

SECTION 32 31 13.53 - HIGH-SECURITY 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 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:

- 1. High-security chain-link fences.

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. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed and exposure category indicated below:
 - a. Wind Speed: 100 mph temporary/130 mph permanent.
 - b. Exposure Category: D.
- 2. Fence Height: as per plan details.
- 3. Fence Framework Material Group: 1A, ASTM F 1043, Schedule 40 steel pipe.

- B. Provide framework for fences/gate that comply with ASTM F 1043, based on the following criteria:

- 1. Fence Framework Material Group: 1A, Schedule 40 round steel pipe.
- 2. Fence Height: see plans.
- 3. Line Post Spacing: see plans.

- C. Fabric Tension: Provide fences in which fabric deflections do not exceed those indicated in Table X1.1 of ASTM F 1916 when tested by applying a 30-lbf force at mid-point between rails and horizontally between posts for every eighth lower panel along the fence line.

- D. Fence Post Rigidity: Provide fences in which post deflections do not exceed $\frac{3}{4}$ inch when tested according to ASTM F 1916 by applying a 50-lbf force at mid height of every eighth post along the fence line.

- E. 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.
- 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 Verification: For each type of chain-link fence and gate indicated.
- D. Product Certificates: For each type of chain-link fence, operator, and gate, signed by product manufacturer.
 - 1. Strength test results for framing according to ASTM F 1043.
 - 2. Each submittal shall contain a certification that no product used contains asbestos.

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.

1.6 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.

1.7 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of high-security chain-link fences and gates that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, the following:
 - a. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - b. Deflection of fence fabric beyond design limits.
 - 3. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

- A. Chain-Link Fence Fabric: Height indicated on Drawings. Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage. Comply with ASTM A 392, CIFMI CIF 2445, and with requirements indicated below:
 - 1. Fabric.
 - a. Wire Diameter: 0.192 inch.
 - b. Mesh Size: 1 inch.
 - c. Coat selvage ends of fabric that is metallic coated before the weaving process with manufacturer's standard clear protective coating.
 - 2. Selvage: Twisted and barbed top and bottom.

2.2 SECURITY FENCE FRAMING

- A. Posts and Rails: Comply with ASTM F 1043 for framing of the following material group and strength requirement for fences of height indicated:
 - 1. Framework Material Group: 1A, round steel pipe, Schedule 40.
 - 2. Fence Height: 10 feet.
 - 3. Strength Requirement: Heavy industrial fence.
 - 4. Post Diameter and Thickness: Provide posts of sizes indicated below that comply with ASTM F 1043.
 - 5. Metallic Coatings for Steel Framing:
 - a. 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.

2.3 FITTINGS

- A. General: Comply with ASTM F 626.

- B. Post and Line Caps: Each post.
 - 1. Line post caps with loop to receive 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 long.
 - 2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom rails in the fence line to line posts.
 - 3. Tamper proof fasteners required

- E. Tension Bars: Steel, length not less than 2 inches shorter than full height of chain-link fabric with 1.2-ozlsq. ft. metallic (zinc) coating. Provide one bar for each gate and end post, and two for each corner and pull post unless fabric is integrally woven into post.

- F. Truss Rod Assemblies: Steel, hot-dip galvanized after threading rod and turnbuckle or other means of adjustment.

- G. Barbed Wire Arms: Pressed steel or cast iron, with clips, slots, or other means for attaching strands of barbed wire, integral with post cap; for each post, unless otherwise indicated, and as follows:
 - 1. Line posts with arms designed with opening to accommodate top rail.
 - 2. Corner arms at fence corner posts, unless extended posts are indicated.
 - 3. Type II, single vertical arm.
 - 4. Type IV, A-shaped arm.
 - 5. Rivets for connection to post.

- H. Tie Wires, Clips, and Fasteners: According to ASTM F 626 and ASTM F 1916.
 - 1. High-Security Round Wire Ties: For attaching chain-link fabric to posts, rails, and frames, complying with the following:
 - a. Metallic-Coated Steel: 0.192-inch-diameter wire; galvanized coating thickness matching coating thickness of chain-link fence fabric.
 - b. Weight of Metallic (Zinc) Coating: ASTM A 6411A 641M, Class B, 2.0 ozlsq. ft.

- I. Power-Driven Fabric Fasteners: Type 304, 0.0938-inch-thick, specially designed cap to anchor fabric to framing with a power-driven, heat-treated, knurled pin.

- J. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. *Isq.* ft. of zinc.

2.4 BARBED WIRE (GATE)

- A. Aluminum-Coated Steel Barbed Wire: 2-strand, 0.099-inch-diameter line wire with 0.080-inch-diameter, 4-point barbs spaced not more than 3 inches o.c.

2.5 BARBED TAPE (FENCE SURROUNDS)

- A. Wire-Reinforced Tape: 430 Series stainless steel hardened to Rockwell 30N, 0.025 inch thick by 1 inch wide before fabrication; with 4-pointed, needle-sharp barbs permanently cold clenched to a minimum of 230 deg F around a core wire.

1. Core wire: 0.098-inch-diameter, high-tensile-strength zinc-coated steel complying with ASTM A 764 or stainless steel complying with ASTM A 313.

- B. Clips: Stainless steel, 0.065 inch thick by 0.375inch wide; capable of withstanding a minimum 150-lbf pull load to limit extension of coil, resulting in a concertina pattern when deployed.

- C. Tie Wires: Stainless steel, 0.065 inch in diameter.

- D. Fabrication: Continuous coils of barbed tape as defined in ASTM F 1379 for the following characteristics:

1. Configuration: as shown.
2. Style: Concertina pattern.
3. Coil Diameter(s): 18 inches as indicated on Drawings.
4. Coil Loop Spacing(s): manufacturer's standard.
5. Barb Length Classification: Long, 1.2-inch barb.
6. Barb Spacing: 4 inches O.C.
7. Barb Set: Manufacturer's standard.

2.6 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.

2.7 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: Listed in UL 467.
 - 1. Grounding Rods: Copper-clad steel.
 - a. Size: 5/8 by 96 inches.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions, with Installer present, for compliance with requirements for site clearing, earthwork, pavement work, and other conditions affecting performance.
 - 1. 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 specified.

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. 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 mid-height of fabric 6 feet 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.
- D. 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 by fencing manufacturer.
- E. Bottom Rails: Install, spanning between posts; anchor rail at midspan to concrete footing.
- F. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Pull fabric taut and tie to posts, rails, and tension wires. Anchor to framework so fabric remains under tension after pulling force is released.
 1. Leave 1 inch between finish grade or surface and bottom selvage, unless otherwise indicated.
 2. Overlapping Fabric: At or between post or rail according to ASTM F 1916 with wire ties or steel strap method.
- G. 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.
- H. Tie Wires: Power-fastened or manually fastened ties configured to wrap a full 360 degrees around rail or post and a minimum of 1 complete diamond of fabric. Twist ends one and one-half machine twists or three full manual twists, and cut-off protruding ends to preclude untwisting by hand.
 1. Maximum Spacing: Tie fabric to line posts at 12 inches o.c. and to braces at 24 inches o.c.

- I. Power-Driven Fasteners: Fasten 0.192- or 0.148-inch wire fabric with 2- or i-inch mesh size.
 - 1. Fasten fabric to line posts 12 inches o.c. and to braces 24 inches o.c.
- J. Fasteners: Install nuts for tension bands and carriage bolts on the side of fence opposite the fabric side. Peen ends of bolts or score threads to prevent removal of nuts.
- K. Barbed Wire: Install barbed wire uniformly spaced as indicated on Drawings. Pull wire taut and install securely to extension arms and secure to end post or terminal arms.
- L. Barbed Tape: Install barbed tape uniformly in configurations indicated and fasten securely to prevent movement or displacement according to ASTM F 1911.

3.5 GROUNDING AND BONDING

- A. Gates and Other Fence Openings: Ground fence on each side of opening.
 - 1. Bond metal gates to gate posts.
- B. 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 grounding location, including the following:
 - 1. Each Barbed Wire Strand. Make grounding connections to barbed wire with wire-to-wire connectors designed for this purpose.
 - 2. Each Barbed Tape Coil: Make grounding connections to barbed tape with connectors designed for this purpose.
- C. Bonding Method for Gates: Connect bonding jumper between gate post and gate frame.
- D. Connections: Make connections so possibility of galvanic action or electrolysis is minimized. Select connectors, connection hardware, conductors, and connection methods so metals in direct contact will be galvanically compatible.
 - 1. Use electroplated or hot-tin-coated materials to ensure high conductivity and to make contact points closer in order of galvanic series.
 - 2. Make connections with clean, bare metal at points of contact.
 - 3. Make aluminum-to-steel connections with stainless-steel separators and mechanical clamps.

4. Make aluminum-to-galvanized-steel connections with tin-plated copper jumpers and mechanical clamps.
 5. Coat and seal connections having dissimilar metals with inert material to prevent future penetration of moisture to contact surfaces.
- E. Bonding to Lightning Protection System: If fence terminates at lightning-protected building or structure, ground the fence and bond the fence grounding conductor to lightning protection down conductor or lightning protection grounding conductor complying with NFPA 780.

3.6 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.
- B. Automatic Gate Operator: Energize circuits to electrical equipment and devices. Adjust operators, controls, safety devices, alarms, and limit switches.
1. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 2. Test and adjust controls, alarms, and safeties. Replace damaged and malfunctioning controls and equipment.

END OF SECTION 32 31 13.53