

**SECTION 32 31 13  
CHAIN LINK FENCES AND GATES**

**CARTER WATKINS ASSOCIATES ARCHITECTS, INC.**  
JACKSON COUNTY ANIMAL SHELTER

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**SECTION 02821 - CHAIN-LINK 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 1 Specification Sections, apply to this Section.

**1.2 SUMMARY**

- A. This Section includes the following:
1. Chain-Link Fences: Vinyl-coated dark green or black.
  2. Gates: [**swinging pairs and single gates**]
- B. Related Section s include the following:
1. Division 2 Section "Earthwork" for site excavation, fill, and backfill where chain-link fences and gates are located.
  2. Division 3 Section "[ **Concrete**]
  3. Division 16 Sections for electrical service and connections for motor operators, controls, limit and disconnect switches, and safety features and for system disconnect switches.
- C. Allowances: Furnish the following under the allowances indicated as specified in Division 1 Section "Allowances":
1. See Section 01 21 13
- D. Alternates: Refer to Division 1 Section "Alternates" for description of Work in this Section affected by alternates.

**1.3 PERFORMANCE REQUIREMENTS**

- A. Structural Performance: Provide chain-link fences and gates capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
1. Minimum Post Size and Maximum Spacing for Wind Velocity Pressure: Determine based on mesh size and pattern specified, and on the following minimum design wind pressures and according to CLFMI WLG 2445:
    - a. Wind Speed: [**80 mph (129 km/h)**]
    - b. Fence Height: [4 feet, **6 feet and 9 feet**]
    - c. Line Post Group: [**IA, ASTM F 1043, Schedule 40 steel pipe**]

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- d. Wind Exposure Category: **[B]**
- 2. Determine minimum post size, group, and section according to ASTM F 1043 for framework AT 6 feet and post spacing not to exceed 8 feet (3 m).
- B. Lightning Protection System: Maximum grounding-resistance value of 25 ohms under normal dry conditions.

**1.4 SUBMITTALS**

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates.
  - 1. Fence and gate posts, rails, and fittings.
  - 2. Chain-link fabric, reinforcements, and attachments.
  - 3. Gates and hardware.
  - 4. Gate operators, including operating instructions.
  - 5. Accessories: None
- B. Shop Drawings: Show locations of fences, gates, posts, rails, tension wires, details of extended posts, extension arms, gate swing, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, gate elevations, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.
  - 1. For installed products indicated to comply with design loads, include structural analysis data **signed and sealed by the qualified professional engineer responsible for their preparation.**
- C. Samples for Initial Selection: Manufacturer's color charts or **6-inch (150-mm)** lengths of actual units showing the full range of colors available for components with factory-applied color finishes.
- D. Samples for Verification: For each type of chain-link fence and gate indicated.
  - 1. Polymer-coated steel wire (for fabric) in **6-inch (150-mm)** lengths.
  - 2. Polymer coating, in **6-inch (150-mm)** lengths on shapes for **[posts, rails, wires,] [and] [gate framing] [and on full-sized units for accessories].**
- E. Product Certificates: For each type of chain-link fence, and gate, signed by product manufacturer.
  - 1. Strength test results for framing according to ASTM F 1043.
- F. Qualification Data: For Installer.
- G. Field quality-control test reports.
- H. Maintenance Data: For the following to include in maintenance manuals:

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1. Polymer finishes.

**1.5 QUALITY ASSURANCE**

- A. Installer Qualifications: An experienced installer who has completed chain-link 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.
  1. Engineering Responsibility: Preparation of data for chain-link fences and gates, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
  1. Testing Agency's Field Supervisor: Person currently certified according to NETA ETT, or the National Institute for Certification in Engineering Technologies, to supervise on-site testing specified in Part 3.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

**1.6 PROJECT CONDITIONS**

- A. Field Measurements: Verify layout information for chain-link fences and gates shown on Drawings in relation to property survey and existing structures. Verify dimensions by field measurements.
- B. Interruption of Existing Utility Service: Do not interrupt utility services to 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 Architect no fewer than [**two**] days in advance of proposed interruption of utility services.
  2. Do not proceed with interruption of utility services without Architect's written permission.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

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- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Chain-Link Fences and Gates:
    - a.

**2.2 CHAIN-LINK FENCE FABRIC**

- A. General: [ **6 foot high fence and gates as shown on drawings**]. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:
  - 1. Steel Wire Fabric: [**Polymer**]-coated wire with a diameter of [**0.148 inch (3.76 mm)**]
    - a. Mesh Size: [**2 inches (50 mm)**]
    - b. Weight of Aluminum Coating: ASTM A 491, Type I, [**0.35 oz./sq. ft. (107 g/sq. m)**]
    - c. Weight of Metallic (Zinc) Coating: ASTM A 392, Type II, Class [**2, 2.0 oz./sq. ft. (610 g/sq. m)**] with zinc coating applied [**before**] weaving.
    - d. Weight of Zn-5-Al-MM Aluminum-Mischmetal Alloy Coating: ASTM F 1345, Type III, Class [**2, 1.0 oz./sq. ft. (305 g/sq. m)**].
    - e. Polymer Coating: ASTM D 668, Class [**1**] over metallic-coated steel wire.
      - 1) Color: [**Dark Green or Black**], complying with ASTM F 934.
    - f. Coat selvage ends of fabric that is metallic coated before the weaving process with manufacturer's standard clear protective coating.
  - 2. Selvage: [**Knuckled at both selvages**].

**2.3 FENCE FRAMING**

- A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:
  - 1. Group: [**IC, round steel pipe, yield strength 50,000 psi (345 MPa)**]. Verify with conditions.
  - 2. Fence Height: . .
  - 3. Strength Requirement: [**Light**] industrial according to ASTM F 1043.
  - 4. Post Diameter and Thickness: According to [**ASTM F 1083**].
  - 5. Post Size and Thickness: [**According to ASTM F 1043.**] Verify with Site conditions and heights.
    - a. Top Rail: [**1.66 inches (42 mm)**] [**1.25 by 1.63 inches (32 by 41 mm)**]

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- b. Line Post: [2.375 inches (60 mm)].
  - c. End, Corner and Pull Post: [ [3.5 by 1.5 inches (89 by 38 mm)]
  - d. Gate Post.
  - e. Horizontal-Slide Gate Post: [According to ASTM F 1184.]
6. Coating for Steel Framing:
- a. Metallic Coating:
    - 1) Type A, consisting of not less than minimum 2.0-oz./sq. ft. (0.61-kg/sq. m) average zinc coating per ASTM A 123/A 123M or 4.0-oz./sq. ft. (1.22-kg/sq. m) zinc coating per ASTM A 653/A 653M.
    - 2) Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film.
    - 3) External, Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. (0.27 kg/sq. m) of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film. Internal, Type D, consisting of 81 percent, not less than 0.3-mil- (0.0076-mm-) thick, zinc pigmented coating.
    - 4) Type C, Zn-5-Al-MM alloy, consisting of not less than 1.8-oz./sq. ft. (0.55-kg/sq. m) coating.
    - 5) Coatings: Any coating above.
  - b. Provide Polymer coating over metallic coating.

**2.5 TENSION WIRE**

- A. General: Provide horizontal tension wire at the following locations:
  - 1. Location: Extended along [bottom ] of fence fabric.
- B. Metallic-Coated Steel Wire: 0.177-inch- (4.5-mm-) diameter, marcelled tension wire complying with ASTM A 817, ASTM A 824, and the following:
  - 1. Metallic Coating: Type by [electrolytic] process, with the following minimum coating weight:
    - a. Matching chain-link fabric coating weight.
  - 2. Metallic Coating: Type III, Zn-5-Al-MM alloy with the following minimum coating weight:
    - a. Matching chain-link fabric coating weight.
- C. Aluminum Wire: 0.192-inch- (4.88-mm-) diameter tension wire, mill finished, complying with ASTM B 211 (ASTM B211M), Alloy 6061-T94 with 50,000-psi (344-MPa) minimum tensile strength.

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**2.6 INDUSTRIAL GATES**

- A. General: Comply with ASTM F 900 for **[single]** gate types.
  - 1. Metal Pipe and Tubing: Galvanized steel. Comply with ASTM F 1043 and ASTM F 1083 for materials and protective coatings.
  - 2. Metal Pipe and Tubing: Aluminum. Comply with ASTM B 429 and ASTM F 1043 for materials and protective coatings.
- B. Frames and Bracing: Fabricate members from **[round] [galvanized steel]** tubing with outside dimension and weight according to ASTM F 900 and the following:
  - 1. Gate Fabric Height: **[2 inches (50 mm) less than adjacent fence height] [As indicated]**
  - 2. Leaf Width: **[As indicated]** .
  - 3. Frame Members:
    - a. Tubular **[Steel [2 inches (50 mm) rectangular]** .
- C. Frame Corner Construction:
  - 1. **[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]**.
- D. Extended Gate Posts and Frame Members: Extend gate posts and frame end members above top of chain-link fabric at both ends of gate frame **[12 inches (300 mm)]** as required to attach barbed **[wire] [tape]** assemblies.

**2.7 FITTINGS**

- A. General: Comply with ASTM F 626.
- B. Post and Line Caps: Provide for each post.
  - 1. Line post caps with loop to receive tension wire or top rail.
- C. Rail and Brace Ends: Attach rails securely to each gate, corner, pull, and end post.
- D. Rail Fittings: Provide the following:
  - 1. Top Rail Sleeves: **[Pressed-steel or round-steel tubing]** not less than **6 inches (152 mm)** long.
  - 2. Rail Clamps: Line and corner boulevard clamps for connecting **[intermediate] [and] [bottom]** rails in the fence line-to-line posts.
- E. Tension and Brace Bands: **[Pressed steel]** .

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- F. Tension Bars: **[Steel]**, length not less than **2 inches (50 mm)** shorter than full height of chain-link fabric. Provide one bar for each gate and end post, and two for each corner and pull post, unless fabric is integrally woven into post.
- G. Truss Rod Assemblies: **[Steel, hot-dip galvanized after threading]** rod and turnbuckle or other means of adjustment.
- H. Barbed Wire Arms: **[Pressed steel or cast iron]**, with clips, slots, or other means for attaching strands of barbed wire, **and means for attaching to posts** [, **integral with post cap**]; for each post, unless otherwise indicated, and as follows:
1. Line posts with arms that accommodate top rail or tension wire.
  2. Corner arms at fence corner posts, unless extended posts are indicated.
  3. Type I, single slanted arm.
  4. Type II, single vertical arm.
  5. Type III, V-shaped arm.
  6. Type IV, A-shaped arm.
- I. Tie Wires, Clips, and Fasteners: According to ASTM F 626.
1. Standard Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
    - a. Hot-Dip Galvanized Steel: **[0.106-inch- (2.69-mm-)] [0.148-inch- (3.76-mm-)]** diameter wire; **galvanized coating thickness matching coating thickness of chain-link fence fabric**.
    - b. Aluminum: **ASTM B 211 (ASTM B 211M)**; Alloy 1350-H19; **[0.148-inch- (3.76-mm-)] [0.192-inch- (4.88-mm-)]** diameter, mill-finished wire.
- J. Finish:
1. Polymer over Metallic Coating for Pressed Steel or Cast Iron: Not less than **1.2 oz. /sq. ft. (366 g /sq. m)** zinc.

**2.8 CAST-IN-PLACE CONCRETE**

- A. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM C 33, and potable water **[for ready-mixed concrete complying with ASTM C 94/C 94M]**.
1. 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.
- B. Materials: Dry-packaged concrete mix complying with ASTM C 387 for normal-weight concrete mixed with potable water according to manufacturer's written instructions.

**2.9 GROUT AND ANCHORING CEMENT**

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- A. Nonshrink, Nonmetallic Grout: Premixed, factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107. Provide grout, recommended in writing by manufacturer, for exterior applications.
- B. Erosion-Resistant Anchoring Cement: Factory-packaged, nonshrink, nonstaining, 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.

**2.10 POLYMER FINISHES**

- A. Supplemental Color Coating: **[In addition to specified metallic coatings for steel, ]**provide fence components with polymer coating.
- B. Metallic-Coated Steel Tension Wire: PVC-coated wire complying with ASTM F 1664, Class **[1]**
- C. **[Metallic-Coated Steel] [Aluminum]** Barbed Wire: PVC-coated wire complying with ASTM F 1665, Class **[1] [2a] [2b]**.
- D. **[Metallic-Coated Steel]** Framing and Fittings: Comply with ASTM F 626 and ASTM F 1043 for polymer coating applied to exterior surfaces and, except inside cap shapes, to exposed interior surfaces.
  - 1. Polymer Coating: Not less than **[10-mil- (0.254-mm-)] thick PVC** finish.
- E. Color: **[As selected by Architect from manufacturer's full range]**, complying with ASTM F 934.

**PART 3 - EXECUTION**

**3.1 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.
  - 1. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

**3.2 PREPARATION**



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- 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.

**3.3 INSTALLATION, GENERAL**

- A. Install chain-link fencing to comply with ASTM F 567 and more stringent requirements specified.
  - 1. Install fencing on established boundary lines inside property line.

**3.4 CHAIN-LINK FENCE INSTALLATION**

- A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacings indicated, in firm, undisturbed soil.
- B. Post Setting: Set posts [**in concrete**] 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 to dimensions indicated and vibrate or tamp for consolidation. Protect aboveground portion of posts from concrete splatter.
    - a. Exposed Concrete: Extend **2 inches (50 mm)** above grade; shape and smooth to shed water.
    - b. Concealed Concrete: Top [**2 inches (50 mm)**] below grade to allow covering with surface material.
- C. Terminal Posts: Locate terminal end, corner, and gate posts per ASTM F 567 and terminal pull posts at changes in horizontal or vertical alignment of [**30 degrees or more**]
- D. Line Posts: Space line posts uniformly at [approx. **8 feet (2.44 m)**] o.c.
- E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Install braces at end and gate posts and at both sides of corner and pull posts.
  - 1. Locate horizontal braces at midheight of fabric **6 feet (1.83 m)** or higher, on fences with top rail and at 2/3 fabric height on fences without top rail. Install so posts are plumb when diagonal rod is under proper tension.
- F. Tension Wire: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Pull wire taut, without sags. Fasten fabric to tension wire with **0.120-inch- (3.05-mm-)** diameter hog rings of same material and finish as fabric wire, spaced a maximum of **24 inches (610 mm)** o.c. Install tension wire in locations indicated before stretching fabric.
  - 1. Top Tension Wire: Install tension wire through post cap loops.
  - 2. Bottom Tension Wire: Install tension wire within **6 inches (150 mm)** of bottom of fabric and tie to each post with not less than same diameter and type of wire.

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- G. Top Rail: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Run rail continuously through line post caps, bending to radius for curved runs and terminating into rail end attached to posts or post caps fabricated to receive rail at terminal posts. Provide expansion couplings as recommended in writing by fencing manufacturer.
- H. Bottom Rails: Install, spanning between posts.
- I. Chain-Link Fabric: Apply fabric to **[outside]** of enclosing framework. Leave **[2 inches (50 mm)]** between finish grade or surface and bottom selvage, unless otherwise indicated. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
- J. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than **15 inches (380 mm)** o.c.
- K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at 1 end to chain-link fabric, wrap wire around post a minimum of 180 degrees, and attach other end to chain-link fabric per ASTM F 626. Bend ends of wire to minimize hazard to individuals and clothing.
  - 1. Maximum Spacing: Tie fabric to line posts at **12 inches (300 mm)** o.c. and to braces at **24 inches (610 mm)** o.c.
- L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side.

**3.5 GATE INSTALLATION**

- A. Install gates according to manufacturer's written instructions, level, plumb, and secure for full opening without interference. Attach fabric as for fencing. 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.

**3.6 FIELD QUALITY CONTROL**

- A. Grounding-Resistance Testing: **[Engage]** a qualified independent testing and inspecting agency to perform field quality-control testing.
  - 1. Grounding-Resistance Tests: Subject completed grounding system to a megger test at each grounding location. Measure grounding resistance not less than two full days after last trace of precipitation, without soil having been moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural grounding resistance. Perform tests by two-point method according to IEEE 81.
  - 2. Excessive Grounding Resistance: If resistance to grounding exceeds specified value, notify Architect promptly. Include recommendations for reducing grounding resistance and a proposal to accomplish recommended work.

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3. Report: Prepare test reports certified by a testing agency of grounding resistance at each test location. Include observations of weather and other phenomena that may affect test results.

**3.7 ADJUSTING**

- A. Gate: Adjust gate 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.

**3.8 DEMONSTRATION**

- A. Engage a factory-authorized service representative to train Owner's personnel to adjust, operate, and maintain gates. Refer to Division 1 Section "[**Closeout Procedures**] [**Demonstration and Training**]."

END OF SECTION 02821