

SECTION 323119 - DECORATIVE METAL FENCES AND GATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

A. Section Includes:

1. Decorative metallic-coated steel tubular picket fences.
2. Decorative metallic-coated steel wire fences.
3. Decorative metallic-coated steel security fences.
4. Decorative steel fences.
5. Decorative aluminum fences.
6. Swing gates.
7. Horizontal-slide gates.
8. Gate operators, including controls.

B. Related Sections:

1. Division 03 Section "[**Cast-in-Place Concrete**] [**Miscellaneous Cast-in-Place Concrete**]" for concrete [**bases for gate operators, drives, and controls**] [**post concrete fill**].
2. Division 26 Sections for electrical service and connections for motor operators, controls, limit and disconnect switches, and safety features and for system disconnect switches.
3. Division 31 Section "Earth Moving" for site excavation, fill, and backfill where decorative metal fences and gates are located.

1.3 PERFORMANCE REQUIREMENTS

- A. Lightning-Protection System: Maximum grounding-resistance value of 25 ohms under normal dry conditions.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For gates. Include plans, elevations, sections, details, and attachments to other work.
 1. Wiring Diagrams: For power, signal, and control wiring.

- C. Samples: For each fence material and for each color specified.
 - 1. Provide Samples [**12 inches (300 mm)**] <Insert size> in length for linear materials.
 - 2. Provide Samples [**12 inches (300 mm)**] <Insert size> square for [**wire mesh**] [**bar grating**] [**and**] [**sheet or plate materials**].
- D. Welding certificates.
- E. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for decorative metallic-coated steel tubular picket fences, including finish, indicating compliance with referenced standard[**and other specified requirements**].
- F. Maintenance Data: For gate operators to include in maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. Welding Qualifications: Qualify procedures and personnel according to [**AWS D1.1/D1.1M, "Structural Welding Code - Steel**] [**AWS D1.2/D1.2M, "Structural Welding Code - Aluminum**]."
- C. 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.
- D. UL Standard: Provide gate operators that comply with UL 325.
- E. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators on gates that must provide emergency access.
- F. Mockups: Build mockups to [**verify selections made under sample submittals and to demonstrate aesthetic effects**] [**and**] [**set quality standards for fabrication and installation**].
 - 1. Include [**10-foot (3-m)**] <Insert measurement> length of fence complying with requirements.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.
- G. Preinstallation Conference: Conduct conference at [**Project site**] <Insert location>.

PART 2 - PRODUCTS

2.1 ALUMINUM

- A. Aluminum, General: Provide alloys and tempers with not less than the strength and durability properties of alloy and temper designated in paragraphs below for each aluminum form required.
- B. Extrusions: **ASTM B 221 (ASTM B 221M)**, Alloy 6063-T5.

- C. Tubing: ASTM B 429, Alloy 6063-T6.
- D. Plate and Sheet: **ASTM B 209** (**ASTM B 209M**), Alloy 6061-T6.
- E. Die and Hand Forgings: **ASTM B 247** (**ASTM B 247M**), Alloy 6061-T6.
- F. Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

2.2 STEEL AND IRON

- A. Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Bars (Pickets): Hot-rolled, carbon steel complying with ASTM A 29/A 29M, Grade 1010.
- C. Tubing: ASTM A 500, cold formed steel tubing.
- D. Bar Grating: NAAMM MBG 531.
 - 1. Bars: Hot-rolled steel strip, ASTM A 1011/A 1011M, Commercial Steel, Type B.
 - 2. Wire Rods: **ASTM A 510** (**ASTM A 510M**).
- E. Uncoated Steel Sheet: [**Hot-rolled steel sheet, ASTM A 1011/A 1011M, Structural Steel, Grade 45 (Grade 310)**] [or] [**cold-rolled steel sheet, ASTM A 1008/A 1008M, Structural Steel, Grade 50 (Grade 340)**].
- F. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, **Grade 50 (Grade 340)**, with [**G90 (Z275)**] [**G60 (Z180)**] coating.
- G. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, **Grade 50 (Grade 340)**, with **AZ60 (AZM180)** coating.
- H. Castings: Either gray or malleable iron unless otherwise indicated.
 - 1. Gray Iron: ASTM A 48/A 48M, Class 30.
 - 2. Malleable Iron: ASTM A 47/A 47M.

2.3 COATING MATERIALS

- A. Shop Primers for Steel: Provide primers that comply with [**Division 09 Section "Exterior Painting."**] [**Division 09 Section "High-Performance Coatings."**]
- B. Epoxy Zinc-Rich Primer for Steel: Complying with MPI #20 and compatible with coating specified to be applied over it.
 - 1. Products: Subject to compliance with requirements, [**provide the following**] [**provide one of the following**] [**available products that may be incorporated into the Work include, but are not limited to, the following**]:
 - a. **<Insert manufacturer's name; product name or designation>**.

2. Use primer with a VOC content of [420 g/L] [400 g/L] [340 g/L] <Insert VOC limit> or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- C. Epoxy Primer for Galvanized Steel: Complying with MPI #101 and compatible with coating specified to be applied over it.
1. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert manufacturer's name; product name or designation>.
 2. Use primer with a VOC content of [420 g/L] [400 g/L] [300 g/L] <Insert VOC limit> or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- D. Epoxy Intermediate Coat: Complying with MPI #77 and compatible with primer and topcoat.
1. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert manufacturer's name; product name or designation>.
 2. Use product with a VOC content of [420 g/L] [400 g/L] [250 g/L] <Insert VOC limit> or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- E. Polyurethane Topcoat: Complying with MPI #72 and compatible with undercoat.
1. Products: Subject to compliance with requirements, [provide the following] [provide one of the following] [available products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. <Insert manufacturer's name; product name or designation>.
 2. Use product with a VOC content of [420 g/L] [400 g/L] [250 g/L] <Insert VOC limit> or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
1. For aluminum, provide type and alloy as recommended by producer of metal to be welded and as required for strength and compatibility in fabricated items.
- B. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Division 03 Section "Cast-in-Place Concrete" with a minimum 28-day compressive strength of 3000 psi (20 MPa), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum aggregate size[or dry, packaged, normal-weight concrete mix complying with ASTM C 387 mixed with potable water according to manufacturer's written instructions].

- C. Nonshrink Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107 and specifically recommended by manufacturer for exterior applications.

2.5 GROUNDING MATERIALS

- A. Grounding Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.
 - 1. Material above Finished Grade: [**Copper**] [**Aluminum**].
 - 2. Material on or below Finished Grade: Copper.
 - 3. Bonding Jumpers: Braided copper tape, **1 inch (25 mm)** wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.
- B. Grounding Connectors and Grounding Rods: Comply with UL 467.
 - 1. Connectors for Below-Grade Use: Exothermic-welded type.
 - 2. Grounding Rods: Copper-clad steel.
 - a. Size: **5/8 by 96 inches (16 by 2440 mm)**.

2.6 DECORATIVE METALLIC-COATED STEEL TUBULAR PICKET FENCES

- A. Decorative Metallic-Coated Steel Tubular Picket Fences: Comply with ASTM F 2408, for [**residential**] [**light industrial (commercial)**] [**industrial**] application (class) unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] **<Insert manufacturer's name; product name or designation>** or comparable product by one of the following:
 - a. Ameristar Fence Products.
 - b. Fortress Iron; a division of Woodmark International, LP.
 - c. Iron Eagle Industries, Inc.
 - d. Master Halco.
 - e. Merchants Metals; a division of MMI Products, Inc.
 - f. Payne Fence Products; a division of Payne Metal Works, Inc.
 - g. Xcel Fence.
 - h. **<Insert manufacturer's name>**.
- B. Metallic-Coated Steel Sheet: Galvanized-steel sheet or aluminum-zinc alloy-coated steel sheet.
- C. Interior surface of tubes formed from uncoated steel sheet shall be [**hot-dip zinc coated same as exterior**] [**or**] [**coated with zinc-rich thermosetting coating to comply with ASTM F 2408**].
- D. Posts:

1. End and Corner Posts: Square tubes [2-1/2 by 2-1/2 inches (64 by 64 mm)] [3 by 3 inches (76 by 76 mm)] formed from 0.108-inch (2.74-mm) nominal-thickness, metallic-coated steel sheet or formed from 0.105-inch (2.66-mm) nominal-thickness steel sheet and hot-dip galvanized after fabrication.
 2. Swing Gate Posts: Square tubes 3 by 3 inches (76 by 76 mm) formed from 0.108-inch (2.74-mm) nominal-thickness, metallic-coated steel sheet or formed from 0.105-inch (2.66-mm) nominal-thickness steel sheet and hot-dip galvanized after fabrication.
 3. Swing Gate Posts: Square steel tubing [3 by 3 inches (76 by 76 mm)] [4 by 4 inches (102 by 102 mm)] <Insert size> with [3/16-inch (4.76-mm)] <Insert thickness> wall thickness, hot-dip galvanized.
 4. Horizontal-Slide Gate Post, Openings up to 12 Feet (3.7 m): Square steel tubing [3 by 3 inches (76 by 76 mm)] [4 by 4 inches (102 by 102 mm)] <Insert size> with [3/16-inch (4.76-mm)] <Insert thickness> wall thickness, hot-dip galvanized.
 5. Horizontal-Slide Gate Post, Openings Wider Than 12 Feet (3.7 m): Square steel tubing 4 by 4 inches (102 by 102 mm) with [3/16-inch (4.76-mm)] <Insert thickness> wall thickness, hot-dip galvanized.
 6. Guide Posts for Class 1 Horizontal-Slide Gates: Square tubes 3 by 3 inches (76 by 76 mm) formed from 0.108-inch (2.74-mm) nominal-thickness, metallic-coated steel sheet or formed from 0.105-inch (2.66-mm) nominal-thickness steel sheet and hot-dip galvanized after fabrication; installed adjacent to gate post to permit gate to slide in space between.
 7. Guide Posts for Class 1 Horizontal-Slide Gates: Square steel tubing [3 by 3 inches (76 by 76 mm)] [4 by 4 inches (102 by 102 mm)] <Insert size> with [3/16-inch (4.76-mm)] <Insert thickness> wall thickness, hot-dip galvanized; installed adjacent to gate post to permit gate to slide in space between.
- E. Post Caps: [Formed from steel sheet and hot-dip galvanized after forming] [UV-resistant plastic] [Aluminum castings] [Aluminum castings with round ball finials].
- F. Rails: [Square tubes] [Double-wall channels].
1. Size: [1-1/2 by 1-1/2 inches (38 by 38 mm)] [1-3/4 by 1-3/4 inches (45 by 45 mm)].
 2. Metal and Thickness: 0.079-inch (2.01-mm) nominal-thickness, metallic-coated steel sheet or 0.075-inch (1.90-mm) nominal-thickness, uncoated steel sheet, hot-dip galvanized after fabrication.
- G. Pickets: Square tubes.
1. [Terminate tops of pickets at top rail for flush top appearance] [Extend pickets beyond top rail as indicated and terminate with UV-resistant plastic caps] [Extend pickets beyond top rail as indicated and terminate with galvanized-steel caps] [Extend pickets beyond top rail as indicated and press flat and trim to produce spear point shape].
 2. Picket Spacing: [6 inches (152.4 mm)] [4 inches (101.6 mm)] [1-3/4 inches (44 mm)] <Insert spacing> clear, maximum.
- H. Fasteners: Manufacturer's standard concealed fastening system.
- I. Fasteners: Manufacturer's standard [tamperproof,]corrosion-resistant, color-coated fasteners matching fence components[with resilient polymer washers].

- J. Galvanizing: For components indicated to be galvanized and for which galvanized coating is not specified in ASTM F 2408, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- K. Finish: [**Organic coating complying with requirements in ASTM F 2408**] [**Powder coating**].

2.7 DECORATIVE METALLIC-COATED STEEL WIRE FENCES

- A. Decorative Metallic-Coated Steel Wire Fences:
 - 1. Manufacturers: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 - 2. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
 - a. Ametco Manufacturing Corporation.
 - b. Jerith Manufacturing Company, Inc.
 - c. Master Halco.
 - d. Merchants Metals; a division of MMI Products, Inc.
 - e. <Insert manufacturer's name>.
- B. Metallic-Coated Steel Wire: Welded-wire fence fabric, hot-dip galvanized after fabrication. Weight of zinc coating shall be not less than 1.0 oz./sq. ft. (305 g/sq. m).
 - 1. Spacing of Vertical Wires: [**1-3/4 inches (44 mm)**] [**2 inches (51 mm)**] [**3-1/2 inches (89 mm)**] [**4 inches (102 mm)**] [As indicated] <Insert spacing>.
 - 2. Vertical Wire Size: [**0.187 inch (4.76 mm)**] [**0.192 inch (4.88 mm)**] [**0.225 inch (5.72 mm)**] [**0.25 inch (6.35 mm)**] [**0.262 inch (6.67 mm)**] <Insert size>.
 - 3. Spacing of Horizontal Wires: [**1-3/4 inches (44 mm)**] [**2 inches (51 mm)**] [**4 inches (102 mm)**] [**8 inches (203 mm)**] [As indicated] <Insert spacing>.
 - 4. Horizontal Wire Size: [**0.187 inch (4.76 mm)**] [**0.192 inch (4.88 mm)**] [**0.225 inch (5.72 mm)**] [**0.25 inch (6.35 mm)**] [**0.312 inch (7.94 mm)**] <Insert size>.
- C. Metallic-Coated Steel Sheet: Galvanized-steel sheet or aluminum-zinc alloy-coated steel sheet.
- D. Interior surface of tubes formed from uncoated steel sheet shall be [**hot-dip zinc coated same as exterior**] [or] [**coated with zinc-rich thermosetting coating to comply with ASTM F 2408**].
- E. Posts:
 - 1. Line Posts: Square tubes [**2 by 2 inches (50 by 50 mm)**] [**2-1/2 by 2-1/2 inches (64 by 64 mm)**] [**3 by 3 inches (76 by 76 mm)**] formed from [**0.064-inch (1.63-mm)**] [**0.079-inch (2.01-mm)**] [**0.108-inch (2.74-mm)**] nominal-thickness, metallic-coated steel sheet or formed from [**0.060-inch (1.52-mm)**] [**0.075-inch (1.90-mm)**] [**0.105-inch (2.66-mm)**] nominal-thickness steel sheet and hot-dip galvanized after fabrication.

2. End and Corner Posts: Square tubes **[2-1/2 by 2-1/2 inches (64 by 64 mm)] [3 by 3 inches (76 by 76 mm)]** formed from **0.108-inch (2.74-mm)** nominal-thickness, metallic-coated steel sheet or formed from **0.105-inch (2.66-mm)** nominal-thickness steel sheet and hot-dip galvanized after fabrication.
 3. Swing Gate Posts: Square tubes **3 by 3 inches (76 by 76 mm)** formed from **0.108-inch (2.74-mm)** nominal-thickness, metallic-coated steel sheet or formed from **0.105-inch (2.66-mm)** nominal-thickness steel sheet and hot-dip galvanized after fabrication.
 4. Swing Gate Posts: Square steel tubing **[3 by 3 inches (76 by 76 mm)] [4 by 4 inches (102 by 102 mm)]** **<Insert size>** with **[3/16-inch (4.76-mm)] <Insert thickness>** wall thickness, hot-dip galvanized.
 5. Horizontal-Slide Gate Post, Openings up to **12 Feet (3.7 m)**: Square steel tubing **[3 by 3 inches (76 by 76 mm)] [4 by 4 inches (102 by 102 mm)]** **<Insert size>** with **[3/16-inch (4.76-mm)] <Insert thickness>** wall thickness, hot-dip galvanized.
 6. Horizontal-Slide Gate Post, Openings Wider Than **12 Feet (3.7 m)**: Square steel tubing **4 by 4 inches (102 by 102 mm)** with **[3/16-inch (4.76-mm)] <Insert thickness>** wall thickness, hot-dip galvanized.
 7. Guide Posts for Class 1 Horizontal-Slide Gates: Square tubes **3 by 3 inches (76 by 76 mm)** formed from **0.108-inch (2.74-mm)** nominal-thickness, metallic-coated steel sheet or formed from **0.105-inch (2.66-mm)** nominal-thickness steel sheet and hot-dip galvanized after fabrication; installed adjacent to gate post to permit gate to slide in space between.
 8. Guide Posts for Class 1 Horizontal-Slide Gates: Square steel tubing **[3 by 3 inches (76 by 76 mm)] [4 by 4 inches (102 by 102 mm)]** **<Insert size>** with **[3/16-inch (4.76-mm)] <Insert thickness>** wall thickness, hot-dip galvanized; installed adjacent to gate post to permit gate to slide in space between.
- F. Post Caps: **[Formed from steel sheet and hot-dip galvanized after forming] [UV-resistant plastic] [Aluminum castings] [Aluminum castings with round ball finials]**.
- G. Rails: Square tubes.
1. Size: **[1-3/16 by 1-1/2 inches (30 by 38 mm)] [1-3/8 by 1-1/2 inches (35 by 38 mm) or 1-1/2 by 1-1/2 inches (38 by 38 mm)]**.
 2. Metal and Thickness: **[0.064-inch (1.63-mm)] [0.079-inch (2.01-mm)]** nominal-thickness, metallic-coated steel sheet or **[0.060-inch (1.52-mm)] [0.075-inch (1.90-mm)]** nominal-thickness, uncoated steel sheet, hot-dip galvanized after fabrication.
- H. Fasteners: Manufacturer's standard **[tamperproof]**, corrosion-resistant, color-coated fasteners matching fence components **[with resilient polymer washers or clips]**.
- I. Galvanizing: For components indicated to be galvanized and for which galvanized coating is not specified, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- J. Finish: **[Organic coating complying with requirements in ASTM F 2408] [Powder coating]**.
- 2.8 DECORATIVE METALLIC-COATED STEEL SECURITY FENCES
- A. Decorative Metallic-Coated Steel Security Fences:

1. Product: Subject to compliance with requirements, provide Impasse by Ameristar Fence Products.
 - B. Posts: **1-3/4-by-4-inch (45-by-102-mm)** double-thickness, I-shaped sections.
 1. Metal and Thickness: **0.108-inch (2.74-mm)** nominal-thickness, metallic-coated steel sheet or **0.105-inch (2.66-mm)** nominal-thickness, uncoated steel sheet, hot-dip galvanized after fabrication.
 - C. Post Caps: Aluminum castings.
 - D. Rails: **2-by-2-1/2-inch (50-by-64-mm)** pentagon-shaped box channel designed to shed water and to enclose wire rope reinforcement.
 1. Metal and Thickness: **0.108-inch (2.74-mm)** nominal-thickness, metallic-coated steel sheet or **0.105-inch (2.66-mm)** nominal-thickness, uncoated steel sheet, hot-dip galvanized after fabrication.
 2. Wire Rope Reinforcement: **3/4-inch (19-mm)** zinc-coated steel wire rope.
 - E. Pickets: **3/4-by-2-3/4-inch (19-by-70-mm)** M-shaped pales.
 1. Metal and Thickness: **0.079-inch (2.01-mm)** nominal-thickness, metallic-coated steel sheet or **0.075-inch (1.90-mm)** nominal-thickness, uncoated steel sheet, hot-dip galvanized after fabrication.
 2. Extend pickets beyond top rail as indicated and [**terminate with rounded edge**] [**cut and split to form three points**].
 3. Picket Spacing: **6 inches (152.4 mm)** o.c.
 - F. Fasteners: Stainless-steel carriage bolts with tamperproof nuts.
 - G. Galvanizing: For components indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M unless otherwise indicated. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
 - H. Finish: Powder coating.
- 2.9 DECORATIVE STEEL FENCES
- A. Decorative Steel Fences: Fences made from steel tubing[**bars**] and shapes[, **hot-dip galvanized**].
 1. Manufacturers: Subject to compliance with requirements, [**provide products by one of the following**] [**available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following**]:
 2. Basis-of-Design Product: Subject to compliance with requirements, provide [**product indicated on Drawings**] <**Insert manufacturer's name; product name or designation**> or comparable product by one of the following:
 - a. A & T Iron Works, Inc.
 - b. Ametco Manufacturing Corporation.

- c. BarnettBates Corporation.
 - d. <Insert manufacturer's name>.
- B. Posts: Square steel tubing.
1. Line Posts: [2 by 2 inches (50 by 50 mm)] [2-1/2 by 2-1/2 inches (64 by 64 mm)] [3 by 3 inches (76 by 76 mm)] <Insert size> with [1/8-inch (3.2-mm)] [3/16-inch (4.76-mm)] <Insert thickness> wall thickness.
 2. End and Corner Posts: [2-1/2 by 2-1/2 inches (64 by 64 mm)] [3 by 3 inches (76 by 76 mm)] [4 by 4 inches (102 by 102 mm)] <Insert size> with [1/8-inch (3.2-mm)] [3/16-inch (4.76-mm)] <Insert thickness> wall thickness.
 3. Swing Gate Posts: [3 by 3 inches (76 by 76 mm)] [4 by 4 inches (102 by 102 mm)] <Insert size> with [3/16-inch (4.76-mm)] <Insert thickness> wall thickness.
 4. Horizontal-Slide Gate Post, Openings up to 12 Feet (3.7 m): [3 by 3 inches (76 by 76 mm)] [4 by 4 inches (102 by 102 mm)] <Insert size> with [3/16-inch (4.76-mm)] <Insert thickness> wall thickness.
 5. Horizontal-Slide Gate Post, Openings Wider Than 12 Feet (3.7 m): 4 by 4 inches (102 by 102 mm) with [3/16-inch (4.76-mm)] <Insert thickness> wall thickness.
 6. Guide Posts for Class 1 Horizontal-Slide Gates: [3 by 3 inches (76 by 76 mm)] [4 by 4 inches (102 by 102 mm)] <Insert size> with [3/16-inch (4.76-mm)] <Insert thickness> wall thickness; installed adjacent to gate post to permit gate to slide in space between.
- C. Post Caps: [Formed from steel sheet] [Formed from steel sheet and hot-dip galvanized after forming] [Aluminum castings] [Aluminum castings with round ball finials].
- D. Rails:
1. Steel Tube Rails: Square steel tubing [2 by 2 inches (50 by 50 mm)] [2-1/2 by 2-1/2 inches (64 by 64 mm)] <Insert size> with [1/8-inch (3.2-mm)] <Insert thickness> wall thickness.
 2. Steel Channel Rails: Steel channels [2 by 1 inch (50 by 25 mm)] [1-1/2 by 3/4 inch (38 by 19 mm)] [1-1/2 by 1/2 inch (38 by 13 mm)] <Insert size>.
- E. Pickets: [1/2-inch- (13-mm-) square steel bars] [3/4-inch- (19-mm-) square steel bars] [Decorative steel bars of pattern and size indicated] [5/8 inch (16 mm) square by 0.065-inch (1.65-mm) steel tubes] [5/8 inch (16 mm) square by 0.083-inch (2.11-mm) steel tubes] [3/4 inch (19 mm) square by 0.065-inch (1.65-mm) steel tubes] [3/4 inch (19 mm) square by 0.083-inch (2.11-mm) steel tubes] [1 inch (25 mm) square by 0.065-inch (1.65-mm) steel tubes] [1 inch (25 mm) square by 0.083-inch (2.11-mm) steel tubes].
1. [Terminate tops of pickets at top rail for flush top appearance] [Extend pickets beyond top rail as indicated and mill ends to pyramid shaped points] [Extend pickets beyond top rail as indicated and press flat and trim to produce spear point shape] [Extend pickets beyond top rail as indicated and cap with metal spear point finial] [Extend pickets beyond top rail as indicated and cap with metal tripoint finial].
 2. Picket Spacing: [6 inches (152.4 mm)] [4 inches (101.6 mm)] [1-3/4 inches (44 mm)] <Insert spacing> clear, maximum.
 3. Treillage: Provide iron castings of pattern indicated between each pair of pickets.
- F. Infill: Forge-welded steel bar grating.

1. Perimeter Bars: Steel flat bars [1 by 1/8 inch (25 by 3.2 mm)] <Insert size>.
 2. Vertical Main Bars: Steel flat bars [1 by 1/8 inch (25 by 3.2 mm)] [1-3/16 by 5/32 inch (30 by 4 mm)] <Insert size>.
 3. Vertical Main Bar Spacing: [1-21/32 inches (42 mm)] [1-7/8 inches (48 mm)] [2-7/16 inches (62 mm)] <Insert spacing> o.c.
 4. Horizontal Cross Rods: [3/16-inch- (4.8-mm-)] [1/4-inch- (6.4-mm-)] diameter, steel rods.
 5. Horizontal Cross Rod Spacing: [1-3/4 inches (45 mm)] [2-19/32 inches (66 mm)] [5-3/16 inches (132 mm)] <Insert spacing> o.c.
- G. Infill: Custom design as indicated on Drawings.
1. Bars: [1/2-inch- (12.7 -mm-) square steel bars] [3/4-inch- (19-mm-) square steel bars] [1/2-inch- (12.7 -mm-) diameter, round steel bars] [3/4-inch- (19-mm-) diameter, round steel bars] [1-by-1/8-inch (25-by-3.2-mm) steel flat bars] [1-by-1/4-inch (25-by-6.4-mm) steel flat bars] [1-by-1/2-inch (25-by-12.7 -mm) steel flat bars] [unless otherwise indicated].
 2. Square Tubes: Square steel tubing [2 by 2 inches (50 by 50 mm)] [2-1/2 by 2-1/2 inches (64 by 64 mm)] <Insert size> with [1/8-inch (3.2-mm)] <Insert thickness> wall thickness[unless otherwise indicated].
 3. Round Tubes: [1-inch- (25-mm-)] [1-1/2-inch- (38-mm-)] [2-inch- (50-mm-)] [2-1/2-inch- (64-mm-)] <Insert size> diameter, round steel tubing with [1/8-inch (3.2-mm)] <Insert thickness> wall thickness[unless otherwise indicated].
 4. Steel Plate: [1/8 inch (3.2 mm)] [3/16 inch (4.8 mm)] [1/4 inch (6.4 mm)] thick[unless otherwise indicated].
 5. Perforated Metal Sheet: Uncoated steel sheet, perforated as indicated, [0.060-inch (1.52-mm)] [0.075-inch (1.90-mm)] [0.105-inch (2.66-mm)] <Insert thickness> nominal thickness.
- H. Fasteners: Stainless-steel carriage bolts and [tamperproof]nuts.
- I. Fabrication: Assemble fences into sections by welding pickets to rails.
1. Fabricate sections with clips welded to rails for fastening to posts in field.
 2. Drill posts and clips for fasteners before finishing to maximum extent possible.
- J. Fabrication: Fabricate bar grating infill into sections of size indicated.
1. Fabricate rails with clips welded to rails for fastening to posts in field.
 2. Drill posts[, clips,] and bar grating for fasteners before finishing to maximum extent possible.
- K. Finish exposed welds to comply with NOMMA Guideline 1, [Finish #2 - completely sanded joint, some undercutting and pinholes okay] [Finish #3 - partially dressed weld with splatter removed] [Finish #4 - good-quality, uniform undressed weld with minimal splatter].
- L. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.

1. Hot-dip galvanize posts[**and rails**].
2. Hot-dip galvanize rail and picket assemblies after fabrication.
3. Hot-dip galvanize bar grating infill after fabrication.
4. Hot-dip galvanize custom-design rail and infill assemblies after fabrication.

M. Finish for Bar Grating Infill: Powder coating.

N. Finish for Steel Items[**Other than Bar Grating Infill**]: [Primed] [Shop painted] [High-performance coating].

O. Finish for Metallic-Coated Steel Items[**Other than Bar Grating Infill**]: [High-performance coating] [Galvanized finish].

2.10 DECORATIVE ALUMINUM FENCES

A. Decorative Aluminum Fences: Fences made from aluminum extrusions.

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
2. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:

- a. Alumi-Guard, Inc.
- b. Ameristar Fence Products.
- c. Carfaro, Inc.
- d. Delair Group, L.L.C.
- e. Elegant Aluminum Products, Inc.
- f. Elite Fence Products, Inc.
- g. Iron Eagle Industries, Inc.
- h. Japra Group International.
- i. Jerith Manufacturing Company, Inc.
- j. Master Halco.
- k. Merchants Metals; a division of MMI Products, Inc.
- l. Royal Aluminum and Steel, Inc.
- m. Specrail; a division of Porcelen LLC.
- n. <Insert manufacturer's name>.

B. Posts: Square extruded tubes.

1. Line Posts: [2 by 2 inches (50 by 50 mm)] [2-1/2 by 2-1/2 inches (64 by 64 mm)] [3 by 3 inches (76 by 76 mm)] <Insert size> with [0.062-inch (1.57-mm)] [0.080-inch (2.03-mm)] [0.093-inch (2.36-mm)] [0.100-inch (2.54-mm)] [0.125-inch (3.18-mm)] <Insert thickness> wall thickness.
2. End and Corner Posts: [2 by 2 inches (50 by 50 mm)] [2-1/2 by 2-1/2 inches (64 by 64 mm)] [3 by 3 inches (76 by 76 mm)] <Insert size> with [0.062-inch (1.57-mm)] [0.080-inch (2.03-mm)] [0.093-inch (2.36-mm)] [0.100-inch (2.54-mm)] [0.125-inch (3.18-mm)] <Insert thickness> wall thickness.

3. Swing Gate Posts: [2-1/2 by 2-1/2 inches (64 by 64 mm)] [3 by 3 inches (76 by 76 mm)] [4 by 4 inches (102 by 102 mm)] <Insert size> with [0.125-inch (3.18-mm)] [0.250-inch (6.35-mm)] <Insert thickness> wall thickness.
 4. Horizontal-Slide Gate Post, Openings up to 12 Feet (3.7 m): [2-1/2 by 2-1/2 inches (64 by 64 mm)] [3 by 3 inches (76 by 76 mm)] [4 by 4 inches (102 by 102 mm)] <Insert size> with [0.125-inch (3.18-mm)] [0.250-inch (6.35-mm)] <Insert thickness> wall thickness.
 5. Horizontal-Slide Gate Post, Openings Wider Than 12 Feet (3.7 m): [3 by 3 inches (76 by 76 mm)] [4 by 4 inches (102 by 102 mm)] [6 by 6 inches (152 by 152 mm)] <Insert size> with [0.125-inch (3.18-mm)] [0.250-inch (6.35-mm)] <Insert thickness> wall thickness.
 6. Guide Posts for Class 1 Horizontal-Slide Gates: [2 by 2 inches (50 by 50 mm)] [2-1/2 by 2-1/2 inches (64 by 64 mm)] [3 by 3 inches (76 by 76 mm)] <Insert size> with [0.062-inch (1.57-mm)] [0.093-inch (2.36-mm)] [0.125-inch (3.18-mm)] <Insert thickness> wall thickness; installed adjacent to gate post to permit gate to slide in space between.
- C. Post Caps: Aluminum castings that [cover entire top of posts] [project at least 1/4 inch (6 mm) beyond posts] [with round ball finial].
- D. Rails: Extruded-aluminum channels, [1-1/2 by 1-1/2 inches (38 by 38 mm), with 0.100-inch- (2.54-mm-) thick sidewalls and 0.070-inch- (1.78-mm-) thick top] [1 by 1-1/2 inches (25 by 38 mm), with 0.082-inch- (2.08-mm-) thick sidewalls and 0.055-inch- (1.40-mm-) thick top] [1-1/4 by 1-1/4 inches (32 by 32 mm), with 0.078-inch- (1.98-mm-) thick sidewalls and 0.062-inch- (1.57-mm-) thick top] [1 by 1 inch (25 by 25 mm), with 0.080-inch- (2.03-mm-) thick sidewalls and 0.055-inch- (1.40-mm-) thick top] [1 by 1 inch (25 by 25 mm), with 0.078-inch- (1.98-mm-) thick sidewalls and 0.062-inch- (1.57-mm-) thick top].
- E. Pickets: Extruded-aluminum tubes, [1 inch (25 mm) square, with 0.062-inch (1.57-mm) wall thickness] [1 inch (25 mm) square, with 0.060-inch (1.52-mm) wall thickness] [3/4 inch (19 mm) square, with 0.050-inch (1.27-mm) wall thickness] [1 by 5/8 inch (25 by 16 mm), with 0.050-inch (1.27-mm) wall thickness] [5/8 inch (16 mm) square, with 0.050-inch (1.27-mm) wall thickness].
1. [Terminate tops of pickets at top rail for flush top appearance] [Extend pickets beyond top rail as indicated and terminate with UV-resistant plastic caps] [Extend pickets beyond top rail as indicated and terminate with cast-aluminum caps] [Extend pickets beyond top rail as indicated and press flat and trim to produce spear point shape] [Extend pickets beyond top rail as indicated and terminate with cast-aluminum spear point finial] [Extend pickets beyond top rail as indicated and terminate with cast-aluminum tripoint finial].
 2. Picket Spacing: [6 inches (152.4 mm)] [4 inches (101.6 mm)] [1-3/4 inches (44 mm)] <Insert spacing> clear, maximum.
- F. Fasteners: Manufacturer's standard concealed fastening system.
- G. Fasteners: Manufacturer's standard [tamperproof,]corrosion-resistant, color-coated fasteners matching fence components[with resilient polymer washers].
- H. Fabrication: Assemble fences into sections by [welding] [fastening] pickets to rails.

1. Fabricate sections with clips welded to rails for fastening to posts in field.
 2. Drill clips for fasteners before finishing.
- I. Finish exposed welds to comply with NOMMA Guideline 1, [**Finish #2 - completely sanded joint, some undercutting and pinholes okay**] [**Finish #3 - partially dressed weld with splatter removed**] [**Finish #4 - good-quality, uniform undressed weld with minimal splatter**].
- J. Finish: Baked enamel or powder coating.
- 2.11 SWING GATES
- A. Gate Configuration: [**Single leaf**] [**Double leaf**] [**As indicated**].
- B. Gate Frame Height: [**72 inches (1830 mm)**] [**As indicated**] <Insert height>.
- C. Gate Opening Width: [**36 inches (914 mm)**] [**As indicated**] <Insert width>.
- D. Galvanized-Steel Frames and Bracing: Fabricate members from square tubes [**1-1/2 by 1-1/2 inches (38 by 38 mm)**] [**1-3/4 by 1-3/4 inches (45 by 45 mm)**] [**2 by 2 inches (50 by 50 mm)**] [**2-1/2 by 2-1/2 inches (64 by 64 mm)**] formed from **0.108-inch (2.74-mm)** nominal-thickness, metallic-coated steel sheet or formed from **0.105-inch (2.66-mm)** nominal-thickness steel sheet and hot-dip galvanized after fabrication.
- E. Steel Frames and Bracing: Fabricate members from square steel tubing [**1-1/2 by 1-1/2 inches (38 by 38 mm)**] [**2 by 2 inches (50 by 50 mm)**] [**2-1/2 by 2-1/2 inches (64 by 64 mm)**] <Insert size> with [**1/8-inch (3.2-mm)**] <Insert thickness> wall thickness. [**Hot-dip galvanize frames after fabrication.**]
- F. Aluminum Frames and Bracing: Fabricate members from square extruded-aluminum tubes [**1-1/2 by 1-1/2 inches (38 by 38 mm)**] [**2 by 2 inches (50 by 50 mm)**] [**2-1/2 by 2-1/2 inches (64 by 64 mm)**] <Insert size> with [**0.100-inch (2.54-mm)**] [**0.125-inch (3.18-mm)**] [**0.140-inch (3.56-mm)**] [**0.154-inch (3.91-mm)**] <Insert thickness> wall thickness.
- G. Frame Corner Construction: [**Welded**] [or] [**assembled with corner fittings**] [**and 5/16-inch (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider**].
- H. Additional Rails: Provide as indicated, complying with requirements for fence rails.
- I. Infill: Comply with requirements for adjacent fence.
- J. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.
1. Treillage: Provide iron castings of pattern indicated between each pair of pickets. Finish as specified for [**adjacent fence**] [**gates**].
- K. Hardware: Latches permitting operation from both sides of gate, hinges, and keepers for each gate leaf more than **5 feet (1.52 m)** wide. Provide [**center gate stops**] [**and**] [**cane bolts**] for pairs of gates. [**Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.**]

1. <Insert requirements for padlocks and chains if not Owner furnished>.
- L. Spring Hinges: BHMA A156.17, Grade 1, suitable for exterior use.
1. Function: [320 - Gate spring pivot hinge. Adjustable tension] [321 - Gate spring pivot hinge. Fixed tension].
 2. Material: Malleable iron.
- M. Hinges: BHMA A156.1, Grade 1, suitable for exterior use.
1. Function: 39 - Full surface, triple weight, antifriction bearing.
 2. Material: Wrought steel, forged steel, cast steel, or malleable iron.
- N. Rim Locks: BHMA A156.5, Grade 1, suitable for exterior use.
1. Function: [621 - Latchbolt by key from outside and by turn from inside. Latchbolt is held retracted by device from inside] [622 - Deadbolt by key from outside and by turn from inside] [629 - Deadlocking latchbolt by key from outside and by turn from inside] [626 - Interlocking deadbolt operated by key from either side] [627 - Interlocking deadbolt operated by key from outside and by turn from inside] <Insert function>.
 2. Material: Cast, forged, or extruded brass or bronze.
 3. Mounting Plate: Configuration necessary for mounting locks. Fabricate from 1/8-inch- (3.2-mm-) thick, [steel] [aluminum] plate.
- O. Mortise Locks: BHMA A156.13, Grade 1, suitable for exterior use.
1. Function: [F06 - Holdback lock] [F07 - Storeroom or closet lock] [F09 - Apartment, exit, or public toilet lock] [F16 - Double-cylinder dead lock] [F17 - Dead lock] <Insert function>.
 2. Material: Brass or bronze.
 3. Levers: Cast, forged, or extruded brass or bronze.
 4. Mounting Box: Configuration necessary to enclose locks. Fabricate from 1/8-inch- (3.2-mm-) thick, [steel] [aluminum] plate.
- P. Electric Strikes: BHMA A156.31, Grade 1, of configuration required for use with lock specified, fail [safe] [secure], and suitable for exterior use.
1. Mounting Plate: Configuration necessary for mounting electric strikes. Fabricate from 1/8-inch- (3.2-mm-) thick, [steel] [aluminum] plate.
 2. Mounting: Mortise into post.
- Q. Exit Hardware: BHMA A156.3, Grade 1, Type 1 (rim exit device), with push pad actuating bar, suitable for exterior use.
1. Function: [01 - Exit only, no trim or blank escutcheon] [04 - Entrance by trim when latch bolt is released by key or set in a retracted position by key] [08 - Entrance by lever. Key locks or unlocks lever] [09 - Entrance by lever only when released by key. Key removable only when locked] <Insert function>.
 2. Mounting Channel: Bent-plate channel formed from 1/8-inch- (3.2-mm-) thick, [steel] [aluminum] plate. Channel spans gate frame. Exit device is mounted on channel web,

recessed between flanges, with flanges extending **1/8 inch (3.2 mm)** beyond push pad surface.

- R. Cane Bolts: Provide for inactive leaf of pairs of gates. Fabricated from [**1/2-inch- (12.7 -mm-)**] [**3/4-inch- (19-mm-)**] diameter, round steel bars, hot-dip galvanized after fabrication. Finish to match gates. Provide galvanized-steel pipe strikes to receive cane bolts in [**closed position**] [**both open and closed positions**].
- S. Finish exposed welds to comply with NOMMA Guideline 1, [**Finish #2 - completely sanded joint, some undercutting and pinholes okay**] [**Finish #3 - partially dressed weld with splatter removed**] [**Finish #4 - good-quality, uniform undressed weld with minimal splatter**].
- T. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M unless otherwise indicated. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- U. Metallic-Coated Steel Finish: [**High-performance coating**] [**Galvanized finish**].
- V. Steel Finish: [**Primed**] [**Shop painted**] [**High-performance coating**].
- W. Aluminum Finish: Baked enamel or powder coating.

2.12 HORIZONTAL-SLIDE GATES

- A. Gate Configuration: [**Single leaf**] [**Double leaf**] [**As indicated**].
 - 1. Type: Overhead slide.
 - 2. Type: Cantilever slide, with [**external**] [**internal**] roller assemblies.
- B. Gate Frame Height: [**72 inches (1830 mm)**] [**As indicated**] <Insert height>.
- C. Gate Opening Width: [**36 inches (914 mm)**] [**As indicated**] <Insert width>.
- D. Galvanized-Steel Frames and Bracing: Fabricate members from square tubing.
 - 1. Frame Members: Square tubes [**1-1/2 by 1-1/2 inches (38 by 38 mm)**] [**1-3/4 by 1-3/4 inches (45 by 45 mm)**] [**2 by 2 inches (50 by 50 mm)**] [**2-1/2 by 2-1/2 inches (64 by 64 mm)**] formed from **0.108-inch (2.74-mm)** nominal-thickness, metallic-coated steel sheet or formed from **0.105-inch (2.66-mm)** nominal-thickness steel sheet and hot-dip galvanized after fabrication.
 - 2. Bracing Members: Square tubes [**1-1/2 by 1-1/2 inches (38 by 38 mm)**] [**1-3/4 by 1-3/4 inches (45 by 45 mm)**] [**2 by 2 inches (50 by 50 mm)**] [**2-1/2 by 2-1/2 inches (64 by 64 mm)**] formed from **0.108-inch (2.74-mm)** nominal-thickness, metallic-coated steel sheet or formed from **0.105-inch (2.66-mm)** nominal-thickness steel sheet and hot-dip galvanized after fabrication.
- E. Steel Frames and Bracing: Fabricate members from square tubing. [**Hot-dip galvanize frames after fabrication.**]

1. Frame Members: Steel tubing [**1-1/2 by 1-1/2 inches (38 by 38 mm)**] [**2 by 2 inches (50 by 50 mm)**] [**2-1/2 by 2-1/2 inches (64 by 64 mm)**] <Insert size> with [**1/8-inch (3.2-mm)**] <Insert thickness> wall thickness.
 2. Bracing Members: Steel tubing [**1-1/2 by 1-1/2 inches (38 by 38 mm)**] [**2 by 2 inches (50 by 50 mm)**] [**2-1/2 by 2-1/2 inches (64 by 64 mm)**] <Insert size> with [**1/8-inch (3.2-mm)**] <Insert thickness> wall thickness.
- F. Aluminum Frames and Bracing: Fabricate members from square tubing.
1. Frame Members: Extruded-aluminum tubes [**1-1/2 by 1-1/2 inches (38 by 38 mm)**] [**2 by 2 inches (50 by 50 mm)**] [**2-1/2 by 2-1/2 inches (64 by 64 mm)**] <Insert size> with [**0.100-inch (2.54-mm)**] [**0.125-inch (3.18-mm)**] [**0.140-inch (3.56-mm)**] [**0.154-inch (3.91-mm)**] <Insert thickness> wall thickness.
 2. Bracing Members: Extruded-aluminum tubes [**1-1/2 by 1-1/2 inches (38 by 38 mm)**] [**2 by 2 inches (50 by 50 mm)**] [**2-1/2 by 2-1/2 inches (64 by 64 mm)**] <Insert size> with [**0.100-inch (2.54-mm)**] [**0.125-inch (3.18-mm)**] [**0.140-inch (3.56-mm)**] [**0.154-inch (3.91-mm)**] <Insert thickness> wall thickness.
- G. Frame Corner Construction:
1. Welded frame [**with panels assembled with bolted or riveted corner fittings**] [**and 5/16-inch- (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider**].
 2. Overhead Slide Gates: Welded or assembled with corner fittings [**including 5/16-inch- (7.9-mm-) diameter, adjustable truss rods for panels 5 feet (1.52 m) wide or wider**].
- H. Additional Rails: Provide as indicated, complying with requirements for fence rails.
- I. Infill: Comply with requirements for adjacent fence.
- J. Picket Size, Configuration, and Spacing: Comply with requirements for adjacent fence.
1. Treillage: Provide iron castings of pattern indicated between each pair of pickets. Finish as specified for [**adjacent fence**] [**gates**].
- K. Overhead Track Assembly: Manufacturer's standard track, with overhead framing supports, bracing, and accessories, engineered to support size, weight, width, operation, and design of gate and roller assemblies.
- L. Hardware: Latches permitting operation from both sides of gate, [**locking devices**] [**hangers**] [**roller assemblies**] <Insert hardware items and accessories> and stops fabricated from [**galvanized steel**] [**galvanized malleable iron**] [**mill-finished, Grade 319 aluminum-alloy casting with stainless-steel fasteners**]. [**Fabricate latches with integral eye openings for padlocking; padlock accessible from both sides of gate.**]
1. <Insert requirements for padlocks and chains if not Owner furnished>.
- M. Finish exposed welds to comply with NOMMA Guideline 1, [**Finish #2 - completely sanded joint, some undercutting and pinholes okay**] [**Finish #3 - partially dressed weld with splatter removed**] [**Finish #4 - good-quality, uniform undressed weld with minimal splatter**].

- N. Galvanizing: For items other than hardware that are indicated to be galvanized, hot-dip galvanize to comply with ASTM A 123/A 123M unless otherwise indicated. For hardware items, hot-dip galvanize to comply with ASTM A 153/A 153M.
- O. Metallic-Coated Steel Finish: [**High-performance coating**] [**Galvanized finish**].
- P. Steel Finish: [**Primed**] [**Shop painted**] [**High-performance coating**].
- Q. Aluminum Finish: Baked enamel or powder coating.

2.13 GATE OPERATORS

- A. General: Provide factory-assembled automatic operating system designed for gate size, type, weight, and operation frequency. Provide operation control system with characteristics suitable for Project conditions, with remote-control stations, safety devices, and weatherproof enclosures; coordinate electrical requirements with building electrical system.
 - 1. Provide operator designed so motor may be removed without disturbing limit-switch adjustment and without affecting auxiliary emergency operator.
 - 2. Provide operator with UL[**approval**] [**-approved components**].
 - 3. Provide electronic components with built-in troubleshooting diagnostic feature.
 - 4. Provide unit designed and wired for both right-hand/left-hand opening, permitting universal installation.
 - 5. Provide controllers, electrical devices, and wiring that comply with requirements specified in Division 26 Sections.
- B. Motors: Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Division 11 Section "Common Motor Requirements for Equipment."
 - 1. Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
 - 2. Horsepower: Not less than [1/4] [1/3] [1/2] [3/4] <Insert horsepower>.
 - 3. Enclosure: [**Open dripproof**] [**Totally enclosed**] [**Manufacturer's standard**].
 - 4. Duty: Continuous duty at ambient temperature of 105 deg F (40 deg C) and at altitude of 3300 feet (1005 m) above sea level.
 - 5. Service Factor: 1.15 for open dripproof motors; 1.0 for totally enclosed motors.
 - 6. Controllers, Electrical Devices, and Wiring: Comply with requirements for electrical devices and connections specified in Division 26 Sections.
- C. Gate Operators: [**Gate**] [**Concrete base**] [**Post**] [**In-ground**] mounted and as follows:
 - 1. Hydraulic [**Swing**] [**Slide**] Gate Operators:
 - a. Duty: [**Light**] [**Medium**] [**Heavy**] duty, [**residential**] [**commercial/industrial**].
 - b. Gate Speed: Minimum [**45 feet (13.7 m)**] [**60 feet (18.2 m)**] per minute.
 - c. Maximum Gate Weight: <Insert weight>.
 - d. Frequency of Use: [**10 cycles per hour**] [**25 cycles per hour**] [**Continuous duty**] <Insert cycles>.
 - e. Locking: Hydraulic in both directions.

- f. Heater: Manufacturer's standard track and roller heater with thermostatic control.
 - g. <Insert feature>.
 - h. Operating Type: [Crank arm] [Wheel and rail drive] [Roller chain] [with manual release].
 - i. <Insert feature>.
2. Mechanical [Swing] [Slide] Gate Operators:
- a. Duty: [Light] [Medium] [Heavy] duty, [residential] [commercial/industrial].
 - b. Gate Speed: Minimum [45 feet (13.7 m) per minute] [60 feet (18.2 m) per minute] [variable speed] <Insert speed>.
 - c. Maximum Gate Weight: [600 lb (272 kg)] [800 lb (363 kg)] <Insert weight>.
 - d. Frequency of Use: [10 cycles per hour] [25 cycles per hour] [60 cycles per hour] [Continuous duty] <Insert cycles>.
 - e. Operating Type: [Crank arm] [Wheel and rail drive] [Roller chain], [with manual release].
 - f. Drive Type: Enclosed worm gear[and chain-and-sprocket] reducers, roller-chain drive.
 - g. Drive Type: V-belt and [worm gear] [chain-and-sprocket] reducers, roller-chain drive.
 - h. <Insert feature>.
- D. Remote Controls: Electric controls separated from gate and motor and drive mechanism, with [NEMA ICS 6, Type 1] [NEMA ICS 6, Type 4] <Insert type of enclosure> enclosure for [surface] [recessed or flush] [concrete base] [pedestal] <Insert mounting> mounting, and with space for additional optional equipment. Provide the following remote-control device(s):
- 1. Control Station: Keyed, [two] [three]-position switch with open[, stop,] and close function; located remotely from gate. Provide two keys per station.
 - 2. Control Station: Momentary-contact, [single] [three]-button-operated with open[, stop,] and close function; located remotely from gate.[Key switch to lock out open and close buttons.]
 - 3. Card Reader: Functions only when authorized card is presented. Programmable, [multiple] [single]-code system[, permitting four different access time periods] [; face-lighted unit fully visible at night].
 - a. Reader Type: [Touch plate] [Swipe] [Insertion] [Proximity].
 - b. Features: [Timed antipassback] [Limited-time usage] [Capable of monitoring and auditing gate activity].
 - 4. Digital Keypad Entry Unit: Multiple-[programmable,]code capability of not less than [5] [500] [2500] <Insert number> possible individual codes, consisting of [1- to 7] [4] [5]-digit codes[, and permitting 4 different access time periods].
 - a. Features: [Timed antipassback] [Limited-time usage] [Capable of monitoring and auditing gate activity].
 - b. Face-lighted unit with [metal-keyed] [keyless-membrane] keypad fully visible at night.
 - 5. Radio Control: Digital system consisting of code-compatible universal receiver for each gate, located where indicated, with remote antenna with coaxial cable and mounting

brackets designed to operate gates. Provide [1] [2] <Insert number> programmable transmitter(s) with multiple-code capability permitting validating or voiding of not less than [1000] [10,000] <Insert number> codes per channel configured for the following functions:

- a. Transmitters: [Single] [Three]-button operated, with open [and close]function.
 - b. Channel Settings: [Two] [Three] [Four] <Insert number> independent channel settings controlling separate receivers for operating more than one gate from each transmitter.
6. Telephone Entry System: Hands-free, voice-communication system for connection to building telephone system with digital-entry code activation of gate operator[**and auxiliary keypad entry**].
- a. Residential System: Designed to be wired to same line with telephone.
 - b. Multiunit System: Designed to be wired to a dedicated telephone line, with capacity to access [20] [100] <Insert number> telephones[, **and with electronic directory**].
7. Vehicle Loop Detector: System including automatic closing timer with adjustable time delay before closing[, **timer cutoff switch,**] and loop detector designed to [**open and close gate**] [**hold gate open until traffic clears**] [**reverse gate**] <Insert functions>. Provide electronic detector with adjustable detection patterns, adjustable sensitivity and frequency settings, and panel indicator light designed to detect presence or transit of a vehicle over an embedded loop of wire and to emit a signal activating the gate operator. Provide number of loops consisting of multiple strands of wire, number of turns, loop size, and method of placement at location shown on Drawings, as recommended in writing by detection system manufacturer for function indicated.
- a. Loop: Wire, in size indicated for field assembly, for [**pave-over**] [**saw cut with epoxy-grouted**] installation.
 - b. Loop: Factory preformed in size indicated; style for [**pave-over**] [**saw cut with epoxy-grouted**] installation.
8. Vehicle Presence Detector: System including automatic closing timer with adjustable time delay before closing[, **timer cutoff switch,**] and presence detector designed to [**open and close gate**] [**hold gate open until traffic clears**] [**reverse gate**] <Insert functions>. Provide [**retroreflective**] [**emitter/receiver**] detector with adjustable detection zone pattern and sensitivity, designed to detect the presence or transit of a vehicle in gate pathway when infrared beam in zone pattern is interrupted, and to emit a signal activating the gate operator.
- E. Obstruction Detection Devices: Provide each motorized gate with automatic safety sensor(s). Activation of sensor(s) causes operator to immediately function as follows:
1. Action: Reverse gate in both opening and closing cycles and hold until clear of obstruction.
 2. Action: Stop gate in opening cycle and reverse gate in closing cycle and hold until clear of obstruction.
 3. Internal Sensor: Built-in torque or current monitor senses gate is obstructed.

4. Sensor Edge: Contact-pressure-sensitive safety edge, profile, and sensitivity designed for type of gate and component indicated, in locations as follows. Connect to control circuit using [**take-up cable reel**] [**self-coiling cable**] [**gate edge transmitter and operator receiver system**].
 - a. Along entire gate leaf leading edge.
 - b. Along entire gate leaf trailing edge.
 - c. Across entire gate leaf bottom edge.
 - d. Along entire length of gate posts.
 - e. Along entire length of gate guide posts.
 - f. Where indicated on Drawings.
 - g. **<Insert extent and location>**.
5. Photoelectric/Infrared Sensor System: Designed to detect an obstruction in gate's path when infrared beam in the zone pattern is interrupted.
- F. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop gate at fully retracted and fully extended positions.
- G. Emergency Release Mechanism: Quick-disconnect release of operator drive system of the following type of mechanism, permitting manual operation if operator fails. Design system so control-circuit power is disconnected during manual operation.
 1. Type: Integral fail-safe release, allowing gate to be pushed open without mechanical devices, keys, cranks, or special knowledge.
 2. Type: Mechanical device, key, or crank-activated release.
- H. Operating Features:
 1. Digital Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features[**with capability for monitoring and auditing gate activity**]. Provide unit that is isolated from voltage spikes and surges.
 2. System Integration: With controlling circuit board capable of accepting any type of input from external devices.
 3. Master/Slave Capability: Control stations designed and wired for gate pair operation.
 4. Automatic Closing Timer: With adjustable time delay before closing[**and timer cutoff switch**].
 5. Open Override Circuit: Designed to override closing commands.
 6. Reversal Time Delay: Designed to protect gate system from shock load on reversal in both directions.
 7. Maximum Run Timer: Designed to prevent damage to gate system by shutting down system if normal time to open gate is exceeded.
 8. Clock Timer: [**24-hour**] [**Seven-day**] **<Insert time period>** programmable for regular events.
- I. Accessories:
 1. Warning Module: [**Audio**] [**Visual**], ADA/ABA-compliant, [**constant**] [**strobe**]-light alarm sounding three to five seconds in advance of gate operation and continuing until gate stops moving.

2. Battery Backup System: Battery-powered drive and access-control system, independent of primary drive system:
 - a. Fail Safe: Gate opens and remains open until power is restored.
 - b. Fail Secure: Gate cycles on battery power, then fail safe when battery is discharged.
3. External electric-powered [**solenoid**] [**magnetic**] lock with delay timer allowing time for lock to release before gate operates.
4. [**Fire**] [**Postal**] box.
5. Fire [**strobe**] [**siren**] alarm.
6. Intercom System: <Insert requirements>.
7. Instructional, Safety, and Warning Labels and Signs: [**According to UL 325**] [**Manufacturer's standard for components and features specified**] [**As indicated on Drawings**] <Insert requirements>.

2.14 ALUMINUM FINISHES

- A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of **2 mils (0.05 mm)**. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.
 1. Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <Insert color and gloss>.

2.15 STEEL FINISHES

- A. Surface Preparation: Clean surfaces according to [**SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning**] [**SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning**].
 1. After cleaning, apply a conversion coating suited to the organic coating to be applied over it.
- B. Powder Coating: Immediately after cleaning, apply 2-coat finish consisting of epoxy primer and TGIC polyester topcoat, with a minimum total dry film thickness of not less than **8 mils (0.20 mm)**. Comply with coating manufacturer's written instructions.
 1. Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <Insert color and gloss>.
- C. Primer Application: Apply zinc-rich epoxy primer immediately after cleaning, to provide a minimum dry film thickness of **2 mils (0.05 mm)** per applied coat, to surfaces that will be exposed after assembly and installation, and to concealed surfaces.
- D. Shop-Painted Finish: Comply with [**Division 09 Section "Exterior Painting"**] [**Division 09 Section "High-Performance Coatings"**]

- E. High-Performance Coating: Apply epoxy intermediate and polyurethane topcoats to prime-coated surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
 - 1. Match approved Samples for color, texture, and coverage. Remove and refinish, or recoat work that does not comply with specified requirements.

2.16 METALLIC-COATED STEEL FINISHES

- A. Galvanized Finish: Clean welds, mechanical connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
- B. Surface Preparation: Clean surfaces with nonpetroleum solvent so surfaces are free of oil and other contaminants. After cleaning, apply a [**zinc-phosphate**] conversion coating suited to the organic coating to be applied over it. Clean welds, mechanical connections, and abraded areas and repair galvanizing to comply with ASTM A 780.
- C. Powder Coating: Immediately after cleaning and pretreating, apply TGIC polyester powder-coat finish, with a minimum dry film thickness of **2 mils (0.05 mm)**.
 - 1. Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <Insert color and gloss>.
- D. Powder Coating: Immediately after cleaning and pretreating, apply 2-coat finish consisting of [**zinc-rich**] epoxy prime coat and TGIC polyester topcoat, with a minimum dry film thickness of **2 mils (0.05 mm)** for topcoat. Comply with coating manufacturer's written instructions to achieve a minimum total dry film thickness of **4 mils (0.10 mm)**.
 - 1. Color and Gloss: [**As indicated by manufacturer's designations**] [**Match Architect's sample**] [**As selected by Architect from manufacturer's full range**] <Insert color and gloss>.
 - 2. Comply with surface finish testing requirements in ASTM F 2408[**except change corrosion-resistance requirement to 3000 hours without failure**].
- E. High-Performance Coating: Apply epoxy primer, epoxy intermediate coat, and polyurethane topcoat to prepared surfaces. Comply with coating manufacturer's written instructions and with requirements in SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting. Apply at spreading rates recommended by coating manufacturer.
 - 1. Match approved Samples for color, texture, and coverage. Remove and refinish, or recoat work that does not comply with specified requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, construction layout, and other conditions affecting performance of the Work.
- B. Do not begin installation before final grading is completed unless otherwise permitted by Architect.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of **500 feet (152.5 m)** or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.
 - 1. Construction layout and field engineering are specified in Division 01 Section "Execution"

3.3 DECORATIVE FENCE INSTALLATION

- A. Install fences according to manufacturer's written instructions.
- B. Install fences by setting posts as indicated and fastening [**rails**] [**and**] [**infill panels**] to posts. [**Peen threads of bolts after assembly to prevent removal.**]
- C. Post Excavation: Drill or hand-excavate holes for posts in firm, undisturbed soil. Excavate holes to a diameter of not less than 4 times post size and a depth of not less than **24 inches (600 mm)** plus **3 inches (75 mm)** for each **foot (300 mm)** or fraction of **a foot (300 mm)** that fence height exceeds **4 feet (1200 mm)**.
- D. Post Setting: Set posts [**in concrete**] [**with mechanical anchors**] [**by mechanically driving into soil**] at indicated spacing into firm, undisturbed soil.
 - 1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete or mechanical devices.
 - 2. Concrete Fill: Place concrete around [**posts**] [**and**] [**sleeves**] and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
 - a. Exposed Concrete: Extend **2 inches (50 mm)** above grade. Finish and slope top surface to drain water away from post.
 - b. Concealed Concrete: Top [**2 inches (50 mm)**] **<Insert dimension>** below grade [**as indicated on Drawings**] to allow covering with surface material. Slope top surface of concrete to drain water away from post.

3. Posts Set in Concrete: Extend post to within **6 inches (150 mm)** of specified excavation depth, but not closer than **3 inches (75 mm)** to bottom of concrete.
4. Posts Set into Concrete in Sleeves: Use galvanized-steel pipe sleeves with inside diameter at least **3/4 inch (20 mm)** larger than outside diagonal dimension of post, preset and anchored into concrete for installing posts.
 - a. Extend posts at least **5 inches (125 mm)** into sleeve.
 - b. After posts have been inserted into sleeves, fill annular space between post and sleeve with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions; shape and smooth to shed water. Finish and slope top surface of grout to drain water away from post.
5. Posts Set into Voids in Concrete: Form or core drill holes not less than **3/4 inch (20 mm)** larger than outside diagonal dimension of post.
 - a. Extend posts at least **5 inches (125 mm)** into concrete.
 - b. Clean holes of loose material, insert posts, and fill annular space between post and concrete with nonshrink grout, mixed and placed to comply with grout manufacturer's written instructions. Finish and slope top surface of grout to drain water away from post.
6. Mechanically Driven Posts: Drive into soil to depth of [**30 inches (762 mm)**] [**36 inches (914 mm)**] <Insert depth>. Protect post top to prevent distortion.
7. Space posts uniformly at [**6 feet (1.83 m)**] [**8 feet (2.44 m)**] <Insert dimension> o.c.

3.4 GATE INSTALLATION

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach hardware using tamper-resistant or concealed means. Install ground-set items in concrete for anchorage. Adjust hardware for smooth operation and lubricate where necessary.

3.5 GATE OPERATOR INSTALLATION

- A. General: Install gate operators according to manufacturer's written instructions, aligned and true to fence line and grade.
- B. Excavation for [**Support Posts**] [**Pedestals**] [**Concrete Bases**]: Hand-excavate holes for bases, in firm, undisturbed soil to dimensions and depths and at locations as required by gate operator component manufacturer's written instructions and as indicated.
- C. Concrete Bases: Cast-in-place or precast concrete, [**depth not less than 12 inches (300 mm)**] <Insert depth **6 to 12 inches (150 to 300 mm)** below frost line or detail on Drawings>, dimensioned and reinforced according to gate operator component manufacturer's written instructions and as indicated on Drawings.
- D. Vehicle Loop Detector System: [**Cut grooves in pavement and**] bury and seal wire loop according to manufacturer's written instructions. Connect to equipment operated by detector.

- E. Comply with NFPA 70 and manufacturer's written instructions for grounding of electric-powered motors, controls, and other devices.

3.6 GROUNDING AND BONDING

- A. Fence Grounding: Install at maximum intervals of **[1500 feet (450 m)]** <Insert a lesser distance if grounding resistance is high> except as follows:
 - 1. Fences within **100 Feet (30 m)** of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of **[750 feet (225 m)]** <Insert a lesser distance if grounding resistance is high>.
 - a. Gates and Other Fence Openings: Ground fence on each side of opening.
 - 1) Bond metal gates to gate posts.
 - 2) Bond across openings, with and without gates, except openings indicated as intentional fence discontinuities. Use No. 2 AWG wire and bury it at least **18 inches (460 mm)** below finished grade.
 - B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of **150 feet (45 m)** on each side of crossing.
 - C. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.
 - D. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is **6 inches (150 mm)** below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at the grounding location.
 - E. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.
 - F. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.
 - 4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 - 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
 - G. Bonding to Lightning-Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning-protection down conductor or lightning-protection grounding conductor, complying with NFPA 780.

3.7 FIELD QUALITY CONTROL

- A. Grounding-Resistance Testing: **[Owner will engage]** **[Engage]** a qualified testing agency to perform tests and inspections.
1. Grounding-Resistance Tests: Subject completed grounding system to a megger test at each grounding location. Measure grounding resistance not less than two full days after last trace of precipitation, without soil having been moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural grounding resistance. Perform tests by two-point method according to IEEE 81.
 2. Excessive Grounding Resistance: If resistance to grounding exceeds specified value, notify Architect promptly. Include recommendations for reducing grounding resistance and a proposal to accomplish recommended work.
 3. Report: Prepare test reports certified by a testing agency of grounding resistance at each test location. Include observations of weather and other phenomena that may affect test results.

3.8 ADJUSTING

- A. Gates: Adjust gates to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, or malfunction, throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- B. Automatic Gate Operators: Energize circuits to electrical equipment and devices. Adjust operators, controls, safety devices, **[alarms,]** and limit switches.
1. Hydraulic Operators: Purge operating system, adjust pressure and fluid levels, and check for leaks.
 2. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 3. Test and adjust controls, **[alarms,]** and safeties. Replace damaged and malfunctioning controls and equipment.
- C. Lubricate hardware, **[gate operators,]** and other moving parts.

3.9 DEMONSTRATION

- A. **[Engage a factory-authorized service representative to train]** **[Train]** Owner's personnel to adjust, operate, and maintain gates.

END OF SECTION 323119