



SECTION 32 31 00

DECORATIVE METAL FENCES AND GATES

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PART 1 GENERAL

1.1 SECTION INCLUDES

- 1.A. Ornamental welded steel fence system. (Classic Commercial)
- 1.B. Ornamental welded steel fence system. (Classic Residential)
- 1.C. Ornamental welded steel fence system. (Estate)
- 1.D. Ornamental rackable welded steel fence system. (Versai Commercial)
- 1.E. Ornamental rackable welded steel fence system. (Versai Residential)
- 1.F. Ornamental rackable welded steel fence system. (Versai Assurance Commercial)
- 1.G. Ornamental rackable welded steel fence system. (Versai Assurance Residential)
- 1.H. Ornamental rackable mechanically locked fence system. (Titan Industrial)
- 1.I. Ornamental rackable mechanically locked fence system. (Titan Commercial)

1.2 RELATED SECTIONS

- 2.A. Section 03 30 00 - Cast-in-Place Concrete.
- 2.B. Section 31 10 00 - Site Clearing.

1.3 REFERENCES

- 3.A. American Society for Testing and Materials International (ASTM).
 - 3.A.1. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - 3.A.2. ASTM B117 - Standard Practice for Operating Salt Spray (Fog) Apparatus.

- 3.A.3. ASTM D523 - Standard Test Method for Specular Gloss.
- 3.A.4. ASTM D714 - Standard Test Method for Evaluating Degree of Blistering of Paints.
- 3.A.5. ASTM D822 - Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- 3.A.6. ASTM D1654 - Standard Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments.
- 3.A.7. ASTM D2244 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
- 3.A.8. ASTM D2794 - Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).
- 3.A.9. ASTM D3359 - Standard Test Methods for Measuring Adhesion by Tape Test.
- 3.A.10. ASTM F593 - Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- 3.A.11. ASTM F1908 - Standard Guide for Fences for Residential Outdoor Swimming Pools, Hot Tubs, and Spas.
- 3.A.12. ASTM F2049 - Standard Safety Performance Specification for Fences/Barriers for Public, Commercial, and Multi-Family Residential Use Outdoor Play Areas.
- 3.A.13. ASTM F2408 - Standard Specification for Ornamental Fences Employing Galvanized Steel Tubular Pickets.

3.B. American Welding Society (AWS): AWS D1.1 - Structural Welding Code - Steel

3.C. U.S. Consumer Product Safety Commission (CPSC). 2008. Public playground safety handbook. Bethesda, MD: CPSC. <http://www.spcs.gov/cpscpub/pubs/325.pdf>

1.4 SUBMITTALS

4.A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

4.B. Manufacturer's printed product information indicating material compliance and specified options are to be submitted prior to installation. Submit manufacturer's product data sheets on each product to be used.

4.C. Shop drawings shall include plans, elevations, sections, details, and attachments to other work. Drawings must be submitted for approval and be approved prior to installation.

4.D. Design data which verifies compliance with design loads specified in Performance Requirements Article. Design data shall be signed and sealed by the qualified professional engineer responsible for their preparation.

4.E. Submit samples for initial color selection. Submit samples of each specified finish.

1.5 QUALITY ASSURANCE

5.A. Manufacturing company with engineering and fabrication of custom fencing and gate systems for a minimum of 15 years.

5.B. Installation company with experienced in manufacturer's products for a minimum of 5 years. The Contractor shall provide trained laborers with prior experience in the type of construction involved as well as experience installing the materials and techniques specified.

5.C. Obtain each fence system and gates through one source from a single manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

- 6.A. Upon delivery to the jobsite, inspect all materials for damage that might have occurred during shipment.
- 6.B. Handle and store materials in manufacturer's packaging until materials are ready to be installed. Store materials in such a way as to prevent damage and theft.

1.7 PROJECT CONDITIONS

- 7.A. Verify actual locations of walls and other construction contiguous with fencing and gates by field measurements before fabrication and indicate measurements on shop drawings. Provide allowance for trimming and fitting onsite.

1.8 COORDINATION AND SCHEDULING

- 8.A. Coordinate installation of anchorages for fencing and gates. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors that are to be embedded in concrete or masonry. Deliver such items to the Project Site in time for installation.
- 8.B. Schedule installation so wall attachments are made only to completed walls. Do not support systems temporarily by any means that do not satisfy structural performance requirements.

1.9 WARRANTY

- 9.A. Manufacturer's Warranty: Provide manufacturer's standard 10 year limited warranty, from the date of purchase, against defects in materials and workmanship including protection against cracking, peeling, blistering, and corrosion (rusting).
- 9.B. Manufacturer's Warranty: Provide manufacturer's standard 20 year limited warranty, from the date of purchase, against defects in materials and workmanship including protection against cracking, peeling, blistering, and corrosion (rusting).

PART 2 PRODUCTS

2.1 MANUFACTURERS

- 1.A. Acceptable Manufacturer: Fortress Fence Products, which is located at: 1720 North First Street; Garland, TX 75040; Toll Free Tel: 844-909-1999; Fax: 972-372-0078; Email: [request info \(Specifications@FortressFence.com\)](mailto:request_info@FortressFence.com); Web: www.fortressfence.com
- 1.B. Substitutions: Not permitted.
- 1.C. Substitutions: Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.2 SITE FENCING AND GATES

- 2.A. Ornamental Welded Steel Fence Systems:
 - 2.A.1. Basis of Design: Classic Commercial Fence Systems as manufactured by Fortress Fence Products, a division of The Fortress Company.
 - 2.A.1.a. Style: As indicated on the Drawings.
 - 2.A.1.b. Style: Extended Picket (EXT).

- 2.A.1.c. Style: Plain Iron Panel (PIP).
- 2.A.1.d. Style: Spear Point Picket (SP).
- 2.A.1.e. Fence Panels: Fabricated in standard length of 90-1/2 inches (2299 mm).
 - 2.A.1.e.1) Height: As indicated on the Drawings.
 - 2.A.1.e.2) Height: 46 inch (1168 mm).
 - 2.A.1.e.3) Height: 58 inch (1473 mm).
 - 2.A.1.e.4) Height: 70 inch (1778 mm).
- 2.A.1.f. Materials:
 - 2.A.1.f.1) Rails and pickets shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653 and have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653.
 - 2.A.1.f.2) Posts shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653, have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653, and have a powder-coated factory finish.
- 2.A.1.g. Components:
 - 2.A.1.g.1) Rails: 1-1/2 inch (38 mm) square, 16 gauge.
 - 2.A.1.g.2) Pickets: 3/4 inch (19 mm) square, 19 gauge.
 - 2.A.1.g.3) Posts: 2-1/2 inch (63.5 mm) square, 16 gauge.
 - 2.A.1.g.4) Posts: 3 inch (76 mm) square, 14 gauge.
- 2.A.1.h. Gates: Provide manufacturer's standard gates and hardware.
- 2.A.1.i. Fabrication:
 - 2.A.1.i.1) Fence Panels: Fabricated in standard length of 90-1/2 inches (2299 mm). Comply with requirements indicated for materials, thickness, design and details of construction.
 - 2.A.1.i.2) Welded connections shall comply with AWS standards for recommended practice in shop welding.
 - 2.A.1.i.3) Components shall be accurately cut and drilled to receive hardware, fasteners, and accessories.
 - 2.A.1.i.4) Fence panel shall be capable of meeting structural test load capabilities for a commercial fence system referenced in table 2 of ASTM 2409.
 - 2.A.1.i.5) Fence panel shall be capable of meeting coating performance requirements in table 3 of ASTM 2409.
- 2.A.2. Basis of Design: Classic Residential Fence Systems as manufactured by Fortress Fence Products, a division of The Fortress Company.
 - 2.A.2.a. Style: As indicated on the Drawings.
 - 2.A.2.b. Style: Extended Picket (EXT).
 - 2.A.2.c. Style: Plain Iron Panel (PIP).
 - 2.A.2.d. Style: Spear Point Picket (SP).
 - 2.A.2.e. Fence Panels: Fabricated in standard length of 90-1/2 inches (2299 mm).
 - 2.A.2.f. Height: As indicated on the Drawings.
 - 2.A.2.g. Height: 46 inch (1168 mm).
 - 2.A.2.h. Height: 58 inch (1473 mm).
 - 2.A.2.i. Height: 70 inch (1778 mm).
 - 2.A.2.j. Materials:
 - 2.A.2.j.1) Rails and pickets shall be cold-rolled steel formed and welded

tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653 and have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653.

2.A.2.j.2) Posts shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653, have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653, and have a powder-coated factory finish.

2.A.2.k. Components:

2.A.2.k.1) Rails: 1 inch (25 mm) square, 17 gauge.

2.A.2.k.2) Pickets: 5/8 inch (16 mm) square, 20 gauge.

2.A.2.k.3) Posts: 2 inch (51 mm) square, 16 gauge.

2.A.2.l. Gates: Provide manufacturer's standard gates and hardware.

2.A.2.m. Fabrication:

2.A.2.m.1) Fence Panels: Fabricated in standard length of 90-1/2 inches (2299 mm). Comply with requirements indicated for materials, thickness, design and details of construction.

2.A.2.m.2) Welded connections shall comply with AWS standards for recommended practice in shop welding.

2.A.2.m.3) Components shall be accurately cut and drilled to receive hardware, fasteners, and accessories.

2.A.2.m.4) Fence panel shall be capable of meeting structural test load capabilities for a residential fence system referenced in table 2 of ASTM 2409.

2.A.2.m.5) Fence panel shall be capable of meeting coating performance requirements in table 3 of ASTM 2409.

2.A.3. Basis of Design: Estate Privacy Fence Systems as manufactured by Fortress Fence Products, a division of The Fortress Company.

2.A.3.a. Materials:

2.A.3.a.1) Rails and pickets shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653 and have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653.

2.A.3.a.2) Posts shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653, have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653 and have a powder-coated factory finish.

2.A.3.b. Components:

2.A.3.b.1) Rails: 1-1/2 inch (38 mm) square, 16 gauge.

2.A.3.b.2) Pickets and Attachment Bars: 3/4 inch (19 mm) square, 19 gauge.

2.A.3.b.3) Posts: 3 inch (76 mm) square, 14 gauge.

2.A.3.c. Gates: Provide manufacturer's standard gates and hardware.

2.A.3.d. Fabrication:

2.A.3.d.1) Fence Panels: Fabricated in standard length of 94-7/8 inches (2410 mm) to hold 15 each 5-1/2 inch (140 mm) boards. Panels shall be 75-1/8 inch (1908 mm) high to hold 72 inch (1829 mm) boards. Panels shall comply with requirements indicated for materials, thickness, design, and details of construction.

2.A.3.d.2) Welded connections shall comply with AWS standards for recommended practice in shop welding.

2.A.3.d.3) Components shall be accurately cut and drilled to receive hardware, fasteners, and accessories.

2.A.3.d.4) Fence panel shall be capable of meeting structural test load

capabilities for a residential fence system referenced in table 2 of ASTM 2409.

2.A.3.d.5) Fence panel shall be capable of meeting coating performance requirements in table 3 of ASTM 2409.

2.A.4. Finish:

2.A.4.a. Materials are coated with the Fortress Guard process including galvanization, zinc phosphate, and architectural grade powder coat.

2.A.4.b. Metal parts shall be assembled and finished individually prior to shipment.

2.A.4.c. Galvanized steel fence components shall be cleaned with a non-petroleum solvent followed by the application of a sealing zinc phosphate coating.

2.A.4.d. Immediately after sealing, a powder finish coating is applied by the electrostatic spray process. This consists of a thermosetting carboxyl polyester resin top coat with a minimum dry film thickness of 50 microns.

2.B. Ornamental Rackable Welded Steel Fence Systems:

2.B.1. Basis of Design: Versai Commercial Fence Systems as manufactured by Fortress Fence Products, a division of The Fortress Company.

2.B.1.a. Style: As indicated on the Drawings.

2.B.1.b. Style: Flat Top, Extended Bottom (FT).

2.B.1.c. Style: Flat Top, Flat Bottom (FT/FB).

2.B.1.d. Style: Flat Top, Flat Bottom (PL) for Swimming Pool installations

2.B.1.e. Style: Extended Top, Extended Bottom (EXT).

2.B.1.f. Style: Extended Top, Flat Bottom (EXT/FB).

2.B.1.g. Style: Spear Point Top, Extended Bottom (SP).

2.B.1.h. Style: Spear Point Top, Flat Bottom (SP/FB).

2.B.1.i. Style: Curve Top, Extended Bottom (CT).

2.B.1.j. Style: Curve Top, Flat Bottom (CT/FB).

2.B.1.k. Rails: 2.

2.B.1.l. Rails: 3.

2.B.1.m. Fence Panels: Fabricated in standard length of 90-1/2 inches (2299 mm).

2.B.1.m.1) Height: As indicated on the Drawings.

2.B.1.m.2) Height: 34 inch (864 mm).

2.B.1.m.3) Height: 40 inch (1016 mm).

2.B.1.m.4) Height: 46 inch (1168 mm).

2.B.1.m.5) Height: 54 inch (1372 mm).

2.B.1.m.6) Height: 58 inch (1473 mm).

2.B.1.m.7) Height: 70 inch (1778 mm).

2.B.1.m.8) Height: 82 inch (2083 mm).

2.B.1.m.9) Height: 94 inch (2388 mm).

2.B.1.n. Airspace Between Pickets, V2 Commercial: 3-15/16 inch.

2.B.1.o. Materials:

2.B.1.o.1) Rails shall be cold-rolled steel formed U-channel and pickets shall be cold-rolled steel formed and welded tubing, both having a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653 and have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653.

2.B.1.o.2) Posts shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653, have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with

ASTM A653, and have a powder-coated factory finish.

- 2.B.1.p. Components:
 - 2.B.1.p.1) Rails: 1-9/16 inch (40 mm) by 1-3/16 inch (30 mm) (Leg x Web), 14 gauge.
 - 2.B.1.p.2) Pickets:
 - 2.B.1.p.2.a) 3/4 inch (19 mm) square, 16 gauge.
 - 2.B.1.p.2.b) 3/4 inch (19 mm) square, 14 gauge.
 - 2.B.1.p.3) Posts: 2-1/2 inch (64 mm) square, 16 gauge.
 - 2.B.1.p.4) Posts: 2-1/2 inch (64 mm) square, 14 gauge.
 - 2.B.1.p.5) Posts: 2-1/2 inch (64 mm) square, 12 gauge.
 - 2.B.1.p.6) Posts: 3 inch (76 mm) square, 14 gauge.
 - 2.B.1.p.7) Posts: 3 inch (76 mm) square, 12 gauge.
- 2.B.1.q. Gates: Provide manufacturer's standard gates and hardware.
- 2.B.1.r. Fabrication:
 - 2.B.1.r.1) Fence panels shall be fabricated in standard length of 90-1/2 inches (2299 mm). Comply with requirements indicated for materials, thickness, design, and details of construction.
 - 2.B.1.r.2) Pickets are welded to the rails with a patented pin hinge system which allows the panel to rake without metal fatigue or damage to the finish.
 - 2.B.1.r.3) Welded connections shall comply with AWS standards for recommended practice in shop welding.
 - 2.B.1.r.4) Components shall be accurately cut and drilled to receive hardware, fasteners, and accessories.
 - 2.B.1.r.5) Panels shall be rackable to an 18 degree change in grade (30 inch vertical travel per panel).
 - 2.B.1.r.6) Fence panel shall be capable of meeting structural test load capabilities for a commercial fence system referenced in table 2 of ASTM 2409.
 - 2.B.1.r.7) Fence panel shall be capable of meeting coating performance requirements in table 3 of ASTM 2409.
- 2.B.2. Basis of Design: Versai Residential Fence Systems as manufactured by Fortress Fence Products, a division of The Fortress Company.
 - 2.B.2.a. Style: As indicated on the Drawings.
 - 2.B.2.b. Style: Flat Top, Extended Bottom (FT).
 - 2.B.2.c. Style: Flat Top, Flat Bottom (FT/FB).
 - 2.B.2.d. Style: Flat Top, Flat Bottom (PL) for Swimming Pool installations
 - 2.B.2.e. Style: Extended Top, Extended Bottom (EXT).
 - 2.B.2.f. Style: Extended Top, Flat Bottom (EXT/FB).
 - 2.B.2.g. Style: Spear Point Top, Extended Bottom (SP).
 - 2.B.2.h. Style: Spear Point Top, Flat Bottom (SP/FB)
 - 2.B.2.i. Rails: 2.
 - 2.B.2.j. Rails: 3.
 - 2.B.2.k. Fence Panels: Fabricated in standard length of 90-1/2 inches (2299 mm).
 - 2.B.2.k.1) Height: As indicated on the Drawings.
 - 2.B.2.k.2) Height: 34 inch (864 mm).
 - 2.B.2.k.3) Height: 40 inch (1016 mm).
 - 2.B.2.k.4) Height: 46 inch (1168 mm).
 - 2.B.2.k.5) Height: 48 inch (1219 mm).
 - 2.B.2.k.6) Height: 54 inch (1372 mm).

- 2.B.2.k.7) Height: 58 inch (1473 mm).
- 2.B.2.k.8) Height: 70 inch (1778 mm).
- 2.B.2.l. Airspace Between Pickets, Versai Residential: 3-7/8 inch.
- 2.B.2.m. Materials:
 - 2.B.2.m.1) Rails shall be cold-rolled steel formed U-channel and pickets shall be cold-rolled steel formed and welded tubing, both having a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653 and have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653.
 - 2.B.2.m.2) Posts shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653, have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653, and have a powder-coated factory finish.
- 2.B.2.n. Components:
 - 2.B.2.n.1) Rails: 1-3/16 inch (30 mm) by 1 inch (25 mm) (Leg x Web), 16 gauge.
 - 2.B.2.n.2) Pickets: 5/8 inch (16 mm) square, 18 gauge.
 - 2.B.2.n.3) Posts: 2 inch (51 mm) square, 16 gauge.
- 2.B.2.o. Gates: Provide manufacturer's standard gates and hardware.
- 2.B.2.p. Fabrication:
 - 2.B.2.p.1) Fence panels shall be fabricated in standard length of 90-1/2 inches (2299 mm). Comply with requirements indicated for materials, thickness, design, and details of construction.
 - 2.B.2.p.2) Pickets are welded to the rails with a patented pin hinge system which allows the panel to rake without metal fatigue or damage to the finish.
 - 2.B.2.p.3) Welded connections shall comply with AWS standards for recommended practice in shop welding.
 - 2.B.2.p.4) Components shall be accurately cut and drilled to receive hardware, fasteners, and accessories.
 - 2.B.2.p.5) Panels shall be rackable to a 30 degree change in grade (48 inch vertical travel per panel).
 - 2.B.2.p.6) Fence panel shall be capable of meeting structural test load capabilities for a residential fence system referenced in table 2 of ASTM 2409.
 - 2.B.2.p.7) Fence panel shall be capable of meeting coating performance requirements in table 3 of ASTM 2409.
- 2.B.3. Basis of Design: Versai Assurance Commercial Fence Systems as manufactured by Fortress Fence Products, a division of The Fortress Company.
 - 2.B.3.a. Style: As indicated on the Drawings.
 - 2.B.3.b. Style: Flat Top, Extended Bottom (FT).
 - 2.B.3.c. Style: Flat Top, Flat Bottom (FT/FB).
 - 2.B.3.d. Style: Flat Top, Flat Bottom (PL) for Swimming Pool installations
 - 2.B.3.e. Style: Extended Top, Extended Bottom (EXT).
 - 2.B.3.f. Style: Extended Top, Flat Bottom (EXT/FB).
 - 2.B.3.g. Style: Spear Point Top, Extended Bottom (SP).
 - 2.B.3.h. Style: Spear Point Top, Flat Bottom (SP/FB).
 - 2.B.3.i. Style: Curve Top, Extended Bottom (CT).
 - 2.B.3.j. Style: Curve Top, Flat Bottom (CT/FB).
 - 2.B.3.k. Rails: 2.
 - 2.B.3.l. Rails: 3.
 - 2.B.3.m. Fence Panels: Fabricated in standard length of 90-1/2 inches (2299

- mm).
- 2.B.3.m.1) Height: As indicated on the Drawings.
- 2.B.3.m.2) Height: 34 inch (864 mm).
- 2.B.3.m.3) Height: 40 inch (1016 mm).
- 2.B.3.m.4) Height: 46 inch (1168 mm).
- 2.B.3.m.5) Height: 54 inch (1372 mm).
- 2.B.3.m.6) Height: 58 inch (1473 mm).
- 2.B.3.m.7) Height: 70 inch (1778 mm).
- 2.B.3.m.8) Height: 82 inch (2083 mm).
- 2.B.3.m.9) Height: 94 inch (2388 mm).
- 2.B.3.n. Airspace Between Pickets, V2 Assurance Commercial: 3 inch.
- 2.B.3.o. Materials:
 - 2.B.3.o.1) Rails shall be cold-rolled steel formed U-channel and pickets shall be cold-rolled steel formed and welded tubing, both having a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653 and have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653.
 - 2.B.3.o.2) Posts shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653, have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653, and have a powder-coated factory finish.
- 2.B.3.p. Components:
 - 2.B.3.p.1) Rails: 1-9/16 inch (40 mm) by 1-3/16 inch (30 mm) (Leg x Web), 14 gauge.
 - 2.B.3.p.2) Pickets:
 - 2.B.3.p.2.a) 3/4 inch (19 mm) square, 16 gauge.
 - 2.B.3.p.2.b) 3/4 inch (19 mm) square, 14 gauge.
- 2.B.3.q. Posts: 2-1/2 inch (64 mm) square, 16 gauge.
- 2.B.3.r. Posts: 2-1/2 inch (64 mm) square, 14 gauge.
- 2.B.3.s. Posts: 2-1/2 inch (64 mm) square, 12 gauge.
- 2.B.3.t. Posts: 3 inch (76 mm) square, 14 gauge.
- 2.B.3.u. Posts: 3 inch (76 mm) square, 12 gauge.
- 2.B.3.v. Gates: Provide manufacturer's standard gates and hardware.
- 2.B.3.w. Fabrication:
 - 2.B.3.w.1) Fence panels shall be fabricated in standard length of 90-1/2 inches (2299 mm). Comply with requirements indicated for materials, thickness, design, and details of construction.
 - 2.B.3.w.2) Pickets are welded to the rails with a patented pin hinge system which allows the panel to rake without metal fatigue or damage to the finish.
 - 2.B.3.w.3) Welded connections shall comply with AWS standards for recommended practice in shop welding.
 - 2.B.3.w.4) Components shall be accurately cut and drilled to receive hardware, fasteners, and accessories.
 - 2.B.3.w.5) Panels shall be rackable to an 18 degree change in grade (30 inch vertical travel per panel).
 - 2.B.3.w.6) Fence panel shall be capable of meeting structural test load capabilities for a commercial fence system referenced in table 2 of ASTM 2409.
 - 2.B.3.w.7) Fence panel shall be capable of meeting coating performance requirements in table 3 of ASTM 2409.
- 2.B.4. Basis of Design: Versai Assurance Residential Fence Systems as

manufactured by Fortress Fence Products, a division of The Fortress Company.

- 2.B.4.a. Style: As indicated on the Drawings.
- 2.B.4.b. Style: Flat Top, Extended Bottom (FT).
- 2.B.4.c. Style: Flat Top, Flat Bottom (FT/FB).
- 2.B.4.d. Style: Flat Top, Flat Bottom (PL) for Swimming Pool installations
- 2.B.4.e. Style: Extended Top, Extended Bottom (EXT).
- 2.B.4.f. Style: Extended Top, Flat Bottom (EXT/FB).
- 2.B.4.g. Style: Spear Point Top, Extended Bottom (SP).
- 2.B.4.h. Style: Spear Point Top, Flat Bottom (SP/FB).
- 2.B.4.i. Rails: 2.
- 2.B.4.j. Rails: 3.
- 2.B.4.k. Fence Panels: Fabricated in standard length of 90-1/2 inches (2299 mm).
 - 2.B.4.k.1) Height: As indicated on the Drawings.
 - 2.B.4.k.2) Height: 34 inch (864 mm).
 - 2.B.4.k.3) Height: 40 inch (1016 mm).
 - 2.B.4.k.4) Height: 46 inch (1168 mm).
 - 2.B.4.k.5) Height: 48 inch (1219 mm).
 - 2.B.4.k.6) Height: 54 inch (1372 mm).
 - 2.B.4.k.7) Height: 58 inch (1473 mm).
 - 2.B.4.k.8) Height: 70 inch (1778 mm).
- 2.B.4.l. Airspace Between Pickets, Versai Assurance Residential: 3 inch.
- 2.B.4.m. Materials:
 - 2.B.4.m.1) Rails shall be cold-rolled steel formed U-channel and pickets shall be cold-rolled steel formed and welded tubing, both having a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653 and have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653.
 - 2.B.4.m.2) Posts shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653, have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653, and have a powder-coated factory finish.
- 2.B.4.n. Components:
 - 2.B.4.n.1) Rails: 1-3/16 inch (30 mm) by 1 inch (25 mm) (Leg x Web), 16 gauge.
 - 2.B.4.n.2) Pickets: 5/8 inch (16 mm) square, 18 gauge.
 - 2.B.4.n.3) Posts: 2 inch (51 mm) square, 16 gauge.
- 2.B.4.o. Gates: Provide manufacturer's standard gates and hardware.
- 2.B.4.p. Fabrication:
 - 2.B.4.p.1) Fence panels shall be fabricated in standard length of 90-1/2 inches (2299 mm). Comply with requirements indicated for materials, thickness, design, and details of construction.
 - 2.B.4.p.2) Pickets are welded to the rails with a patented pin hinge system which allows the panel to rake without metal fatigue or damage to the finish.
 - 2.B.4.p.3) Welded connections shall comply with AWS standards for recommended practice in shop welding.
 - 2.B.4.p.4) Components shall be accurately cut and drilled to receive hardware, fasteners, and accessories.
 - 2.B.4.p.5) Panels shall be rackable to a 30 degree change in grade (48 inch vertical travel per panel).

2.B.4.p.6) Fence panel shall be capable of meeting structural test load capabilities for a residential fence system referenced in table 2 of ASTM 2409.

2.B.4.p.7) Fence panel shall be capable of meeting coating performance requirements in table 3 of ASTM 2409.

2.B.5. Finish:

2.B.5.a. Materials are coated with the Fortress Shield process including galvanization, zinc phosphate, electrodeposition (E-coat), and architectural grade powder coat.

2.B.5.b. Metal parts shall be assembled and finished individually prior to shipment.

2.B.5.c. Galvanized steel fence components shall be cleaned with a non-petroleum solvent followed by the application of a sealing zinc phosphate coating.

2.B.5.d. Immediately after sealing, provide a two-step finishing process consisting first of an electrostatic dipping process in a lead-free high corrosion resistant epoxy resin leaving a coating of approximately 20 microns followed by a thermosetting carboxyl polyester resin top coat with a minimum dry film thickness of 60 microns. The second coating shall be applied by the electrostatic spray process.

2.C. Ornamental Rackable Mechanically Locked Steel Fence Systems:

2.C.1. Basis of Design: Titan Industrial Fence Systems as manufactured by Fortress Fence Products, a division of The Fortress Company.

2.C.1.a. Style: As indicated on the Drawings.

2.C.1.b. Style: Flat Top, Extended Bottom (FT).

2.C.1.c. Style: Extended Top, Extended Bottom (EXT).

2.C.1.d. Style: Spear Point Top, Extended Bottom (SP).

2.C.1.e. Style: Curve Top, Extended Bottom (CT).

2.C.1.f. Rails: 2.

2.C.1.g. Rails: 3.

2.C.1.h. Fence Panels: Fabricated in standard length of 92 inches (2337 mm).

2.C.1.h.1) Height: As indicated on the Drawings.

2.C.1.h.2) Height: 34 inch (864 mm).

2.C.1.h.3) Height: 46 inch (1168 mm).

2.C.1.h.4) Height: 58 inch (1473 mm).

2.C.1.h.5) Height: 70 inch (1778 mm).

2.C.1.h.6) Height: 82 inch (2083 mm).

2.C.1.h.7) Height: 94 inch (2388 mm).

2.C.1.h.8) Height: 106 inch (2692 mm).

2.C.1.h.9) Height: 118 inch (2997 mm).

2.C.1.i. Fence Panels: Fabricated in standard length of 90-1/2 inches (2299 mm).

2.C.1.i.1) Height: As indicated on the Drawings.

2.C.1.i.2) Height: 34 inch (864 mm).

2.C.1.i.3) Height: 46 inch (1168 mm).

2.C.1.i.4) Height: 58 inch (1473 mm).

2.C.1.i.5) Height: 70 inch (1778 mm).

2.C.1.i.6) Height: 82 inch (2083 mm).

2.C.1.i.7) Height: 94 inch (2388 mm).

2.C.1.i.8) Height: 106 inch (2692 mm).

2.C.1.i.9) Height: 118 inch (2997 mm).

- 2.C.1.j. Airspace Between Pickets: 3-15/16 inch.
- 2.C.1.k. Materials:
 - 2.C.1.k.1) Rails shall be cold-rolled steel formed U-channel and pickets shall be cold-rolled steel formed and welded tubing, both having a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653 and have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653.
 - 2.C.1.k.2) Posts shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653, have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653, and have a powder-coated factory finish.
- 2.C.1.l. Materials:
 - 2.C.1.l.1) Rails shall be cold-rolled steel formed U-channel and pickets shall be cold-rolled steel formed and welded tubing, both having Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653 and have a G90 zinc coating, 0.90 oz./ft² (0.18 kg/m²) in accordance with ASTM A653.
 - 2.C.1.l.2) Posts shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653, have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653, and have a powder-coated factory finish.
- 2.C.1.m. Components:
 - 2.C.1.m.1) Rails: 1-3/4 inch (44.5 mm) x 1-3/4 inch (44.5 mm), 14 gauge.
 - 2.C.1.m.2) Pickets: 1 inch (25 mm) square, 14 gauge.
 - 2.C.1.m.3) Pickets: 1 inch (25 mm) square, 16 gauge.
 - 2.C.1.m.4) Pickets: 1 inch (25 mm) square, 18 gauge.
 - 2.C.1.m.5) Slide Lock: 18 gauge patented slide lock system, attaches pickets to each rail.
 - 2.C.1.m.6) Post Size: 2-1/2 inches (63.5 mm) tube, 16 gauge.
 - 2.C.1.m.7) Post Size: 2-1/2 inches (63.5 mm) tube, 14 gauge.
 - 2.C.1.m.8) Post Size: 2-1/2 inches (63.5 mm) tube, 12 gauge.
 - 2.C.1.m.9) Post Size: 3 inches (76 mm) tube, 12 gauge.
 - 2.C.1.m.10) Post Size: 4 inches (102 mm) tube, 11 gauge.
- 2.C.1.n. Gates: Provide manufacturer's standard gates and hardware.
- 2.C.1.o. Fabrication:
 - 2.C.1.o.1) Fence panels shall be fabricated in standard length of 92 inches (2337 mm). Comply with requirements indicated for materials, thickness, design, and details of construction.
 - 2.C.1.o.2) Fence panels shall be fabricated in standard length of 90-1/2 inches (2299 mm). Comply with requirements indicated for materials, thickness, design, and details of construction.
 - 2.C.1.o.3) Pickets are inserted into the rails through grommets which are put into the rails pre-punched holes, and held in place with the patented slide lock system. This allows the panel to rake without metal fatigue or damage to the finish.
 - 2.C.1.o.4) Panels shall be rackable to a 14.5 degree change in grade (24 inch vertical travel per panel).
 - 2.C.1.o.5) Components shall be accurately cut and drilled to receive hardware, fasteners, and accessories.
 - 2.C.1.o.6) Fence panel shall be capable of meeting structural test load capabilities for an industrial fence system referenced in table 2 of ASTM 2409.
 - 2.C.1.o.7) Fence panel shall be capable of meeting coating performance requirements in table 3 of ASTM 2409.

- 2.C.2. Basis of Design: Titan Commercial Fence Systems as manufactured by Fortress Fence Products, a division of The Fortress Company.
- 2.C.2.a. Style: As indicated on the Drawings.
- 2.C.2.b. Style: Flat Top, Extended Bottom (FT).
- 2.C.2.c. Style: Extended Top, Extended Bottom (EXT).
- 2.C.2.d. Style: Spear Point Top, Extended Bottom (SP).
- 2.C.2.e. Rails: 2.
- 2.C.2.f. Rails: 3.
- 2.C.2.g. Fence Panels: Fabricated in standard length of 92 inches (2337 mm).
 - 2.C.2.g.1) Height: As indicated on the Drawings.
 - 2.C.2.g.2) Height: 34 inch (864 mm).
 - 2.C.2.g.3) Height: 46 inch (1168 mm).
 - 2.C.2.g.4) Height: 58 inch (1473 mm).
 - 2.C.2.g.5) Height: 70 inch (1778 mm).
- 2.C.2.h. Fence Panels: Fabricated in standard length of 90-1/2 inches (2299 mm).
 - 2.C.2.h.1) Height: As indicated on the Drawings.
 - 2.C.2.h.2) Height: 34 inch (864 mm).
 - 2.C.2.h.3) Height: 46 inch (1168 mm).
 - 2.C.2.h.4) Height: 58 inch (1473 mm).
 - 2.C.2.h.5) Height: 70 inch (1778 mm).
- 2.C.2.i. Airspace Between Pickets: 3-15/16 inch.
- 2.C.2.j. Materials:
 - 2.C.2.j.1) Rails shall be cold-rolled steel formed U-channel and pickets shall be cold-rolled steel formed and welded tubing, both having a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653 and have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653.
 - 2.C.2.j.2) Posts shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653, have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653, and have a powder-coated factory finish.
- 2.C.2.k. Materials:
 - 2.C.2.k.1) Rails shall be cold-rolled steel formed U-channel and pickets shall be cold-rolled steel formed and welded tubing, both having Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653 and have a G90 zinc coating, 0.90 oz./ft² (0.18 kg/m²) in accordance with ASTM A653.
 - 2.C.2.k.2) Posts shall be cold-rolled steel formed and welded tubing with a Grade A minimum tensile strength of 45,000 psi (310 MPa) conforming to ASTM A653, have a G60 zinc coating, 0.60 oz./ft² (0.18 kg/m²) in accordance with ASTM A653, and have a powder-coated factory finish.
- 2.C.2.l. Components:
 - 2.C.2.l.1) Rails: 1-3/4 inch (44 mm) by 1-1/2 inch (38 mm) (Leg x Web), 16 gauge.
 - 2.C.2.l.2) Pickets: 3/4 inch (19 mm) square, 16 gauge.
 - 2.C.2.l.3) Slide Lock: 18 gauge patented slide lock system, attaches pickets to each rail.
- 2.C.2.m. Post Size: 2-1/2 inch (64 mm) square, 16 gauge.
- 2.C.2.n. Post Size: 2-1/2 inch (64 mm) square, 14 gauge.
- 2.C.2.o. Post Size: 2-1/2 inch (64 mm) square, 12 gauge.
- 2.C.2.p. Post Size: 3 inch (76 mm) square, 12 gauge.

- 2.C.2.q. Post Size: 4 inch (102 mm) square, 11 gauge.
- 2.C.2.r. Gates: Provide manufacturer's standard gates and hardware.
- 2.C.2.s. Fabrication:
 - 2.C.2.s.1) Fence panels shall be fabricated in standard length of 92 inches (2337 mm). Comply with requirements indicated for materials, thickness, design, and details of construction.
 - 2.C.2.s.2) Fence panels shall be fabricated in standard length of 90-1/2 inches (2299 mm). Comply with requirements indicated for materials, thickness, design, and details of construction.
 - 2.C.2.s.3) Pickets are inserted into the rails through grommets which are put into the rails pre-punched holes, and held in place with the patented slide lock system. This allows the panel to rake without metal fatigue or damage to the finish.
 - 2.C.2.s.4) Panels shall be rackable to a 14.5 degree change in grade (24 inch vertical travel per panel).
 - 2.C.2.s.5) Components shall be accurately cut and drilled to receive hardware, fasteners, and accessories.
 - 2.C.2.s.6) Fence panel shall be capable of meeting structural test load capabilities for a commercial fence system referenced in table 2 of ASTM 2409.
 - 2.C.2.s.7) Fence panel shall be capable of meeting coating performance requirements in table 3 of ASTM 2409.
- 2.C.3. Finish:
 - 2.C.3.a. Materials are coated with the Fortress Shield process including galvanization, zinc phosphate, electrodeposition (E-coat), and architectural grade powder coat.
 - 2.C.3.b. Metal parts are assembled and finished individually prior to shipment.
 - 2.C.3.c. Galvanized steel fence components are cleaned with a non-petroleum solvent followed by the application of a sealing zinc phosphate coating.
 - 2.C.3.d. Immediately after sealing, a two-step finishing process consisting first of an electrostatic dipping process in a lead free high corrosion resistant epoxy resin leaving a coating of approximately 20 microns followed by a thermosetting carboxyl polyester resin top coat with a minimum dry film thickness of 50 microns. The second coating will be applied by the electrostatic spray process.
 - 2.C.3.e. Materials are coated with the Fortress Armour process including galvanization, zinc phosphate, epoxy powder coat, and architectural grade powder coat.
 - 2.C.3.f. Metal parts are finished and assembled individually prior to shipment.
 - 2.C.3.g. Galvanized steel fence components are cleaned with a non-petroleum solvent followed by the application of a sealing zinc phosphate coating.
 - 2.C.3.h. Immediately after sealing, a two-step finishing process consisting first of an epoxy powder coat leaving a coating of approximately 20 microns followed by a thermosetting carboxyl polyester resin top coat with a minimum dry film thickness of 60 microns. The second coating will be applied by the electrostatic spray process.

PART 3 EXECUTION

3.1 EXAMINATION

- 1.A. Examine areas and conditions under which the work is to be installed, and notify the Contractor in writing, with a copy to the Owner and the Architect, of any conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- 2.A. Stake layout showing locations of gates and posts per submitted shop drawings.
- 2.B. Contact applicable authorities and take necessary precautions prior to beginning any excavation work.

3.3 INSTALLATION

- 3.A. Install fences in accordance with manufacturer's written instructions and in accordance with authorities having jurisdiction. Installation shall conform to the specifications referenced elsewhere in this Section and as indicated on the Drawings.
- 3.B. Refer to Division 3 for concrete specification. Recommend minimum 28 day compressive strength of 3,000 psi (20 MPa). Crown concrete at top to shed water.
- 3.C. On-center post spacing per manufacturer's drawings.
- 3.D. For non-level installations the on-center post spacing must be measured along the grade. Ensure that fence sections are parallel to grade within 1/4 inch (6mm) in 12 feet (3658 mm).
- 3.E. Install brackets onto fence section and posts as indicated in manufacturer's printed instructions for specific fence style. Attach fence sections to brackets with approved fasteners and techniques.
- 3.F. Install gate in accordance with manufacturer's printed instructions and approved signoff drawings. Do not mount gate from wall of a structure. Provide gate post on both sides of a gate. For double drive gate installation, provide concrete center drop to foundation depth and drop rod retainers at center. Lubricate to ensure smooth operation and verify proper latch operation.

3.4 CLEANING

- 4.A. Remove cutting and drilling chips that are attached to the fencing, post, brackets, or additions to prevent corrosion.
- 4.B. Repair scratches and other installation-incurred damage using manufacturers recommended paint. Use paint of the appropriate color with a zinc additive to prevent rust from forming.
- 4.C. Clean up debris and unused material, and remove from site.

3.5 PROTECTION

- 5.A. Protect finishes from damage during construction period with temporary protective coverings approved by manufacturer. Remove protective coverings at time of Substantial Completion.
- 5.B. Restore finishes damaged during installation and construction period so no evidence remains of correction work. Return items that cannot be refinished in field to shop; make required alterations and refinish entire unit, or provide new units.

END OF SECTION