <**Insert color**>.

* + - * 1. Laminated Mirrors: ASTM C1172, Type II.

Mirror Select Quality grade may be available only in clear glass, 6 mm thick. Revise "Glass for Outer Lite" subparagraph below if tempered glass is required to suit Project, and verify availability with manufacturers.

Glass for Outer Lite: Annealed float glass, Mirror [**Select**] [**Glazing**] Quality, [**clear**] [**low-iron (low-iron) float glass with a minimum 91 percent visible light transmission**] [**tinted**].

Tint Color: [**Blue**] [**Black**] [**Bronze**] [**Gold**] [**Gray**] [**Green**] [**Peach**] [**Pink**] <**Insert color**>.

Nominal Thickness for Outer Lite: [**3.0 mm**] [**4.0 mm**] [**5.0 mm**] [**6.0 mm**] [**As indicated**] <**Insert thickness**>.

Glass for Inner Lite: [**Annealed float glass; ASTM C1036, Type I (transparent flat glass), Quality-Q3; Class 1 (clear)**] [**Heat-strengthened float glass; ASTM C1048, Type I; Quality-Q3; Class I (clear) Kind HS, Condition A**] [**Tempered float glass; ASTM C1048, Type I; Quality-Q3; Class I (clear), Kind FT, Condition A**].

Nominal Thickness: [**3.0 mm**] [**4.0 mm**] [**5.0 mm**] [**6.0 mm**] [**As indicated**] <**Insert thickness**>.

Interlayer: Mirror manufacturer's standard 0.030-inch-thick, clear polyvinyl-butyral interlayer with a proven record of showing no tendency to delaminate from, or cause damage to, silver coating.

Retain "Safety Glazing Products" paragraph below if mirrors required for Project need safety glass.

* + - * 1. Safety Glazing Products: For [**film-backed**] [**laminated**] [**tempered**] mirrors, provide products that comply with 16 CFR 1201, Category II.
			1. MISCELLANEOUS MATERIALS
				1. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.
				2. Edge Sealer: Coating compatible with glass coating and approved by mirror manufacturer for use in protecting against silver deterioration at mirrored glass edges.

National Glass Association (NGA) recommends that where mastic is used to position mirrors initially on a surface, mechanical devices should also be used. Various mastic products are available. Retain names of manufacturers only after verifying, with both mirror and mastic manufacturer, that mastics proposed for use are compatible with mirror's protective coating and substrates on which mirror will be installed.

* + - * 1. Mirror Mastic: An adhesive setting compound, asbestos-free, produced specifically for setting mirrors and certified by both mirror and mastic manufacturer as compatible with glass coating and substrates on which mirrors will be installed.
				2. Film Backing for Safety Mirrors: Film backing and pressure-sensitive adhesive; both compatible with mirror backing paint as certified by mirror manufacturer.
			1. MIRROR HARDWARE
				1. Aluminum J-Channels: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.

"Aluminum J Channel Bottom( and Side) Trim" and "Aluminum J Channel Top Trim" subparagraphs below are examples of product descriptions. As an alternative, delete descriptions and insert product designations and manufacturers' names. For mirrored walls that consist of at least three sections of mirror, side channels are often used at the ends of the wall; do not retain option in first subparagraph below for single- and two-section mirrors.

Aluminum J Channel Bottom[**and Side**] Trim: J-channels formed with front leg and back leg not less than 3/8 and 7/8 inch in height, respectively, and a thickness of not less than 0.04 inch.

Aluminum J Channel Top Trim: J-channels formed with front leg and back leg not less than 5/8 and 1 inch in height, respectively, and a thickness of not less than 0.04 inch.

Finish: [**Clear**] [**Gold**] bright anodized.

* + - * 1. Aluminum J-Channels and Cleat: Aluminum extrusions with a return deep enough to produce a glazing channel to accommodate mirrors of thickness indicated and in lengths required to cover edges of mirrors in a single piece.

Products described in "Aluminum J Channel and Cleat, Bottom( and Side) Trim" and "Aluminum J Channel and Cleat, Top Trim" subparagraphs below do not require a gap between top edge of mirror and web of J-channel. For mirrored walls that consist of at least three sections of mirror, side channels are often used at the ends of the wall; do not retain option in first subparagraph below for single- and two-section mirrors.

Aluminum J Channel and Cleat, Bottom[**and Side**] Trim: J-channels formed with front leg and back leg not less than 5/16 and 3/4 inch in height, respectively.

Aluminum J Channel and Cleat, Top Trim: Formed with front leg with a height matching bottom trim and back leg designed to fit into the pocket created by wall-mounted aluminum cleat.

Finish: [**Clear**] [**Gold**] bright anodized.

* + - * 1. Mirror Bottom Clips: [**As indicated**] <**Insert description and finish or product designation and manufacturer's name**>.
				2. Mirror Top Clips: [**As indicated**] <**Insert description and finish or product designation and manufacturer's name**>.
				3. Plated Steel Hardware: Formed-steel shapes with plated finish indicated.

Profile: As indicated.

Finish: <**Insert manufacturer's finish designation and name**>.

* + - * 1. Fasteners: Fabricated of same basic metal and alloy as fastened metal and matching it in finished color and texture where fasteners are exposed.
				2. Anchors and Inserts: Provide devices as required for mirror hardware installation. Provide toothed or lead-shield, expansion-bolt devices for drilled-in-place anchors. Provide galvanized anchors and inserts for applications on inside face of exterior walls and where indicated.
			1. FABRICATION
				1. Shop fabricate mirrors to greatest extent possible.
				2. Fabricate cutouts for notches and holes in mirrors without marring visible surfaces. Locate and size cutouts, so they fit closely around penetrations in mirrors.

Retain "Mirror Edge Treatment" paragraph below for mirrors with exposed edges. According to NGA, un-edged mirrors should never be used where the edges are exposed. Below does not apply to tempered glass mirrors.

* + - * 1. Mirror Edge Treatment: [**Flat polished**] [**Rounded polished**] [**Flat high polished**] [**Rounded high polished**] [**Beveled polished edge of width shown**].

Seal edges of mirrors with edge sealer after edge treatment to prevent chemical or atmospheric penetration of glass coating.

Retain subparagraph below if cutting to size and edge treatment must be performed in factory. Verify availability because not all manufacturers perform this.

Require mirror manufacturer to perform edge treatment and sealing in factory immediately after cutting to final sizes.

Glass in "Film-Backed Safety Mirrors" paragraph below is an alternative to laminated units for door and wall applications where back is concealed.

* + - * 1. Film-Backed Safety Mirrors: Apply film backing with adhesive coating over mirror backing paint, as recommended in writing by film-backing manufacturer, to produce a surface free of bubbles, blisters, and other imperfections.
1. EXECUTION
	* + 1. EXAMINATION
				1. Examine substrates, over which mirrors are to be mounted, with Installer present, for compliance with installation tolerances, substrate preparation, and other conditions affecting performance of the Work.
				2. Verify compatibility with and suitability of substrates, including compatibility of existing finishes or primers with mirror mastic.
				3. Proceed with installation only after unsatisfactory conditions have been corrected and surfaces are dry.
			2. PREPARATION

Retain this article for mastic installations.

* + - * 1. Comply with mastic manufacturer's written installation instructions for preparation of substrates, including coating substrates with mastic manufacturer's special bond coating where applicable.
			1. INSTALLATION
				1. General: Install mirrors to comply with mirror manufacturer's written instructions and with referenced National Glass Association (NGA) publications. Mount mirrors accurately in place in a manner that avoids distorting reflected images.

NGA Publications: [**"Laminated Glazing Reference Manual,"**]"Glazing Manual" and "Installation Techniques Designed to Prolong the Life of Flat Glass Mirrors."

* + - * 1. Provide a minimum airspace of 1/8 inch between back of mirrors and mounting surface for air circulation between back of mirrors and face of mounting surface.

Where mastic applications are specified, NGA recommends using mirror hardware, with or without mastic, to support mirror weight at bottom edge and to prevent mirror at top edge from coming away from wall.

* + - * 1. Install mirrors with [**mastic and**]mirror hardware. Attach mirror hardware securely to mounting surfaces with mechanical fasteners installed with anchors or inserts as applicable. Install fasteners so heads do not impose point loads on backs of mirrors.

Retain "Aluminum J-Channels," "Aluminum J-Channels and Cleat," and "Mirror Clips" subparagraphs below to comply with products specified in "Mirror Hardware" Article.

Aluminum J-Channels: Provide setting blocks 1/8 inch thick by 4 inches long at quarter points. To prevent trapping water, provide, between setting blocks, two slotted weeps not less than 1/4 inch wide by 3/8 inch long at bottom channel.

Retain "Aluminum J-Channels and Cleat" or "Mirror Clips" subparagraph below if applicable.

Aluminum J-Channels and Cleat: Fasten J-channel directly to wall and attach top trim to continuous cleat fastened directly to wall.

Mirror Clips: Place a felt or plastic pad between mirror and each clip to prevent spalling of mirror edges. Locate clips [**where indicated**] [**so they are symmetrically placed and evenly spaced**].

Retain subparagraph below if mirrors are to be installed with mastic.

Install mastic as follows:

Apply barrier coat to mirror backing where approved in writing by manufacturers of mirrors and backing material.

Apply mastic to comply with mastic manufacturer's written instructions for coverage and to allow air circulation between back of mirrors and face of mounting surface.

After mastic is applied, align mirrors and press into place while maintaining a minimum airspace of 1/8 inch between back of mirrors and mounting surface.

* + - 1. CLEANING AND PROTECTION
				1. Protect mirrors from breakage and contaminating substances resulting from construction operations.
				2. Do not permit edges of mirrors to be exposed to standing water.
				3. Maintain environmental conditions that prevent mirrors from being exposed to moisture from condensation or other sources for continuous periods of time.

END OF SECTION 088300