SECTION 323116 - WELDED WIRE 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. Steel welded-wire fences.
2. Steel welded wire gate.

B. Related Requirements:

1. Section 033000 "Cast-in-Place Concrete for base material.
2. Section 281300 "Access Control" for access control devices installed at gates and provided as part of a security system.
3. Section 312000 "Earth Moving" for site excavation, fill, and backfill where welded-wire fences and gates are located.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project Site.

1.4 ACTION SUBMITTALS

A. Product Data: Manufacturer's descriptive data for each type of product.

B. Shop Drawings: For fence and gates. Include plans, elevations, sections, details, and attachments to other work.

1. Include 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)**] square for wire mesh.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For gate operators to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Minimum 2 years documented experience in work of tis section.

B. Mockups: Build mockups to verify selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for fabrication and installation.

1. Include [**10-foot (3-m)**] length of fence complying with requirements.
2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 WARRANTIES

A. Furnish manufacturer's 10 year warranty providing coverage against corrosion of galvanized steel coatings and blistering or loosening of powder coatings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

2.2 METALLIC-COATED-STEEL, WELDED-WIRE FENCES

A. Metallic-Coated-Steel, Welded-Wire Fences:
1. Basis-of-Design Product: Subject to compliance with requirements, provide Designmaster fence panels as manufactured by Deacero or comparable product by one of the following only:
   a. Ametco Manufacturing Corporation.
   b. BarnettBates Corporation.
   c. BetaFence USA LLC.
   d. Deacero S.A. DE C.V.
   e. Hill & Smith Inc.
   f. Jerith Manufacturing Company, Inc.
   g. Master Halco.
   h. Metalco Fence & Railing Systems; Atlantis Products, Inc.
   i. Omega II Fence Systems; a division of Metaltech - Omega Inc.

B. Fence Fabric: Metallic-coated-steel wire.

1. Spacing of Vertical Wires: **2 inches (51 mm)**.
2. Spacing of Horizontal Wires: 6 **inches (153 mm)**.
3. Horizontal & Vertical Wire Size: 6 Gauge [**0.2031 inch (5.16 mm)**].
4. Resistance welded steel wire mesh, ASTM A185/A815M, 6 Gauge, Class 1 galavnised steel wire per ASTM A641/A641M.

C. Posts:

1. Posts: Square tubes **2 by 2 inches (50 by 50 mm)** nominal-thickness steel sheet and hot-dip galvanized after fabrication.
2. Length: To suit panel height and post mounting.
3. Bases: Steel plate welded to bottom of posts, with four plated steel anchor bolts per base.

D. Post Caps: UV-resistant plastic sized to post dimensions, friction fit.

E. Fasteners: Manufacturer's standard tamperproof**,** corrosion-resistant, color-coated fasteners matching fence components with resilient polymer washers or clips.

F. Finish: Polyester powder coated to approximately 4 mils thickness.
1. Color: Black
2. Salt Spray Resistance: no rusting or blistering tested to ASTM B117 for 1000 hours.
3. Adhesion: tested to ASTM D3359, Method B

2.3 SWING GATES

A. Gate Configuration: As indicated.

B. Gate Frame Height: **As indicated**.

C. Gate Opening Width: **36 inches (914 mm)**.

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. 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**].

F. Additional Rails: Provide as indicated, complying with requirements for fence rails.

G. Infill: Welded-wire fence fabric matching adjacent fence.

H. 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**>.

I. 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; galvanized.

J. 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; galvanized.

K. 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 plate; hot-dip galvanize after fabrication.

L. 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 plate; hot-dip galvanize after fabrication.
2. Mounting: Mortise into post.

M. 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 plate; hot-dip galvanized after fabrication. 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.

N. 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**.

O. Metallic-Coated-Steel Finish: **High-performance coating**.

2.4 FENCE AND GATE MATERIALS

A. 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).

B. Plates, Shapes, and Bars: ASTM A 36/A 36M.

C. Tubing: ASTM A 500/A 500M, cold-formed steel tubing.

D. 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).

1. Interior surface of tubes formed from uncoated steel sheet shall be hot-dip zinc coated same as exterior.

E. Metallic-Coated Steel Sheet: Galvanized-steel sheet or aluminum-zinc, alloy-coated steel sheet.

F. Galvanized-Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 50 (Grade 340), with **G90 (Z275)** coating.

G. Aluminum-Zinc, Alloy-Coated Steel Sheet: ASTM A 792/A 792M, structural quality, Grade 50 (Grade 340), with AZ60 (AZM180) coating.

H. Iron 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.

I. Aluminum Castings: ASTM B 26/B 26M, Alloy A356.0-T6.

J. Galvanizing: For components indicated to be galvanized and for which galvanized coating is unspecified, 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.

2.5 MISCELLANEOUS MATERIALS

A. Concrete: Normal-weight, air-entrained, ready-mix concrete complying with requirements in Section 033000 "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.

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

2.6 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**.
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).

2.7 METALLIC-COATED-STEEL FINISHES

A. Galvanized Finish: Clean welds, mechanical connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

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/A 780M.

C. Powder Coating: Immediately after cleaning and pretreating, apply two-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**.

D. High-Performance Coating: Apply epoxy primer, polyurethane 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 Section 017300 "Execution."

3.3 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 (1.2 m).

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 dimension**>. 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 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 at 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 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 are 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.

H. 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.

I. 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.

J. Lubricate hardware[**, gate operators,**] and other moving parts.

END OF SECTION 323116