

SECTION 32 31 19 – ORNAMENTAL METAL FENCES AND GATES

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PART I - GENERAL

1.01 SCOPE OF WORK

Work described in this section includes materials, equipment, labor costs, including shipping of fences, gates and accessories.

1.02 RELATED WORK (Sections to consult)

****NOTE TO SPECIFIER** Delete any sections below not relevant to this project; add others as required.**

- A. Division 03 – Concrete
- B. Division 04 – Masonry
- C. Division 31 – Earthwork
- D. Division 32 – Exterior Improvements
- E. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

****NOTE TO SPECIFIER** Delete Section F if motorized gates are not required.**

- F. Division 26 - Electrical. For electrical service and connections for motor operators, controls, limit switches, other powered devices and for system disconnect switches.

1.03 REFERENCES

****NOTE TO SPECIFIER** Delete references from the list below that are not required by the text of the edited section.**

ASTM STANDARDS: American Society for Testing and Materials

A121 – 19	Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
A123 / A123M - 17	Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
A153 / A153M - 16a	Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A500 / A500M - 23	Standard Specification for Cold Formed Welded and Seamless Carbon Steel Structural Tubing in Round Shapes
A505 - 16	Standard Specification for Steel, Sheet and Strip, Alloy, Hot-Rolled and Cold-Rolled, General Requirements
A513/A513M - 19	Standard Specification for Electric-Resistance-Welded Carbon and Alloy Steel Mechanical Tubing
A641/A641M - 09a (2014)	Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire
A653/A653M - 19	Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
A659/A659M - 18	Standard Specification for Commercial Steel (CS), Sheet and Strip, Carbon (0.16 Maximum to 0.25 Maximum Percent), Hot-Rolled
A787/A787M - 15a	Standard Specification for Electric-Resistance-Welded Metallic-Coated Carbon Steel Mechanical Tubing
A853 - 24 (2017)	Standard Specification for Steel Wire, Carbon, for General Use
A1008 / A1008M - 18	Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
A1064 / A1064M - 18a	Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
B6 - 18	Standard Specification for Zinc
B117 - 11	Standard Practice for Operating Salt Spray (Fog) Apparatus
B209/B209M - 14	Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

B210 / B210M – 19a	Standard Specification for Aluminum and Aluminum-Alloy Drawn Seamless Tubes
B221 – 20	Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
B429 - 20	Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube (posts / rails)
D2247 - 15	Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity
D2794 - 93 (2014)	Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
D3359 - 17	Standard Test Methods for Measuring Adhesion by Tape
F567- 07	Standard Practice for Installation of Chain-Link Fencing
F626 - 14 (2019)	Standard Specification for Fence Fittings
F900 - 11 (2017)	Standard Specification for Industrial and Commercial Swing Gates.
F934 - 96 (2017)	Standard Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials.
F1043 - 18	Standard Specification for Strength and Protective Coatings on Steel Industrial Chain Link Fence Framework
F1184 - 16	Standard Specification for Industrial and Commercial Horizontal Slide Gates
F2957 - 13(2019)e1	Standard Specification for Ornamental Aluminum Fence Systems
G155 – 21	Standard Practice for Operating Xenon Arc Lamp Apparatus for Exposure of Materials

CGSB STANDARDS: Canadian General Standards Board

CAN/CGSB-138.1-2019	Fabric for Chain Link Fence
CAN/CGSB-138.2-2019	Steel Framework for Chain Link Fence
CAN/CGSB-138.3-2019	Installation of Chain Link Fence
CAN/CGSB-138.4-2019	Gates for Chain Link Fence

CSA STANDARDS: Canadian Standards Association

A23.1:24/A23.2:24	Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete
G164-18 (R2023)	Hot Galvanization of Irregularly Shaped Articles.

NFPA STANDARDS: National Fire Protection Association

NFPA 70 (2023)	National Electrical Code® 2023
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UL STANDARDS: Underwriters Laboratories

UL 325:2023:	Standard for Door, Drapery, Gate, Louver, and Window Operators and Systems
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1.04 SUBMITTALS

- A. Product Data: Material descriptions, dimension of individual components and profiles, and finishes for the following:
1. Fence, gate posts, brackets, rails and fittings.
 2. Gates and hardware.

****NOTE TO SPECIFIER** Sections 3 & 4 are for gate operators and motors for automatic gates. Add if needed, delete if not required.**

3. Gate operators, including operating instructions.

4. Motors: Show nameplate data, ratings, characteristics, and mounting arrangements.
- B. Shop Drawings: In accordance with Section 01 33 00 with six (6) copies:
 1. Show locations of fence, each gate, posts, rails, and details of gate swing direction, or other operation, hardware, and accessories.
 2. Indicate materials, dimensions, sizes, weights, and finishes of components.
 3. Include plans, elevations, sections, gate swing direction and other required installation and operational clearances, and details of post anchorage, attachment and bracing.
 4. Installation recommendations and instructions by manufacturer describing all details for a typical fence and gates.

****NOTE TO SPECIFIER** Section 5 is for gate operators for automatic gates. Add if needed, delete if not required.**

5. Gate Operator: Show locations and details for installing operator components, switches, and controls. Indicate motor size, electrical characteristics, drive arrangement, mounting, and grounding provisions.

****NOTE TO SPECIFIER** Section 6 is for wiring diagrams for automatic gates. Add if needed, delete if not required.**

6. Wiring Diagrams: Power and control wiring, communication features, and access control features. Differentiate between factory-installed and field-installed wiring and between components provided by fence manufacturer and those provided by sections.

****NOTE TO SPECIFIER** Delete if not required. A Color sample available upon request**

- C. Verification Samples: For each finish product specified, two (2) samples, minimum size 6 in (150 mm) long, representing actual standard/optional color or color chips for custom color.
- D. Qualification Data: For firms and persons specified in "Quality Assurance" article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Maintenance Data: Material Safety Data Sheet available upon request.

1.05 SUBSTITUTION OF PRODUCTS

To enable all tenders to be judged equitably, they shall be based on the specified products in this document and shown on the drawings:

- A. The proposal for any substitute products must be attached to their tender separately, identifying the substitution product by its trade name along with any savings it may represent.
- B. Following the opening of the tender, only the substitutions proposed by the lowest bidder of the specified products will be considered.
- C. All substitutions approval requests shall be accompanied by manufacturing drawings and specifications, and they meet all specifications for design, size gauge of metal parts and fabrication.
- D. Each substitution sample must be presented to the owner/consultant within seven days following the opening of tenders. After this time, the bidder will be required to supply the original specified product.
- E. The owner/consultant reserves the right to grant or deny approval for proposed substitutions without prejudice to this right and the decision shall be final.
- F. Fencing products must be entirely interchangeable, if applicable, with already installed material.
- G. The above conditions apply to this section independently of any other clauses on the subject found in this document.

1.06 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed installations of fences and gates similar in material, design, and extent to those indicated for this project and whose work has resulted in construction with a record of successful in-service performance.
- B. Source Limitations for Fences and Gates: Obtain each color, grade, finish, type, and variety of components for fences and gates from one source with resources to provide fences and gates of consistent quality in appearance and physical properties.

****NOTE TO SPECIFIER** For electric gates only. Add if needed, delete if not required.**

- C. Electrical Components, Devices, and Accessories: Listed and labelled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

****NOTE TO SPECIFIER** For electric gates only. Add if needed, delete if not required.**

- D. UL Standard: Provide gate operators that comply with UL 325.

****NOTE TO SPECIFIER** Add if needed, delete if not required.**

- E. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators serving as a required means of access.
 - 1. Coordinate with door hardware and site security requirements.
 - 2. Coordinate direction of entering and exiting traffic with life safety plans.

1.07 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify local utility making services before beginning work.
 - 2. Unless otherwise indicated in the general provisions of the contract, notify the Architect no less than two (2) days in advance of proposed utility interruptions.
 - 3. Do not proceed with utility interruptions without Architect's written permission.
- B. Field Measurements: Verify layout information for fences and gates shown on drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

PART II - THE PRODUCT

2.01 MANUFACTURER

OMEGA II FENCE SYSTEMS™

A division of Metaltech - Omega Inc.
1735, St-Elzéar west
Laval (Quebec), Canada
H7L 3N6

Tel: 800-836-6342 / 450-686-9600
Fax: 450-681-5318
Email: customerservice@omegatwo.com
Web site: www.omegatwo.com

****NOTE TO SPECIFIER** Delete one of the following two paragraphs: Coordinate with requirements on product options and substitutions.**

- A. Substitutions: Not permitted.
- B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirement:
 - 1. All substitution approval requests shall be accompanied by manufacturing drawings and specifications, and they shall meet all specifications for design, size, gauge of metal parts, and fabrication.

****NOTE TO SPECIFIER** Product is galvanized and finished with a polyester-coated finish. Add if needed, delete if not required.**

2.02 COATINGS

- A. Zinc coating:
 - 1. Square fence posts, swing gate posts:

****NOTE TO SPECIFIER** Select according to square tube thickness. Delete if not required.**

- a. Thickness of 11GA (0.120 in or 3.0 mm) or less: Zinc coated (pre-galvanized process) with a minimum of 0.9 oz/ft² (275 g/m²) as per ASTM A653 Grade 90.
 - b. Thickness over 1/8 in (3.2 mm): Coated with a minimum of 2.3 oz/ft² (705 g/m²) zinc (hot-dip galvanizing) in conformity with ASTM A123 Grade 100.
- B. Polyester Coating:

Polyester coating to be minimum 4 mils applied by an electrostatic process. Coating shall cover all surfaces of the wire and post sections. Coating shall be capable of withstanding the following tests:

 - 1. Mechanical adhesion test as per ASTM D3359 - Method B.
 - 2. Shock resistance tests as per ASTM D2794.
 - 3. Salt spray testing with a minimum of 1 000 hours without red rust appearance, as per ASTM B117.
 - 4. Humidity resistance in a weather meter chamber as per ASTM D2247.
 - 5. Exposure to ultraviolet light with exposure of 500 hours using Xenon Arc Lamp apparatus and 63°C as per ASTM G155.
- C. Polyester Surface Coating Colors:

****NOTE TO SPECIFIER** Select one: standard black or optional color coating below. Delete options not required. See Omega II Fence Systems' website - or [color chart as per a RAL code].**

- 1. Standard Coating: Black, RAL 9004 (30% Gloss).
- 2. Gloss Coating: Signal white, RAL 9003 (85%-90% Gloss).
- 3. Gloss Coating: Silver grey, RAL 7001 (85%-90% Gloss).
- 4. Gloss Coating: Basalt grey, RAL 7012 (85%-90% Gloss).
- 5. Gloss Coating: Fir green, RAL 6009 (85%-90% Gloss).

6. Gloss Coating: Chocolate brown, RAL 8017 (55%-60% Gloss).
7. Gloss Coating: Signal red, RAL 3001 (85%-90% Gloss).
8. Gloss Coating: Taupe brown. (50%-60% Gloss).
9. Textured Coating: Signal yellow, RAL 1003 (85%-90% Gloss).
10. Textured Coating: Sapphire blue, RAL 5003 (50%-60% Gloss).
11. Metallic Coating: Silver (85%-90% Gloss).
12. Metallic Coating: Silver vein (85%-90% Gloss).
13. Metallic Coating: Copper vein (85%-90% Gloss).
14. Corten Steel Look: Rust ($\pm$ 6 months).
15. Corten Steel Look: Dark Rust ($\pm$ 2 years).
16. Custom Coating: [] [Match RAL] [Gloss].
17. Custom Coating: Color Match [Provide metal color sample].

2.03 MATERIALS

2.03.1 ORNAMENTAL FENCE MODEL “OMEGA SAFARI” AND ACCESSORIES

A. Ornamental Panel « OMEGA SAFARI »

**** NOTE TO SPECIFIER ****Select desired nominal panel height. Customized dimensions available upon request.

i. Nominal Dimensions of Safari Panels

Panel Nominal Height	Nominal Height	Maximum Height	Panel Width
4 ft	46 in (1 168 mm)	47-9/16 in (1 208 mm)	91-1/2 in (2 324 mm)
6 ft	70 in (11778 mm)	71-3/4 in (1 822 mm)	91-1/2 in (2 324 mm)
8 ft	94 in (2 388 mm)	95-9/16 in (2 427 mm)	91-1/2 in (2 324 mm)

ii. Safari panel composition

1. Fabricated from 11/16 in (18 mm) solid vertical 6061-T6 aluminum rods, diagonally welded and crisscrossed. Reinforced according to panel height with two to four (2 to 4) pairs of 1/4 in (6.3 mm) thick 6061-T6 aluminum flat bars.
2. Rigid yet lightweight structure, providing protection, durability, and a contemporary aesthetic inspired by bamboo.
3. The design's offset arrangement gives the panel a 3D appearance. Solid rods are welded on two separate planes, creating a distinctive sense of depth.
4. Each flat bar includes two 3/8 in (9.5 mm) square clearance holes; one on each side for mounting panels to posts.
5. Ideal for projects where design is as important as security: private gardens, schools, parks, zoos, trails, bridges, warehouses, residential areas, guardrails, decorative partitions, etc.

B. Square Posts:

Cold rolled 1008 grade steel to meet ASTM A500 and ASTM A787 and the following maximum horizontal loads, length as required for installation type:

The length of the posts is minimum 36 in (914 mm) more than the actual height of the fence for installation in the ground depending on local land code requirements (frost line).

1. Installation

**** NOTE TO SPECIFIER **** Select installation type. Delete options not required.

- a. In ground, post length as required for local frost line requirements
- b. Surface mounted, flanged
- c. Custom

**** NOTE TO SPECIFIER ** Select Post Size based. Delete options not required.**

2. Post Size

- a. 2 in x 2 in (50.8 mm x 50.8 mm) x 11 gauge (0.12 in or 3.0 mm)
- b. 3 in x 3 in (76.2 mm x 76.2 mm) x 11 gauge (0.12 in or 3.0 mm)

C. Post Brackets:

1. U-Shaped Ornamental Bracket Kit: Includes the following: 1/4 in (6.3 mm) U-shape bracket, nuts and carriage bolts 5/16 in (8.0 mm), Chicago screws and self-drilling screws. All galvanized steel. Tamper-proof fasteners kit available.

**** NOTE TO SPECIFIER ** Select number of brackets based on panel height. Delete options not required.**

- a. For 4-foot-high nominal panels: 4 brackets per panel.
- b. For 6-foot-high nominal panels: 6 brackets per panel.
- c. For 8-foot-high nominal panels: 8 brackets per panel.

D. Post caps:

**** NOTE TO SPECIFIER ** Select type. Delete options not required.**

1. Aluminum alloy: For dimension posts 2 in x 2 in (50.8 mm x 50.8 mm), 3 in x 3 in (76.2 mm x 76.2 mm) and 4 in x 4 in (101.6 mm x 101.6 mm).
2. Galvanized steel: For larger dimensions.

E. Polyester powder coating: (See article 2.02B).

F. Concrete: (See article 3.05B)

NOTE TO SPECIFIER ** Select barbed wire spacing and type. Delete if barbed wire not required.

- G. **Barbed wire**: Zinc or aluminum coated steel wire, double strand, 12 gauge (2.6 mm), twisted line wire with 4-point barbs, spaced approximately (choose one) 3 in or 5 in (76.2 mm or 127.0 mm) conforming to ASTM A121.
- H. **Barbed wire supporting arms**: Pressed steel arms with provisions for attaching three (3) rows of barbed wire. Arms shall withstand 250 lb (113 kg) downward pull at outermost end of arm without failure. Arms are fastened to the posts.
- I. **“V” shaped barbed wire supporting arms**: Pressed steel arms at both sides, with provisions for attaching six (6) rows of barbed wire. Arms shall withstand 250 lb (113 kg) downward pull at outermost end of arm without failure. Arms are fastened to the posts.

NOTE TO SPECIFIER ** Delete if overhang extension is not required. Larger dimensions are available on request.

- J. **Option Overhang**: The 45° extension has the same dimensions as the post 2 in x 2 in or 3 in x 3 in (50.8 mm x 50.8 mm or 76.2 mm x 76.2 mm) and measuring a minimum 18 in (460 mm) length. They are welded at the end of the square post by forming an angle of 45° and provided with two (2) kits of fasteners to receive a panel of 16 in (420 mm).

2.03.2 SINGLE / DOUBLE SWING GATES

A. Configuration:

NOTE TO SPECIFIER ** Select single, double, or as shown on the drawings if more than one type. Delete options not required.

1. Single swing.
2. Double swing.

3. Swing as shown on Drawings.

B. Gate Frame:

The fence frame shall be fabricated from two (2) vertical square tubes, 2 in x 2 in (50.8 mm x 50.8 mm) with a wall thickness of 1/8 in (3.2 mm), welded at panel intersections to form a rigid structure in accordance with **ASTM F900**.

Fence frames shall be fabricated from aluminum tubing and coated with a polyester coating. (See article 2.02B)

C. Gate Posts:

Cold rolled from 1008 grade steel to meet ASTM A500 and ASTM A787 and with dimensions corresponding to the gate openings listed below. Each post includes an aluminium cap and U-Shaped Bracket Kit Kits for adjacent panel mounting. Two (2) hinges are used to attach the gate frame to the posts. Length as required for installation type:

**** NOTE TO SPECIFIER ** Select post installation type. Delete option not required.**

1. Installation:
 - a. In ground, post length as required for local frost line requirements
 - b. Surface mounted, flanged

**** NOTE TO SPECIFIER ** Select post size based on panel height and gate opening dimensions. Delete options not required.**

2. Post Size:
 - a. For fences with 4-foot-high nominal panels:

**** NOTE TO SPECIFIER ** For fences with 4-foot-high nominal panels. Delete options not required.**

Opening Dimension	Post Size
3 ft to 8 ft	3 in x 3 in (76.2 mm x 76.2 mm) 11 gauge (3.0 mm)

- b. For fences with 6-foot-high nominal panels:

**** NOTE TO SPECIFIER ** For fences with 6-foot-high nominal panels. Delete options not required.**

Opening Dimension	Post Size
3 ft to 8 ft	3 in x 3 in (76.2 mm x 76.2 mm) 11 gauge (3.0 mm)

- c. For fences with 8-foot-high nominal panels:

**** NOTE TO SPECIFIER ** For fences with 8-foot-high nominal panels. Delete options not required.**

Opening Dimension	Post Size
3 ft to 6.5 ft	3 in x 3 in (76.2 mm x 76.2 mm) 11 gauge (3.0 mm)
> 6.5 ft to 8 ft	4 in x 4 in (101.6 mm x 101.6 mm) 11 gauge (3.0 mm)

D. Gate Hardware:

1. Standard Hardware: Hot-dip galvanized steel in conformity with ASTM F900, sized to assure proper gate operation. Non-moving parts shall be powder coated.
 - a. Hinge: Structurally designed to support all gates without deformation during opening and closing.
 - b. Latch: Clamp-on gravity system that is self latching. Includes the following:
 - Self-locking Device: With padlock eyes as an integral part of latch.

**** NOTE TO SPECIFIER ** Include for double gates. Delete if not required.**

2. Additional Hardware for Double Gates:
 - a. Key lockable drop bolt: Secure one gate in closed position.

**** NOTE TO SPECIFIER ** Optional hardware. Delete options not required.**

3. Optional Hardware:
 - a. Hydraulic door closer hinges for light, medium, and heavy-duty use: Automatic closing mechanism with damping. [Replaces the standard hinge]
 - b. Panic Bar and Plate: (Dorex 8500). For quick unlocking during an emergency. Includes protective plates that prevent activation from outside the fence [Replace Standard Latch]
 - c. Keyed Lock for Single and Double Swing Gate: LOCINOX (LAKQ U2) with lockbox with key and receiver. [Replace Standard Latch]
 - d. Kick Plate: Solid plate added to both sides of the gate and protects the door from shoe marks.
 - e. Other: [Insert brand and model of optional hardware required]

E. **Polyester Coating:** (See article 2.02B)

F. **Concrete:** (See article 3.05)

2.03.3 CANTILEVER GATES

Omega II cantilever slide gates shall be fabricated in accordance with ASTM F1184 Class 2 as well as F2200 when gate is automated. Gate frame members are all made of aluminum extrusions 6061-T6 following ASTM B221. Each gate frame consists of a top track, a bottom track, vertical uprights, horizontal beams and diagonal braces. Components shall be welded together forming a rigid one-piece frame integrating the top and bottom track. Vertical uprights shall be positioned on the gate frame, up to approximately 8 ft (2 438 mm) apart and dividing the opening section of the frame into equal sections as well as the tail section.

each opening section will be reinforced with one (1) diagonal brace and each tail section will be cross braced using two (2) diagonal braces.

**** NOTE TO SPECIFIER ** Cantilever gates reinforcement according to the gate opening. Delete options not required.**

1. For openings up to 16 ft (4 877 mm), each front section includes one panel section reinforced with a structural aluminium tube frame, and each tail section shall be reinforced with an aluminium tube frame and two (2) diagonal cross-braces.
2. For openings over 16 ft (4 877 mm), each front opening section shall be reinforced with a structural aluminium tube frame and one (1) diagonal brace, and each tail section shall be reinforced with an aluminium tube frame and two (2) diagonal cross-braces.

Each gate has an overall length equal to 1.5x its single opening (opening and overhang). An additional distance equal to the gate single opening length must be kept unobstructed to one side of the single cantilevered gate for opening functionality (also applies to double cantilevered gates). Therefore, an entire distance equal to 2.5x the gate single opening is required in total for each gate to allow opening and closing functionality.

- A. Gate Posts: Gate posts shall be 4 in (101.6 mm) steel square sections. The steel shall meet requirements of ASTM A500, Grade B with a minimum yield strength of 40 000 psi (276 MPa). The length of the posts is minimum 36 in (914 mm) more than the actual height of the fence for installation in the ground depending on local land code requirements (frost line).

**** NOTE TO SPECIFIER ** Select single or double cantilever gates and tracks. Delete options not required.**

1. Single cantilevered gate:
 - a. Single track: 1 latch post and 2 support posts.
 - b. Double track: 1 latch post and 4 support posts.
2. Double cantilevered gates:
 - a. Single track: 4 support posts.

- b. Double track: 8 support posts.

**** NOTE TO SPECIFIER ** For double cantilever gates, the dimensions of each of the two (2) doors follow the same dimensions as the single cantilevered gate (see 2.03.3C below), be considered twice to represent the bi-parting. Delete options not required.**

B. Gate Single Openings:

The maximum Single Cantilever Gate Opening is 24 ft (7 315 mm). It includes: two (2) truck assemblies with their support brackets, one (1) gate latch (if manually operated), one (1) gate catch, bottom stabilizing brackets and all hardware needed for installation.

**** NOTE TO SPECIFIER ** Single Cantilever Gate Dimensions, based on the gate opening. Delete options not required.**

Gate Single Opening	Overhang Length	Overall Length
4 ft (1 219 mm)	2 ft (609 mm)	6 ft (1 828 mm)
8 ft (2 438 mm)	4 ft (1 219 mm)	12 ft (3 657 mm)
16 ft (4 876 mm)	8 ft (2 438 mm)	24 ft (7 315 mm)
24 ft (7 315 mm)	12 ft (3 657 mm)	36 ft (10 972 mm)

- C. Panel section: Panels shall be sized for the fence sections of the gate opening and welded to the gate frame and both tracks.
- D. Vertical Uprights are 2 in x 2 in (50.8 mm x 50.8 mm) 6061-T6 aluminum square extrusion. Their number and position will be determined by the opening.
- E. Horizontal beams are 2 in x 2 in (50.8 mm x 50.8 mm) 6061-T6 aluminum square extrusion. Their number and position shall be determined by the opening.
- F. Bracing shall be done with 1 in x 2 in (25.4 mm x 50.8 mm) 6061-T6 aluminum rectangular extrusion. Their number and position will be determined by the opening.
- G. Top Track is a 6061-T6 aluminum extrusion. It combines the necessary features for the gate to slide and to facilitate welding assembly. Track will resist a reaction load of 2 000 lb (907 kg).
- H. Bottom Track is a 6061-T6 aluminum extrusion. It combines the necessary features for the gate to resist swaying and to facilitate welding assembly.
- I. Truck Assembly: Swivel type, zinc plated body with four (4) sealed and lubricated ball bearings, 2 in (50.8 mm) in diameter by 9/16 in (14.3 mm) in width, and two (2) horizontal rolling wheels to ensure truck alignment in track. Trucks mount on post brackets using 3/4 in (19.1 mm) diameter machined stud with reduced shank. Truck assembly designed to withstand same reaction load as track.
- J. Gate accessories and Hardware: Malleable iron or steel, galvanized after fabrication. Latches provide the possibility for padlocking.
- K. Bottom Guide: Each assembly shall consist of one (1) 2 in (50.8 mm) diameter ball bearing hidden inside the bottom track, adjustable in height to maintain gate frame plumb and in proper alignment.
- L. Coatings:
1. Paint primer:
 - a. Epoxy-vinyl paint primer is applied to cantilever gate aluminum frame in 1 layer by spray paint process. Primer shall cover all visible surfaces.
 2. Paint Frame coat:

- a. The acrylic surface coating color shall be standard black or any optional color, see Omega Web site – or color chart as per RAL code.
 - b. Acrylic coating is applied in 1 layer by spray paint process.
3. Panel coat: (See article 2.02B)
- M. Concrete: (See article 3.05)

**** NOTE TO SPECIFIER ** Delete gate operators if not required.**

2.04 GATE OPERATOR

(This section describes typical gate operator systems. For detailed precisions and supplementary information, please contact a gate operator vendor.)

- A. General: Provide factory-assembled automatic gate operation system designed for gate size, type, weight, construction, use, traffic-flow patterns, and operation frequency. Provide operation system for gate specified, of size and capacity and with features, characteristics, and accessories suitable for Project conditions, recommended or provided by gate manufacturer. Complete with electric motor and factory-prewired motor controls, remote-control stations, control devices, power disconnect switch, obstruction detection device, lockable weatherproof enclosures protecting controls and all operating parts, and accessories required for proper operation. Provide enclosures with corrosion-resistant-protective and decorative finish and two (2) keys per lock. Include wiring from motor controls to motor. Coordinate operator wiring requirements and electrical characteristics 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.
 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.
- B. Comply with NFPA 70.
- C. Control Equipment: Comply with NEMA ICS 1, NEMA ICS 2, and NEMA ICS 6, with NFPA 70, Class 2 control circuit, maximum 24-V AC or DC.

**** NOTE TO SPECIFIER ** Select Electromechanical or Electrohydraulic operation as recommended by the manufacturer. Delete option not required.**

- D. Electrohydraulic Operation: Provide unit designed for [gate] [surface] [concrete base/pad] [pedestal] [post] <Insert mounting> mounting; consisting of electric motor, pump, hydraulic actuator to suit gate type and valves.

**** NOTE TO SPECIFIER ** Provide in cold climates. Delete if not required.**

1. Provide heater to maintain constant temperature and cold-weather hydraulic fluid with hydraulic locking in both directions.
- E. Electromechanical Operation: Provide unit designed for [gate] [surface] [concrete base/pad] [pedestal] [post] <Insert mounting> mounting; consisting of electric motor and factory-prewired motor controls, starter, speed control device, chain-drive assembly, brake, clutch or torque limiter, and as follows:

**** NOTE TO SPECIFIER ** Select one of the following based on manufacturer recommendations. Delete options not required.**

1. Enclosed worm gear reducer, roller chain drive.
 2. Enclosed worm gear and chain and sprocket reducers, roller chain drive.
 3. V-belt and [worm gear] [chain and sprocket] reducers, roller chain drive.
 4. Enclosed worm gear reducer, wheel and rail drive.
- F. Operation Cycle Requirements: Design gate operator to operate for not less than the following duty and cycles per hour. One cycle equals one gate opening plus one gate closing.

**** NOTE TO SPECIFIER ** Select based on Owners project requirements. Delete options not required.**

1. Medium Duty: 10 cycles per hour.
2. Heavy Duty: 25 cycles per hour.
3. Peak Duty: 20 cycles per hour at peak periods.
4. <Insert requirements for duty: ____ cycles per hour or day.>

G. Gate Operation Speed:

**** NOTE TO SPECIFIER ** Select based on Owners project requirements. Delete options not required.**

1. Minimum 45 fpm (0.229 m/s).
2. Minimum 60 fpm (0.305 m/s).
3. <Insert speed ____ fpm (____ m/s)>.

H. Electric Motors: High-starting torque, continuous-duty, insulated electric motors, complying with NEMA MG-1, sized to start and operate size and weight of gate considering Project's service conditions without exceeding nameplate ratings or considering service factor.

1. Direction:

**** NOTE TO SPECIFIER ** Select reversible or single. Delete option not required.**

- a. Reversible.
- b. Single direction.
2. Service Factor: According to NEMA MG-1, unless otherwise indicated.
3. Enclosure: Totally enclosed, nonventilated or fan-cooled motors, fitted with plugged drain, unless otherwise indicated.
4. Thermal Protection:

**** NOTE TO SPECIFIER ** Select manual or automatic thermal protection. Delete option not required.**

- a. Internal manual reset.
- b. Internal automatic reset.
5. Motor phase and power requirements:

**** NOTE TO SPECIFIER ** Select Motor phase and power requirements. Delete options not required.**

- a. Motors Smaller Than 1/2 hp: Single phase, 60 Hz.
- b. Motors Smaller Than 1/2 hp: Polyphase, 60 Hz.
- c. Motors 1/2 hp and Larger: Polyphase, ____ voltage rating, 60 Hz.
- d. Motor horsepower as recommended by operator manufacturer.
- e. Motor horsepower as indicated on Drawings.
- f. <Insert Motor horsepower ____>.
- I. Limit Switches: Adjustable switches, interlocked with motor controls and set to automatically stop gate at fully retracted and fully extended positions.
- J. 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.

**** NOTE TO SPECIFIER ** Select type. Delete options not required.**

1. Integral fail-safe release, allowing gate to be pushed open without mechanical devices, keys, cranks, or special knowledge.
2. Mechanical device, key, or crank-activated release.

K. Operating Features: Include the following:

1. Digital Microprocessor Control: Electronic programmable means for setting, changing, and adjusting control features.

- a. Provide unit that is isolated from voltage spikes and surges.

**** NOTE TO SPECIFIER **Delete option if not required.**

- b. Provide unit capable of monitoring and auditing gate activity.
2. Fully Systems Compatible: 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.

**** NOTE TO SPECIFIER **Delete option if not required.**

- a. Provide unit with timer cut-off 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:

**** NOTE TO SPECIFIER ** Select Clock Timer period. Delete option not required.**

- a. 24-hour, programmable for regular events.
- b. Seven-day, programmable for regular events.

2.05 REMOTE CONTROLS

Electric controls separated from gate and motor and drive mechanism, with NEMA ICS 6, Type 1, NEMA ICS 6, Type 4 or other type of enclosure for [surface] [recessed or flush] [concrete base/pad] [pedestal] [post] <Insert mounting> mounting, and with space for additional optional equipment. Provide the following remote-control device(s):

**** NOTE TO SPECIFIER ** Select options. Delete all if keyed control stations are not used.**

A. Keyed Control Station:

1. Keyed, two-position, switch-operated control station located remotely from gate, with on and off functions. Provide two (2) keys per station.
2. Keyed, three-position, switch-operated control station with open and close functions and spring return to off position [with stop button]. Provide two (2) keys per station.
3. Keyed, three-position, switch-operated control station with open and close functions and spring return to off position with stop button. Provide two (2) keys per station.

**** NOTE TO SPECIFIER ** Select options. Delete all if momentary-contact control stations are not required.**

B. Momentary-contact Control Station:

1. Single-button-operated control station with open and close functions.
2. Three-button-operated control station with open, close, and stop positions.
3. Three-button-operated control station with open, close, and stop positions with key switch to lock out open and close buttons. Provide two (2) keys per station.

**** NOTE TO SPECIFIER ** Select card reader coding options. Delete all if card readers are not required.**

C. Card Reader: Functions only when authorized card is presented. Provide insertion-reader-type, face-lighted unit fully visible at night and one of the following:

1. Magnetically coded, single-code system activated by coded card.
2. Magnetically coded, single-code system activated by coded card and permitting four (4) different access time periods.
3. Easily programmable, multiple-code capability permitting validating or voiding of individual cards.
4. Easily programmable, multiple-code capability permitting validating or voiding of individual cards and permitting four (4) different access time periods.
5. Reader Type:

**** NOTE TO SPECIFIER ** Select card reader type. Delete options not required.**

- a. Touch plate.
- b. Swipe.
- c. Insertion.
- d. Proximity.

**** NOTE TO SPECIFIER ** Delete card reader features not required.**

- 6. Features:
 - a. Timed anti-passback.
 - b. Limited-time usage.
 - c. Capable of monitoring and auditing gate activity.

**** NOTE TO SPECIFIER ** Select digital keypads options. Delete all if digital keypads are not required.**

- D. Digital Keypad Entry Unit: Functions only when authorized code is entered.
 - 1. Multiple-code capability of not less than 5 possible individual codes.
 - 2. Multiple-code capability of not less than 100 possible individual codes.
 - 3. Multiple-code capability of not less than 500 possible individual codes.
 - 4. Multiple-code capability of not less than 2 500 possible individual codes.
 - 5. Multiple-code capability of not less than 10 000 possible individual codes.
 - 6. Multiple-code capability as indicated.
 - 7. Programmable using 1 to 6 digits.
 - 8. Programmable using 1 to 6 digits and permitting up to four (4) different access time periods.
 - 9. Face-lighted unit with metal-keyed keypad fully visible at night
 - 10. Face-lighted unit with keyless-membrane keypad fully visible at night.

**** NOTE TO SPECIFIER ** Delete digital keypads features not required.**

- 11. Features:
 - a. Timed anti-passback.
 - d. Limited-time usage.
 - e. Capable of monitoring and auditing gate activity.

**** NOTE TO SPECIFIER ** Select radio control options. Delete all if radio control stations are not required.**

- E. Radio Control: Digital system consisting of code-compatible universal coaxial receiver, remote antenna with coaxial cable and mounting brackets, including:

**** NOTE TO SPECIFIER ** Select location options. Delete options not required.**

- 1. Location:
 - a. One radio control per gate.
 - b. Where indicated on Drawings.

**** NOTE TO SPECIFIER ** Delete options not required.**

- 2. Receivers:
 - a. One (1) permanently mounted transmitter per receiver.
 - b. Four (4) portable transmitters per receiver.
 - c. <Insert number of transmitters per receiver designed to operate gates as recommended by manufacturer>.

**** NOTE TO SPECIFIER ** Delete options not required.**

- 3. Multiple-code capability: Provide easily programmable transmitter with multiple-code capability permitting validating or voiding of not less than the following codes per channel:
 - a. 1 000 codes per channel.
 - b. 10 000 codes per channel.
 - c. <Insert another number to suit Project>

**** NOTE TO SPECIFIER ** Delete options not required.**

4. Button Transmitters:
 - a. Single-button-operated control station, with open function.
 - b. Single-button-operated control station, with open and close functions.
 - c. Three-button-operated control station, with open, close, and stop functions.
 - d. Three-button-operated control station with open, close, and stop positions, and with key switch to lock out open and close buttons. Minimum two-keys per station.
 - e. Provide transmitters featuring [two] [three] [four] <Insert another number to suit Project> independent channel settings controlling separate receivers for operating more than one gate from each transmitter.

**** NOTE TO SPECIFIER ** Select Telephone Entry System options. Delete all if Telephone Entry Systems are not required.**

- F. Telephone Entry System: Hands-free voice-communication system for connection to building telephone system with digital-entry code activation of gate operator, including:
 1. Auxiliary keypad entry.
 2. Residential System: Designed to be wired to same line with telephone.
 3. Multiunit System: Designed to be wired to a dedicated telephone line, and the following:
 - a. Capacity to access 20 telephones
 - b. Capacity to access 100 telephones
 - c. Capacity to access <Insert number> telephones
 - d. Include electronic directory.

**** NOTE TO SPECIFIER ** Select Vehicle Loop Detector options. Delete all if Vehicle Loop Detector systems are not required.**

- G. Vehicle Loop Detector System: System including automatic closing timer with adjustable time delay before closing and electronic loop detector. Provide an 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. Provide with the following:
 1. Timer cut-off switch.
 2. Operation:
 - a. Designed to open and close gate.
 - b. Designed hold gate open until traffic clears.
 - c. Designed to reverse gate.
 3. Loop:
 - a. Wire, in size indicated for field assembly, and sealant.
 - b. Factory preformed in size indicated; style for [pave-over] [saw-cut] installation.
 4. Installation Style:
 - a. Style for pave-over installation.
 - b. Style for saw-cut installation.

**** NOTE TO SPECIFIER ** Select Vehicle Presence Detector options. Delete all if Vehicle Presence Detector systems are not required.**

- H. Vehicle Presence Detector: System including automatic closing timer with adjustable time delay before closing and presence detector, with adjustable detection zone pattern and sensitivity, designed to detect the presence or transit of a vehicle in gate pathway by interrupting an infrared beam in zone pattern and to emit a signal activating the gate operator, and the following:
 1. Timer cut-off switch.
 2. Operation:
 - a. Designed to open and close gate.
 - b. Designed hold gate open until traffic clears.
 - c. Designed to reverse gate.
 3. Detector type:
 - a. Retroreflective.
 - b. Emitter/receiver.

**** NOTE TO SPECIFIER ** Select Obstruction Detection options. Delete all if Obstruction Detection Devices are not required.**

- I. Obstruction Detection Devices: Provide each motorized gate with automatic safety sensor(s). Activation of sensor(s) causes operator to immediately function as follows:

**** NOTE TO SPECIFIER ** Select action. Delete options not required.**

1. Action:
 - a. Reverse gate in both opening and closing cycles and hold until clear of obstruction.
 - b. Stop gate in opening cycle and reverse gate in closing cycle and hold until clear of obstruction.

**** NOTE TO SPECIFIER ** Select sensor type and all options. Delete options not required.**

2. Sensor Type:
 - a. Internal Sensor: Built-in torque or current monitor senses gate is obstructed.
 - b. 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 the following:
 - 1) Take-up cable reel.
 - 2) Self-coiling cable.
 - 3) Gate edge transmitter and operator receiver system.
 - c. Sensor Edge location:
 - 1) Along entire gate leaf leading edge.
 - 2) Along entire gate leaf trailing edge.
 - 3) Across entire gate leaf bottom edge.
 - 4) Along entire length of gate posts.
 - 5) Along entire length of gate guideposts.
 - 6) Where indicated on Drawings.
 - 7) <Insert extent and location.>
 - d. Photoelectric/Infrared Sensor System: Designed to detect an obstruction in partition's path by interruption of an infrared beam in the zone pattern without obstruction contacting gate.

2.06 ACCESSORIES

**** NOTE TO SPECIFIER ** Select additional accessories to be provided. Delete accessories not required.**

- A. Mounting Kit, including pedestal.
- B. Audio Warning Module: Provide ADA-compliant audible alarm sounding three (3) to five (5) seconds in advance of gate operation and continuing until gate stops moving.
- C. Visual Warning Module: Provide ADA-compliant visible light alarm sounding three (3) to five (5) seconds in advance of gate operation and continuing until gate stops moving.

**** NOTE TO SPECIFIER ** Select alarm light type. Delete option not required.**

1. Constant alarm light
 2. Strobe alarm light
- D. Battery Backup System: Battery-powered drive and access control system, independent of primary drive system, opening gate if power fails. <Insert additional requirements.>
 - E. External electric-powered lock with delay timer allowing time for lock to release before gate operates. Provide with:

**** NOTE TO SPECIFIER ** Select types. Delete options not required.**

1. Solenoid for swing gate.
 2. Magnetic for swing gate.
 3. Solenoid for cantilever gate.
 4. Magnetic for cantilever gate.
- F. Fire box in accordance with local jurisdiction's requirements.

- G. Postal box in accordance with local jurisdiction's requirements.
- H. Fire strobe sensor.
- I. Fire siren sensor.
- J. Intercom System: <Insert requirements.>
- K. Instructional, Safety, and Warning Labels and Signs:

** NOTE TO SPECIFIER ** Select warning sign types. Delete options not required.
--

- 1. According to UL 325.
- 2. Manufacturer's standard for components and features specified.
- 3. As indicated on Drawings.
- 4. <Insert requirements>.

PART III - EXECUTION

3.01 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for a verified survey of property lines and legal boundaries, site clearing, earthwork, pavement work, and other conditions affecting performance.
- 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.

3.02 PREPARATION

Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 ft (152.5 m) or line of sight between stakes. Indicate locations of utilities, lawn sprinkler system, underground structures, benchmarks, and property monuments.

3.03 IN-GROUND CONCRETE INSTALLATION

- A. Install fencing on established boundary lines inside property line
- B. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacing indicated, in firm, undisturbed or compacted soil.
- C. Post Setting: Set posts in concrete footing. Protect portion of posts above ground from concrete splatter. Place concrete around posts and consolidation. Using mechanical devices to set posts is not permitted. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during placement and finishing operations until concrete is sufficiently cured.
 - 1. Dimensions and Profile: As indicated on Drawings.
 - 2. Space line posts uniformly at center to center.
 - 3. Exposed Concrete Footings: Extend concrete 2 in (50.8 mm) above grade. Smooth and shape to shed water.
 - 4. Concealed Concrete Footings: Stop footings 2 in (50.8 mm) <Insert dimension> below grade [as indicated on Drawings] to allow covering with surface material.
 - 5. Posts Set into Concrete in Sleeves: Use steel pipe sleeves pre-set and anchored into concrete for installing posts. After posts have been inserted into sleeves, fill annular space between post and sleeve with [non shrink, non-metallic grout,] [anchoring cement,] mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.
 - 6. Posts Set into Concrete in Voids: Form or core drill holes not less than 5 in (125 mm) deep and 3/4 in (19.1 mm) larger than OD of post. Clean holes of loose material, insert posts, and fill granular space between post and concrete with [non-shrink, non-metallic grout,] [anchoring cement,] mixed and placed to comply with anchoring material manufacturer's written instructions, and finished sloped to drain water away from post.
 - 7. Flange Post Installation: Bolt mounting plates attached to each post to slab or structure as indicated, using expansion bolts.

3.04 FENCE INSTALLATION – Model “OMEGA SAFARI”

- A. Install the fence along the specified layout according to the drawings. The fence panel shall be installed to maintain a clear minimum distance of 1-1/4 in (31.8 mm) and a maximum distance of 2 in (50.8 mm) from the ground surface. Holes for posts shall be at least 8 in (200 mm) in diameter and at least 42 in (1 070 mm) deep.
- B. Posts shall be adequately supported within the concrete forms to maintain the required positioning and prescribed level until concrete has set. All necessary anchors and posts shall be at a minimum depth of 36 in (914 mm) into the ground.
- C. Square Post Installation: Once the concrete is set, the fence sections are fastened to the posts with the desired bracket type.

- a. Ornamental Panel "U" Support Kit: Allows horizontal adjustment of $\pm 1"$ (25.4 mm) and vertical adjustment of 1.5" (38.1 mm).

**** NOTE TO SPECIFIER ** Select post type. Delete option not required.**

Post Size	Post Spacing C/C
2 in x 2 in (50.8 mm x 50.8 mm)	95-3/8 in (2 423 mm)
3 in x 3 in (76.2 mm x 76.2 mm)	96-3/8 in (2 448 mm)

- D. For the fence to follow slopes, it is required to step the fence sections. When faced with a steep slope, it will be necessary to order longer posts and panels cut in half as to keep the gap under the panel to a minimum.
- E. Upon cutting or trimming a post or a panel section, apply a zinc rich primer to the exposed ends and finish with the matching touch-up paint supplied by the manufacturer.

3.05 CAST-IN-PLACE CONCRETE

- A. General: Comply with ACI 301 for cast-in-place concrete.
- B. Materials: Portland cement complying with ASTM C150 <Insert type if required>, aggregates complying with ASTM C33, and potable water [for ready-mixed concrete complying with ASTM C94]. [Measure, batch, and mix Project-site-mixed concrete according to ASTM C94.]
- C. Concrete Mixture: Normal-weight concrete with not less than 3 000 psi (20.7 Mpa) compressive strength (28 days), 3 in (76.2 mm) slump, and contain "coarse aggregate" of a minimum diameter of 1/5 in (5.1 mm) to a maximum of 3/4 in (19.1 mm) maximum size aggregate. A 5% to 7% air entrained or according to recommendation of section 03 00 00.
- D. Materials: Dry-packaged concrete mix complying with ASTM C387 for normal-weight concrete mixed with potable water according to manufacturer's written instructions.

3.06 GROUT AND ANCHORING CEMENT

- A. Non-shrink, Non-metallic Grout: Premixed, factory-packaged, non-staining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Erosion-Resistant Anchoring Cement: Factory-packaged, non-shrink, non-staining, hydraulic-controlled expansion cement formulation for mixing with potable water at Project site to create pourable anchoring, patching, and grouting compound. Provide formulation that is resistant to erosion from water exposure without needing protection by a sealer or waterproof coating and that is recommended in writing by manufacturer for exterior applications.

3.07 GATE INSTALLATION AND ADJUSTMENT

- A. Install gate posts in accordance with manufacturer's instructions.
- B. Concrete Set Gate Posts: Drill holes in firm, undisturbed or compacted soil. Holes shall have a diameter 4 times greater than outside dimension of post, and depths approximately 6 in (150 mm) deeper than frost level. Excavate deeper as required for adequate support in soft and loose soils, and for posts with heavy lateral loads. Set post bottom 36 in (914 mm) below surface when in firm, undisturbed soil. Place concrete around posts in a continuous pour, tamp for consolidation. Trowel finish around post and slope to direct water away from posts. Check each post for vertical and top alignment and maintain in position during placement and finishing operations.
- C. Install gates perfectly horizontal and levelled (at junction), plumb, and secure for full opening without interference.

- D. Attach hardware so to have the nuts inside the property thus making the assembly tamper-proof which will prevent unauthorized removal. Install ground-set items in concrete for anchorage.
- E. Adjust hardware for smooth operation and lubricate where necessary to operate smoothly, easily, and quietly, free from 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.

3.08 GATE OPERATOR INSTALLATION

(Indicative only. Consult local professional for proper design.) (See notes section 2.4.)

- 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/Pads]: Hand-excavate holes for bases/pads, in firm, undisturbed or compacted soil to dimensions and depths and at locations as required by gate operator component manufacturer's written instructions and as indicated on Drawings.
- C. Concrete Bases/Pads: Cast-in-place or precast concrete, made of not less than 3 000 psi (20.7 Mpa) compressive strength (28 days), [depth not less than 12 in (300 mm)] <Insert depth 6 to 12 in (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. Comply with NFPA 70 and manufacturer's written instructions for grounding of electric-powered motors, controls, and other devices.

3.09 GROUNDING AND BONDING

(Indicative only. Consult local professional for proper design.)

- A. Fence Grounding: Install at maximum intervals of [1 500 ft (450 m)] <Insert a lesser distance where grounding resistance is high> except as follows:
 - 1. Fences within 100 ft (30 m) of Buildings, Structures, Walkways, and Roadways: Ground at maximum intervals of [750 ft (225 m)] <Insert a lesser distance where grounding resistance is unusually high>.
 - 2. Gates and Other Fence Openings: Ground fence on each side of opening.
 - 1.1 Bond metal gates to gate posts.
 - 1.2 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 in (460 mm) below finished grade.
 - 3. Conductors: Bare, solid wire for No. 6 AWG and smaller; stranded wire for No. 4 AWG and larger.
 - 3.1. Material Above Finished Grade: [Copper] [Aluminum].
 - 3.2. Material on or below Finished Grade: Copper.
 - 3.3. Bonding Jumpers: Braided copper tape, 1 in (25.4 mm) wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.
 - 4. Connectors and Ground Rods: Listed in UL 467.
 - 4.1. Connectors for Below-Grade Use: Exothermic welded type.
 - 4.2. Ground Rods: Copper-clad steel. Size: 5/8 in by 96 in (16 mm by 2 400 mm).
- B. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing and at a maximum distance of 150 ft (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 ground rod vertically until the top is 6 in (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 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.

3.10 FIELD QUALITY CONTROL- GROUNDING

(Indicative only. Consult local professional for proper design.)

- A. Ground-Resistance Testing Agency: [Owner will engage] [Engage] a qualified independent testing agency to perform field quality-control testing.
- B. Ground-Resistance Tests: Subject completed grounding system to a megger test at each grounding location. Measure ground resistance not less than two (2) 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 ground resistance. Perform tests by two-point method according to IEEE 81. Desired Maximum Grounding Resistance Value: 25 ohms. Excessive Ground Resistance: If resistance to ground exceeds desired value, notify Architect promptly. Include recommendations to reduce ground resistance and proposal to accomplish recommended work.
- C. Report: Prepare test reports, certified by testing agency, of ground resistance at each test location. Include observations of weather and other phenomena that may affect test results.

3.11 ADJUSTING (For gate operator only)

- A. Gate: Adjust gate to operate smoothly, easily, and quietly, free from 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 Operator: Energize circuits to electrical equipment and devices. Adjust operators, controls, safety devices, [alarms,] and limit switches.
 - 1. Electrohydraulic Operator: 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. Test controls [, alarms,] and safeties. Remove damaged and malfunctioning units, replace with new units, and retest.
- C. Lubricate hardware [, gate operator,] and other moving parts.

3.12 DEMONSTRATION (For gate operator only)

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

1. Test and adjust [operators,] [controls,] [alarms,] [safety devices,] hardware, and other operable components. Replace damaged or malfunctioning operable components.
2. Train Owner's personnel on procedures and schedules for starting and stopping, troubleshooting, servicing, and maintaining equipment and schedules.
3. Review data in maintenance manuals. Refer to Division 1 Section "Contract Closeout." and/ or Section "Operation and Maintenance Data."
4. Schedule training with Owner (, through Architect,) with at least seven days' advance notice. END OF SECTION 02821

3.13 SITE CLEANING

Clean and adjust soil disturbed during work. Get of all surplus and waste materials and replace damaged turf in accordance with directives of Engineer and Consultant.

3.14 MAINTENANCE

- A. Inspection
 1. A thorough visual inspection shall be done annually.
 2. This inspection must include overall verification of physical condition.
- B. Moveable parts shall be adjusted, if needed, every five (5) years, unless project requires additional inspections.
- C. In areas of extreme winter conditions, entire installation must be free of excessive ice and snow accumulation.