



## SECTION 323113 - FENCES AND GATES

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Chain-link fences.
2. Gates: swing.

#### 1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Fence and gate framework shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to ASCE/SEI 7:

1. Minimum Post Size: Determine according to ASTM F 1043 for framework up to 12 feet high, and post spacing not to exceed 10 feet.
2. Minimum Post Size and Maximum Spacing: Determine according to CLFMI WLG 2445, based on mesh size and pattern specified and on the following:
  - a. Wind Loads: 120 mph.
  - b. Exposure Category: B.
  - c. Fence Height: 6 feet.

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

#### 1.3 SUBMITTALS

A. Product Data: For each type of product indicated. 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. Accessories: Barbed wire.
4. Gates and hardware.
5. Gate operators, including operating instructions.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. Show accessories, hardware, gate operation, and operational clearances.

1. Gate Operator: Show locations and details for installing operator components.

C. Qualification Data: For qualified factory-authorized service representative.



- D. Product Certificates: For each type of chain-link fence, operator, and gate, from manufacturer.
- E. Product Test Reports: For framing strength according to ASTM F 1043.
- F. Field quality-control reports.
- G. Operation and Maintenance Data: For the following to include in emergency, operation, and maintenance manuals:
  - 1. Polymer finishes.
  - 2. Gate hardware.
  - 3. Gate operator.
- H. Warranty: Sample of special warranty.

#### 1.4 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site.
  - 1. Inspect and discuss electrical roughing-in, equipment bases, and other preparatory work specified elsewhere.
  - 2. Review sequence of operation for each type of gate operator.
  - 3. Review coordination of interlocked equipment specified in this Section and elsewhere.
  - 4. Review required testing, inspecting, and certifying procedures.

#### 1.5 PROJECT CONDITIONS

- A. Field Measurements: Verify layout information for fences and gates shown on Standard details in relation to property survey and existing structures. Verify dimensions by field measurements.

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which Installer agrees to repair or replace components of fences and gates that fail in materials or workmanship within specified warranty period.
  - 1. Failures include, but are not limited to, the following:
    - a. Faulty operation of gate operators and controls.
    - b. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
  - 2. Warranty Period: One year from date of Substantial Completion.



## PART 2 - PRODUCTS

## 2.1 CHAIN-LINK FENCE FABRIC

- A. General: Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle or twist. Comply with CLFMI Product Manual and with requirements indicated below:
1. Fabric Height: 6 feet.
  2. Steel Wire Fabric: Wire with a diameter of 0.192 inch.
    - a. Mesh Size: 2 inches.
    - b. Aluminum-Coated Fabric: ASTM A 491, Type I, 0.40 oz./sq. ft..
    - c. Zinc-Coated Fabric: ASTM A 392, Type II, Class 2, 2.0 oz./sq. ft. with zinc coating applied after weaving.
    - d. Zn-5-Al-MM Aluminum-Mischmetal-Coated Fabric: ASTM F 1345, Type III, Class 2, 1.0 oz./sq. ft..
    - e. Coat selvage ends of fabric that is metallic coated before the weaving process with manufacturer's standard clear protective coating.
  3. Aluminum Wire Fabric: ASTM F 1183, with mill finish, and wire diameter of 0.192 inch.
    - a. Mesh Size: 2 inches.
  4. Selvage: Knuckled at both selvages.

## 2.2 FENCE FRAMING

- A. Posts and Rails: Comply with ASTM F 1043 for framing, including rails, braces, and line; terminal; and corner posts. Provide members with minimum dimensions and wall thickness according to ASTM F 1043 or ASTM F 1083 based on the following:
1. Fence Height: 72 inches.
  2. Light Industrial Strength: Material Group IC-L, round steel pipe, electric-resistance-welded pipe.
    - a. Line Post: 2.375 inches in diameter.
    - b. End, Corner and Pull Post: 2.875 inches.
  3. Horizontal Framework Members: Intermediate, top, and bottom rails complying with ASTM F 1043.
    - a. Top Rail: 1.66 inches in diameter.
  4. Brace Rails: Comply with ASTM F 1043.
  5. Metallic Coating for Steel Framing:



- a. Type A, consisting of not less than minimum 2.0-oz./sq. ft. average zinc coating per ASTM A 123/A 123M or 4.0-oz./sq. ft. zinc coating per ASTM A 653/A 653M.
- b. Type B, zinc with organic overcoat, consisting of a minimum of 0.9 oz./sq. ft. of zinc after welding, a chromate conversion coating, and a clear, verifiable polymer film.
- c. Type C, Zn-5-Al-MM alloy, consisting of not less than 1.8-oz./sq. ft. coating.
- d. Coatings: Any coating above.

### 2.3 TENSION WIRE

- A. Metallic-Coated Steel Wire: 0.177 inch diameter, marcelled tension wire complying with ASTM A 817 and ASTM A 824, with the following metallic coating:
  1. Type I, aluminum coated (aluminized).
  2. Type II, zinc coated (galvanized) by hot-dip process, with the following minimum coating weight:
    - a. Class 4: Not less than 1.2 oz./sq. ft. of uncoated wire surface.
    - b. Class 5: Not less than 2 oz./sq. ft. of uncoated wire surface.
    - c. Matching chain-link fabric coating weight.
  3. Type III, Zn-5-Al-MM alloy with the following minimum coating weight:
    - a. Class 100: Not less than 1 oz./sq. ft. of uncoated wire surface.
    - b. Matching chain-link fabric coating weight.
- B. Aluminum Wire: 0.192-inch diameter tension wire, mill finished, complying with ASTM B 211, Alloy 6061-T94 with 50,000-psi minimum tensile strength.

### 2.4 SWING GATES

- A. General: Comply with ASTM F 900 for gate posts and double swing gate types.
  1. Gate Leaf Width: 60 inches.
  2. Gate Fabric Height: 72 inches.
- B. Pipe and Tubing:
  1. Zinc-Coated Steel: Comply with ASTM F 1043 and ASTM F 1083; manufacturer's standard protective coating and finish.
  2. Aluminum: Comply with ASTM B 429/B 429M; manufacturer's standard finish.
  3. Gate Posts: Round tubular steel.
  4. Gate Frames and Bracing: Round tubular steel.
- C. Frame Corner Construction: Welded or assembled with corner fittings.
- 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 to attach barbed wire assemblies.



E. Hardware:

1. Hinges: 360-degree inward and outward swing.
2. Latches permitting operation from both sides of gate with provision for padlocking accessible from both sides of gate.
3. Padlock and Chain: To be furnished by Owner.

2.5 FITTINGS

A. General: Comply with ASTM F 626.

B. Post Caps: Provide for each post.

1. Provide line post caps with loop to receive tension wire or top rail.

C. Rail and Brace Ends: For 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 long.
2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate rails in the fence line-to-line posts.

E. Tension and Brace Bands: Pressed steel.

F. Tension Bars: Steel, length not less than 2 inches 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, 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. Provide line posts with arms that accommodate top rail or tension wire.
2. Provide 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 diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.



- b. Aluminum: ASTM B 211; Alloy 1350-H19; 0.148 inch diameter, mill-finished wire.

J. Finish:

- 1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. zinc.
- 2. Aluminum: Mill finish.

2.6 PRIVACY SLATS

- A. Material: PVC, UV-light stabilized, sized to fit mesh specified for direction indicated.
- B. Material: Polyethylene tubular slats, manufactured for chain-link fences from virgin polyethylene containing UV inhibitor, sized to fit mesh specified for direction indicated.
- C. Material: Fiber-glass-reinforced plastic, UV-light stabilized, sized to fit mesh specified for direction indicated.

2.7 BARBED WIRE

- A. Steel Barbed Wire: Comply with ASTM A 121, for two-strand barbed wire, 0.099 inch diameter line wire with 0.080 inch diameter, four-point round barbs spaced not more than 5 inches o.c.
  - 1. Aluminum Coating: Type A.
  - 2. Zinc Coating: Type Z, Class 3.

2.8 GROUT AND ANCHORING CEMENT

- 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.

2.9 FENCE GROUNDING

- A. 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 wide, woven of No. 30 AWG bare copper wire, terminated with copper ferrules.
- B. Connectors and Grounding Rods: Comply with UL 467.
  1. Connectors for Below-Grade Use: Exothermic welded type.
  2. Grounding Rods: Copper-clad steel, 5/8 by 96 inches.

## 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 of the Work.
  1. Do not begin installation before final grading is completed.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Stake locations of fence lines, gates, and terminal posts. 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 indicated.
  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 above grade; shape and smooth to shed water.



- 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 10 feet o.c.
- E. Post Bracing and Intermediate Rails: Install according to ASTM F 567, maintaining plumb position and alignment of fencing. Diagonally brace terminal posts to adjacent line posts with truss rods and turnbuckles. Install braces at end and gate posts and at both sides of corner and pull posts.
  - 1. Locate horizontal braces at midheight of fabric 72 inches or higher, on fences with top rail and at two-third 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 diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches o.c. Install tension wire in locations indicated before stretching fabric. Provide horizontal tension wire at the following locations:
  - 1. Extended along top and bottom of fence fabric. Install top tension wire through post cap loops. Install bottom tension wire within 6 inches of bottom of fabric and tie to each post with not less than same diameter and type of wire.
- 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. Intermediate and Bottom Rails: Install and secure to posts with fittings.
- I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2 inches 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 o.c.
- K. Tie Wires: Use wire of proper length to firmly secure fabric to line posts and rails. Attach wire at one 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 o.c. and to braces at 24 inches o.c.
- L. Fasteners: Install nuts for tension bands and carriage bolts on the side of the fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.
- M. Privacy Slats: Install slats in direction indicated, securely locked in place.



- N. Barbed Wire: Install barbed wire uniformly spaced. Pull wire taut, install securely to extension arms, and secure to end post or terminal arms.

### 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 GROUNDING AND BONDING

- A. Protection at Crossings of Overhead Electrical Power Lines: Ground fence at location of crossing.
- B. Fences Enclosing Electrical Power Distribution Equipment: Ground as required by IEEE C2 unless otherwise indicated.
- C. Grounding Method: At each grounding location, drive a grounding rod vertically until the top is 6 inches below finished grade. Connect rod to fence with No. 6 AWG conductor. Connect conductor to each fence component at the grounding location, including the following:
  - 1. Make grounding connections to each barbed wire strand with wire-to-wire connectors designed for this purpose.
- D. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.
- E. Connections: Make connections to minimize possibility of galvanic action or electrolysis. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.

### 3.7 ADJUSTING

- A. 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.

END OF SECTION 323113