

SECTION 32 31 00

CHAIN LINK FENCING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Fence, Framework, and Accessories.
 - 2. Manual Gates and Related Hardware.
- B. Requirements:
 - 1. Furnish all materials, labor, and equipment required to provide fence for project area.
- C. Related Requirements:
 - 1. Section 03 05 00, Concrete.

1.2 REFERENCE STANDARDS

- A. Standard References in this Section are:
 - 1. ASTM A153/A153M, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - 2. ASTM A491, Specification for Aluminum-Coated Steel Chain-Link Fence Fabric.
 - 3. ASTM F567, Practice for Installation of Chain-Link Fence.
 - 4. ASTM F626, Specification for Fence Fittings.
 - 5. ASTM F900, Specification for Industrial and Commercial Swing Gates.
 - 6. ASTM F1043, Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework.
 - 7. ASTM F1083, Specification for Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded, for Fence Structures.
 - 8. UL 467, Grounding and Bonding Equipment.

1.3 QUALITY ASSURANCE

- A. Qualifications:
 - 1. Erector/Installer:
 - a. Engage a single erector that is skilled and trained, and possesses successful and documented experience installing fencing, and employs only workers with specific skill and successful experience in the type of Work required.

1.4 SUBMITTALS

- A. Section 01 33 00 - Submittal Procedures.
- B. Shop Drawings: Indicate plan layout, spacing of components, post foundation dimensions, hardware anchorage, gates, and schedule of components.

- C. Manufacturer's Installation Instructions: Submit installation requirements.
- D. Closeout Submittals: Submit the following:
 - 1. Section 01 70 00, Execution and Closeout Requirements.
 - 2. Project Record Documents: Accurately record actual locations of property perimeter posts relative to property lines and easements.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 - Product Requirements.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Chain-Link Fence Fabric:
 - 1. One-piece fabric widths, for fencing 12 feet and less in height, complying with CLFMI CLF 2445. Fabric Gage shall be No. 6-gage wires.
 - 2. Two-inch wire mesh shall be woven throughout in uniform with parallel sides in compliance with ASTM A817, Type 1, cold-drawn carbon steel wire with minimum breaking strength of 2,170 pounds and coated with aluminized finish, as specified. Fabric shall be as recommended by CLFMI for heavy industrial usage.
 - 3. Provide fence fabric imprinted with manufacturer's trade name, country of origin, core wire gage, and finished outside diameter gage.
 - 4. Provide fabric knuckled to eliminate exposure of sharp edges.
- B. Pipe shall be commercial grade, plain-end steel pipe with standard-weight walls. Steel strip used for manufacture of pipe shall comply with ASTM F1083, Schedule 40 pipe with minimum yield strength of 25,000 psi and protected with zinc, as specified
- C. Barbed Wire shall be commercial quality steel, two-strand, 11-gage line wire with 14-gage, four point twisted aluminum alloy barbs.

2.2 COMPONENTS

- A. Framework Dimensions:
 - 1. End, corner and pull posts shall meet the following minimum sizes:
 - a. 2.375 inches OD for fabric heights up to six feet.
 - b. 2.875 inches OD for fabric heights over six feet.
 - 2. Line posts shall meet the following minimum sizes:
 - a. 1.90 inches OD for fabric heights up to six feet.
 - b. 2.375 inches OD for fabric heights over six feet.
 - 3. Top rail shall be 1.90 inches OD unless otherwise indicated.

- a. Provide in manufacturer's longest lengths with expansion-type coupling rail sleeves.
- 4. Gate Posts: Provide gate posts for supporting single gate leaf, or one leaf of a double gate installation, for nominal gate widths as follows:
 - a. 2.875 inches OD for fabric heights up to six feet.
 - b. 4.00 inches OD for fabric heights over six feet.
- 5. Gate Frame: Spaced so that frame members are not more than eight feet apart.
 - a. 1.900-inch OD
 - b. Gates shall be 14 feet with double swing gates
- B. Auxiliary Fencing Materials and Accessories:
 - 1. Stretcher Bars: One-piece lengths equal to height of fabric with minimum cross section of 3/16-inch by 3/4-inch.

2.3 GATES

- A. General:
 - 1. Swing gates shall comply with ASTM F900. Use same fabric as provided for fence.
 - 2. Gate hinges shall be double clamping offset type and each gate frame shall be provided with a keeper to automatically engage gate shoe set in concrete.
 - a. Gate Hinges: Pressed or forged steel or malleable iron to suit gate size, non-lift off type, 180-degree offset heavy-industrial hinges, 1.5 pair per leaf.
 - b. Latch: Forked type or plunger bar type to permit operation from either side of gate, with padlock eye as integral part of latch.
 - 3. Frames shall be welded construction and horizontal intermediate rails and diagonal bracing shall be provided in one direction extending from top to bottom rail.
 - 4. Gate stops shall be provided for double gates consisting of mushroom-type flush plate with anchors, set in concrete and designed to engage a center drop rod. Include locking device and padlock eyes as integral part of latch.
 - 5. Install diagonal cross-bracing on gates consisting of 3/8-inch diameter adjustable length truss rods with turnbuckles to ensure frame rigidity without sag or twist.
 - 6. Where barbed wire is shown or indicated above gates, extend endmembers of gate frames one foot above top member, and prepare to receive three strands of wire. Provide necessary clips for securing wire to extensions.
 - 7. Gates shall include a stopping mechanism per CFPUA Standard Details.

2.4 AUXILIARY FENCING MATERIALS AND ACCESSORIES

- A. Components:
 - 1. Barbed wire supporting arms shall be pressed steel for three rows of barbed wire attached to each arm complete with provisions for anchorage to posts. A single 45-degree arm shall be provided for each post.
 - 2. Post caps shall be pressed steel, wrought iron designed as weather-tight closure cap for tubular posts. Provide one cap for each post. Provide caps with openings to allow through-passage of top rail. Cone-type caps shall be provided for terminal posts and loop-type caps for line posts.

3. Stretcher bars shall be provided for each gate at not more than 15-inches on center for gate frame and for each end-post. Two bars shall be provided for each corner and pull-post. Attach with rivets to provide against removal and breakage.
4. Stretcher bar bands shall be pressed steel, galvanized, 0.078-inch to 0.108-inch thick, spaced not greater than 15-inches on centers to secure stretcher bars to posts.

2.5 FINISHING

- A. Chain-Link Fence Fabric:
 1. Aluminized finish with not less than 0.40 ounces aluminum per square foot, complying with ASTM A491, Class II.
- B. Framework and Appurtenances: Provide the following finishes for steel framework, auxiliary system components, and miscellaneous accessories:
 1. Galvanizing: Zinc for galvanizing shall be of High Grade or Special High-Grade conforming to ASTM B6 with maximum aluminum content of 0.01 percent. Galvanize metal using hot-dip process.
- C. PVC Finish for All Fencing Components: Provide PVC epoxy-modified plastic resin finish, fusion bonded to heated metal, minimum 10-mil thickness.
 1. Provide PVC plastic resin finish over aluminized steel wire by thermal extrusion method, in compliance with ASTM F668, Class 2b.
 2. Color:
 - a. As selected by ENGINEER from manufacturer's complete range of standard and custom colors.
 - b. Provide fencing with all components, including framework and accessories completely protected with color coating, in compliance with CLFMI CLF 2445.
- D. Welded Joints:
 1. Repair zinc coatings at welded joints by applying zinc-rich paint, as specified in Section 09 91 00, Painting, and ASTM A780.
 2. Repair polymer-coated steel by applying an epoxy primer, intermediate coat and urethane topcoat, as specified in Section 09 91 00, Painting, matching color and reflectivity of adjacent PVC finish.

2.6 CONCRETE

- A. See Section 03 05 00, Concrete.

2.7 SOURCE QUALITY CONTROL

- A. Fabrication Tolerances:
 1. Fabric, posts, rails, and other supports shall be straight or uniformly curved to provide the profiles shown, to dimensional tolerance of 1/16-inch in 10 feet without warp or rack in the finished Work.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Section 01 70 00, Execution and Closeout Requirements.
- B. Examine conditions under which the Work will be erected and notify Engineer in writing of conditions detrimental to proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions are corrected.

3.2 ERECTION

- A. Comply with CLFMI Step-by-Step Installation Guide and ASTM F567. Do not begin installation and erection of fencing until final grading is completed.
- B. Excavation: Drill holes of diameters specified, for post footings in firm, undisturbed or compacted soil.
 - 1. For posts set in cast-in-place concrete, provide hole diameters dug or drilled a minimum of four times the largest cross section of post.
 - a. Unless otherwise shown or indicated, excavate hole depths approximately three inches lower than bottom of post, with bottom of posts set not less than two feet below the surface of finished grade when in firm, undisturbed soil, plus an additional three inches for each foot increase in the fence height over four feet.
 - 2. Spread soil from excavations uniformly adjacent to fence line, or on adjacent areas of the Site, as directed by ENGINEER.
 - 3. When solid rock is encountered at ground surface, drill into rock at least 12 inches for line-posts and at least 1.5 feet for end-, pull-, corner-, and gateposts. Drill hole at least one-inch greater diameter than largest dimension of post to be placed.
 - a. If solid rock is below soil overburden, drill to full depth required, except penetration into rock need not exceed the minimum depths specified above for rock encountered at ground surface.
- C. Setting Posts: Remove loose and foreign materials from sides and bottoms of holes and moisten soil prior to placing concrete.
 - 1. Center and align posts in holes 3-inches above bottom of excavation.
 - 2. Posts shall be set in concrete footings, except as otherwise shown or specified. Place concrete around posts in continuous pour and vibrate or tamp for consolidation. Check each post for vertical and top alignment and hold in position during placement and finishing operations.
 - 3. Extend concrete to two inches above ground surface, or to two inches below ground surface if cover of sod, bituminous asphalt paving, or other material is shown or indicated to conceal concrete. Crown to shed water away from posts.
 - 4. Extend footings for gate posts to underside of bottom hinge. Set keeps, stops, sleeves, and other accessories into concrete as required.
 - 5. Keep exposed concrete surfaces moist for at least seven days after placement, or cure with membrane curing materials, or other acceptable curing method.

6. Grout posts set in sleeved holes, concrete constructions, or rock with grout, as specified in Section 03 60 00, Grouting, and as recommended in CLFMI CLF 2445.
- D. Concrete Strength: Allow concrete to attain at least 75 percent of its minimum 28-day compressive strength, but in no case sooner than seven days after placement, before installing rails, tension wires, barbed wire, or chain-link fabric.
1. Do not stretch and tension fabric and wires, and do not hang gates, until concrete has attained its full design strength.
- E. Posts and Rails:
1. Line Posts: Set posts in cast-in-place concrete footings as specified, spaced not more than ten feet on centers. Provide caps on top of each post to exclude moisture and to receive top rail, unless equal protection is afforded by combination post-top cap and barbed wire supporting arm, where barbed wire is required.
 2. Top Rails: Run rail continuously through post caps or extension arms, bending to radius for curved runs. Provide expansion couplings as recommended by fencing manufacturer to form continuous rail between terminal posts.
 3. Brace Assemblies: Install braces so posts are plumb when diagonal rod are under proper tension. Install brace assemblies at end-posts and at both sides of corner- and pull-post panels. Panels adjacent to gates shall have intermediate horizontal rails and diagonal bracing. Diagonal bracing shall run from center of first line-post to bottom of terminal-post.
- F. Chain-Link Fabric:
1. Install fabric on security side of fence, and anchor to framework so that fabric remains in tension after pulling force is released. Fasten to terminal posts and gate posts with tension bars threaded through mesh and secured with tension bands at maximum intervals of 14 inches.
 2. Tie to line-posts, gate frames and top and bottom rails with tie wires spaced at maximum 12 inches on posts and two feet on rails.
 3. Connect tension bars to posts and frames by means of adjustable bolts and bands spaced not more than 14 inches apart.
 4. Leave approximately two inches between finish ground surface and bottom selvage, except where bottom of fabric extends into concrete.
 5. Join roll of chain-link fabric by weaving a single picket into the ends of roll to form continuous mesh.
- G. Barbed Wire:
1. Install three parallel wires on each extension arm; on security side of fence, unless otherwise shown or indicated
 2. Pull wire taut to remove sag and firmly install in slots of extension arms to prevent movement or displacement.
 3. Secure wire to terminal posts utilizing terminal post band arms or brace bands.
 4. Extend vertical members of gates to receive barbed wire.
- H. Stretcher Bars: Thread through or clamp to fabric four inches on centers, and secure to posts with metal bands spaced 15 inches on centers.

- I. Gates: Install gates plumb, level, and secure for full opening without interference. Install ground-set items in concrete for anchorage, as shown on approved Shop Drawings. Adjust hardware for smooth operation and lubricate where necessary.
- J. Tie Wires: Use U-shaped wires conforming to diameter of pipe. Clasp pipe and fabric firmly with ends twisted at least two full turns. Bend ends of wire to minimize hazard to persons and clothing.
- K. Fasteners: Install nuts for tension band and hardware bolts on side of fence opposite fabric side. Peen ends of bolts or score threads to prevent removal of nuts.

3.3 ADJUSTMENT AND CLEANING

- A. Repair coatings damaged in the shop or at the Site by recoating with manufacturer's recommended repair compound, applied in accordance with manufacturer's directions. Repair hot-dip galvanized coatings in accordance with ASTM A780.
- B. Gate: Adjust gate to operate smoothly, easily, and quietly, free of binding, warp, excessive deflection, distortion, nonalignment, misplacement, disruption, and malfunction throughout entire operational range. Confirm that latches and locks engage accurately and securely without forcing or binding.
- C. Lubricate operating equipment and clean exposed surfaces.
- D. Repair and replace broken or bent components.

END OF SECTION