

## SECTION 32 31 00 – FENCES AND GATES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions.

#### 1.2 SUMMARY

- A. This Section includes the following:

1. Fencing system complete with all hardware, posts, rails, gates, and accessories necessary for a structurally integrated and aesthetically balanced installation.
2. Swinging gates and related hardware
3. Sliding Gates and related hardware
4. Concrete foundation for posts

- B. Related Sections

1. 03 30 00 Cast in Place Concrete
2. 31 00 00 Earthwork

#### 1.3 REFERENCES

- A. American Society for Testing and Materials:

1. ASTM A123 Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
2. ASTM A653 Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
3. ASTM B117 Standard Practice for Operating Salt Spray (Fog) Apparatus
4. ASTM B633 Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel
5. ASTM C33 Standard Specification for Concrete Aggregates
6. ASTM C150 Standard Specification for Portland Cement
7. ASTM C207 Standard Specification for Hydrated Lime for Masonry Purposes
8. ASTM D1654 Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments
9. ASTM D2248 Standard Practice for Detergent Resistance of Organic Finishes
10. ASTM D2794 Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation
11. ASTM D3359 Standard Test Methods for Measuring Adhesion by Tape Test
12. ASTM D3363 Standard Test Method for Film Hardness by Pencil Test
13. ASTM D4141 Standard Practice for Conducting Black Box and Solar Concentrating Exposures of Coatings
14. ASTM F2408 Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets

B. American Concrete Institute:

1. ACI 301 Specifications for Structural Concrete

1.4 SYSTEM DESCRIPTION

- A. The Manufacturer shall supply a Fencing System complete with all hardware, posts, rails, gates and accessories necessary for a complete and aesthetically balanced installation.
- B. Design Requirements: Fencing system, foundation and installation shall be engineered to withstand [90] mph wind load. (Where applicable, wind load rating to be based on IBC 2003 or local code if more stringent.)

1.5 SUBMITTALS

- A. Product Data: For each product indicated, include manufacturer's recommendations for installation.
- B. Installation Drawings: Show layout, locations, components, materials, dimensions, sizes, weights, finishes of components, installation and operational clearances, gate swings, post sizes, spacing and mesh type, gate details/dimensions, details of post anchorage, and post attachment/bracing.
- C. Samples: Provide color selections and samples for finishes on fence and accessories if requested by the specifier.

1.6 QUALITY ASSURANCE

- A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and the materials and techniques specified. Review and follow manufacturer's installation instructions.
- B. Provide fence system and gates, as a complete unit produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.
- C. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with a minimum of 10 years documented experience.
- D. Field Quality Control to be conducted by Owner's Project Manager.

1.7 DELIVERY, HANDLING, AND STORAGE

- A. Deliver fence materials, gates, posts, and accessories to project site, completely pre-finished. Upon receipt at the job site, all materials shall be checked to ensure that no damages occurred during shipping. Materials shall be handled and stored properly to protect against damage and theft.
- B. Handle fence components to protect finish coating from any scuffs, abrasion or other damage during unloading and installation. Excessive damage to factory applied coatings will be cause for rejection.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURER

#### A. Acceptable Manufacturers:

1. Betafence, Ennis, TX 75119, fax: 972-878-4703, 888-650-4766

### 2.2 MATERIAL

#### A. Fencing System: UpGrade-C Commercial Ornamental Fence System shall conform to Betafence's Landmark, Summit, Pinnacle 2, 3 or 4-Rail style manufactured by Betafence. Subject to the performance and design requirement specified herein, fence and gates shall be manufactured from the following materials:

1. Pickets: Per ASTM F 2408 with strength to a minimum yield of 45,000 psi. The steel shall be hot-dip galvanized to meet requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.60 oz/ft<sup>2</sup> coating designation G-60 or equivalent. G-90 is available.
  2. Post and Rails: Per ASTM F2408 and shall be hot-dip galvanized to meet requirements of ASTM A653/A653M with a minimum zinc coating weight of 0.90 oz/ft<sup>2</sup> coating designation G-90 or equivalent.
  3. Fence Panels
    - a. Panel Width: Standard Panel width shall be 8' wide.
    - b. Panel Height: Panel Height shall be UpGrade-C [4', 5', 6', 7', 8' High.
- B. Pickets: Pickets to be 3/4" square tubing with 16 or 18 gauge wall thickness spaced UpGrade-C 4-19/32" OC with 3/4" ST on center.
- C. Rails: Rails shall be 1 1/2" formed channel with 15 gauge wall thickness.
- D. Posts: Posts shall be 2 1/2" square tubing with 12 or 14 gauge wall thickness.
1. Post Caps: Shall be of press on type steel caps zinc plated to ASTM B633, Service class II or malleable steel caps galvanized to ASTM A123.
  2. Panel Hangers: Shall be stainless or galvanized steel with galvanized, stainless, or zinc plated fasteners. All brackets shall be finished to match fence finish and color.
  3. Picket Finials: Picket finials are cast alloy Types 1 (Round Point), 2 (Spear Point) or 3 (Fleur De Lis), welded to picket and are finished to match fence color.
- E. Gate Kits: Design of gates shall be as shown on the drawings.
1. Gate Uprights and Panels: Materials as described above in 2.2.
  2. Frame Uprights: Shall be factory MIG welded, then assembled in the field. If necessary, truss rods, or cables to be used to prevent gate sag and allow for future adjustment.
  3. Gate Posts and Foundation: Size as determined by Engineer, based on gate size, local wind loading requirements, and installation type.
- F. Swing Gates: Design of gates shall be as shown on the drawings.
1. Gate Frames and Infill Panels: Materials as described above in 2.2.

2. Frame Members: Shall be MIG welded. If necessary, truss rods or cables to be used to prevent gate sag and allow for future adjustment.
  3. Gate Posts and Foundation: Size as determined by Engineer, based on gate size, local wind loading requirements, and installation type.
  4. Hinges: Manufacturer's standard hinges, structurally capable of supporting gate leaf and allow opening and closing without binding. Non-lift-off type hinge design shall permit gate to swing 180<sup>0</sup> (degrees). Hinge pins shall be non-removable.
  5. Latch: Capable of retaining gate in closed position and have provision for padlock.
  6. Keeper: Provide keeper for each gate leaf over 5 feet wide. Gate keeper shall consist of mechanical device for securing free end of gate when in full open position.
- G. Slide, Cantilever and Overhead Track Gates: Design of gates shall be as shown on the Drawings.
1. Gate Frames and Infill Panels: Materials as described above in 2.2.
  2. Frame Members: Shall be MIG welded. If necessary, truss rods or cables to be used to prevent gate sag and allow for future adjustment.
  3. Gate Posts and Foundation: Size as determined by Engineer, based on gate size, local wind loading requirements, and installation type.

### 2.3 POWDER COATED FACTORY FINISH

- A. Coating Material: Posts, post caps, rails, pales, brackets and security mesh shall be finished with a factory applied TGIC polyester powder coating of the "Super-Durable" class. Powder coated finish shall meet or exceed the following performance criteria. Color shall be Black.
- B. Applicable Requirements to Validate the Coating Process:
1. Adhesion Resistance: ASTM D3359, Measuring Adhesion by Tape Test, Method B.
    - a. Minimum Performance Requirement: Coating retention of not less than 95%.
  2. Impact Resistance: ASTM D2794, Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
    - a. Minimum Performance Requirement: resistance to impact – Pass, 9 N m.
  3. Film Hardness ASTM D3363, Film Hardness by Pencil Test
    - a. Minimum Performance Requirement – Minimum Hardness: 2H.
  4. Solar Concentration Exposure: ASTM D4141, Conducting Black Box and Solar Concentrating Exposures of Coatings, Method C. (Equivalent to EMMAQUA NTW)
    - a. Minimum Performance Requirement - coating must test to a minimum of 50% Gloss Retention at 1,400 MJ/m<sup>2</sup> with no film failure, chalking, cracking or checking and no more than 10% fading.
  5. Film Thickness: ASTM G12, 2.0 min.
  6. Flexibility: ASTM D-1737-89, No breaks, flakes or cracks on Q-panel 5B (100% adhesion to the substrate).
  7. Gloss 60 angle: ASTM D-523-89. 50- 60
  8. Abrasion Resistance: ASTM D1044, 90-95 mg weight loss
  9. Accelerated Weathering: ASTM G-23, 1000 hours (70% gloss retention, ΔE: <2.0).
  10. Humidity: ASTM D2247, 1000 hours – No blisters
  11. Thickness: Provide film thickness of 2-4 mils as measured by manufacturer's standard powder coat measurement and inspection procedures.

12. Pretreatment: The fence sheeting and framework shall be prepared using a 7 stage Zinc Phosphate wash line. The pre-treatment cleaning system will remove foreign material and to properly prepare the surface to achieve the coating system requirements specified above.
13. Curing: Heat cure in accordance with powder manufacturer's prescribed cure schedule to properly crosslink and bond finish to metal substrate.
14. Chemical Resistance: ASTM B117
  - a. Corrosion Resistance:
    - 1) Procedure: Preparation of Test Specimens- Perform a single scribe the length of the specimen, within one inches of any edge and deep enough to expose the base metal. Expose the specimen for 1,000 hours according to ASTM B117-07 using a 5% salt solution and 95°F operational temperature. After exposure, remove specimens and wipe dry. Immediately apply tape (Permacel 99 or equal) over scribed area by pressing down firmly against the coating. Sharply pull the tape off at a right angle to the surface being tested.
    - a) Performance: The required is a minimum of seven on the scribed edge and minimum blister rating of eight within the test specimen field in accordance with tables in ASTM D1654.

## 2.4 CONCRETE FOOTINGS

*\*This section shall be superseded by requirements of anti-ram barrier system if used in conjunction with this installation\**

- A. General: Comply with ACI 301 for cast-in-place concrete; materials consisting of Portland cement complying with ASTM C150, aggregates complying with ASTM C33, and potable water.
- B. Concrete Mixes: Normal-weight concrete air entrained with not less than 3000-psi (20.7-MPa) compressive strength (28 days), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum size aggregate.
- C. Footings: Footings shall be minimum 3,000 psi after twenty-eight (28) days concrete. Footing sizes shall be determined by Engineer.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Verify areas to receive fencing.
- B. Coordinate fence installation with work of other sections listed in these specifications.
- C. Examine conditions under which fencing and gates are to be installed. Notify Contractor of unsatisfactory conditions. Do not proceed with work until conditions are satisfactory to the installer.

### 3.2 INSTALLATION

- A. Install fence and gates in accordance with manufacturer's instructions and approved installation drawings. Install fencing to withstand wind load as specified.
- B. Handle fence components to protect finish coating from any scuffs, abrasion or other damage during installation. Excessive damage to factory applied coatings will be cause for rejection.
- C. Space posts at dimensions indicated in the installation drawings. Attach fence rails to posts using galvanized, stainless steel or zinc plated panel hanger brackets supplied by manufacturer. Field welding of panels to posts is unacceptable as it will cause significant damage to the galvanizing and powder coat protective finishes.
- D. Concrete Footings: Place concrete around posts and vibrate or tamp for consolidation. Verify that posts are set plumb, aligned, and at correct height and spacing, and stabilized in position during placement and finishing operations until concrete is sufficiently cured. Protect portion of posts above ground from concrete splatter.
- E. Install gates 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 gate to operate smoothly, easily, and quietly throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- F. Avoid unnecessary cutting, drilling and welding of pre-finished fence components. If necessary to cut drill, weld or otherwise modify product due to field conditions, repair factory finish in accordance with item 2.3.7 below.
- G. Touch-up any necessary areas by lightly sanding; apply a zinc-rich cold galvanizing primer followed by a high quality acrylic lacquer paint to match finish. (Touch-up paint available from manufacturer) Note: field applied touch-up cannot match the performance of factory applied finishes and should be limited in use.

### 3.3 CLEANING

- A. Fence contractor shall remove packing materials and unused product and level uneven areas due to excavations created by fence installations.

END OF SECTION 32 31 00