

SECTION 32 31 13
CHAIN-LINK FENCES AND GATES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. This work consists of all labor, materials, and equipment necessary for furnishing and installing chain-link fence, gates and accessories in conformance with the lines, grades, and details as shown.

1.2 RELATED WORK

- A. Grounding of fencing for enclosures of electrical equipment and for lightning protection as shown: Section 26 05 26, GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.
- B. Temporary Construction Fence: Section 01 00 00, GENERAL REQUIREMENTS.
- C. Finish Grading: Section 31 20 00, EARTH MOVING, and Section 32 90 00, PLANTING.
- D. Concrete: Section 03 30 00, CAST-IN-PLACE CONCRETE.

1.3 MANUFACTURER'S QUALIFICATIONS

Fence, gates, and accessories shall be products of manufacturers' regularly engaged in manufacturing items of type specified.

1.4 SUBMITTALS

- A. In accordance with Section 01 33 23, SHOP DRAWINGS, PRODUCT DATA AND SAMPLES, furnish the following:
1. Manufacturer's Literature and Data: Chain-link fencing, gates and all accessories.
 2. Manufacturer's Certificates: PVC & Zinc-coatings comply with specifications.
 - a. Statement(s) signed by an official authorized to certify on behalf of the manufacturer(s) of the products provided, attesting that the chain-link fence and component materials meet the minimum specified requirements referred to in these specifications and drawings. The products provided shall only be acceptable from qualified manufacturers having a minimum of five years experience manufacturing thermally fused chain-link fencing of the design, size gauge of metal parts and fabrication as specified herein.
 3. Shop Drawings for Chain-link Fence and gates and all components of functional fence system.

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- a. Layout of fences and gates with dimensions, elevations, details, and finishes of components, accessories, and post foundations. Include all details of fencing and attachments to any walls or buildings around the enclosed area. Coordinate with wall manufacturer to provide appropriate wall and fence construction details that will result in fencing that will withstand the applicable horizontal and vertical loadings for chain-link fencing.
 - b. Manufacturer's catalog cuts indicating materials compliance and specified options.
- 4. Operation and Maintenance Manuals.
 - 5. Certification that fence alignment meets requirements of contract documents.
 - 6. Samples: For each polymer-coated product and for each color and texture specified, in 150 mm (6-inch) lengths for components and on full-sized units for accessories.
 - 7. Sample of special warranty.
 - 8. Shop drawings required for connection between chain-link fencing and ornamental fencing.

1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer and/or Installer agrees to repair or replace components of chain-link fences and gates that fail in materials or workmanship within specified warranty period.
 - 1. Failures include, but are not limited to, deterioration of metals, metal finishes, and other materials beyond normal weathering.
 - 2. Warranty Period: Five years from date of Substantial Completion.

1.6 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. American Society for Testing and Materials (ASTM):
 - A121-07.....Metallic Coated Carbon Steel Barbed Wire
 - A392-07.....Zinc-Coated Steel Chain-Link Fence Fabric
 - A817-07.....Metal-Coated Steel Wire for Chain-Link Fence
Fabric and Marcellled Tension Wire

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C94/C94M-09.....Ready-Mixed Concrete
F567-07.....Installation of Chain-Link Fence
F626-08.....Fence Fittings
F668-07.....Polyvinyl Chloride (PVC) and other Organic
Polymer-Coated Steel Chain-Link Fence Fabric
F900-05.....Industrial and Commercial Swing Gates
F934-96 (R2008).....Standard Colors for Polymer-Coated Chain-link
Fence Materials
F1043-08.....Strength and Protective Coatings on Metal
Industrial Chain-Link Fence Framework
F1083-08.....Pipe, Steel, Hot-Dipped Zinc-Coated
(Galvanized) Welded, for Fence Structures.

C. Federal Specifications (Fed. Spec.):

A-A-59486A.....Padlock Set (Individually Keyed or Keyed Alike)

PART 2 - PRODUCTS

2.1 GENERAL

All chain-link fences and gates shall match existing black chain-link fencing or be approved equal. Materials shall conform to ASTM F1083 and ASTM A392 ferrous metals, zinc-coated; and detailed specifications forming the various parts thereto; and other requirements specified herein. Zinc-coat metal members (including fabric, gates, posts, rails, hardware and other ferrous metal items) after fabrication shall be reasonably free of excessive roughness, blisters and sal-ammoniac spots. The chain-link fencing system for the project shall be provided with the specified PVC coating system of the color indicated.

2.2 CHAIN-LINK FABRIC

- A. Polyolefin elastomer coating, 10 mil (0.25mm) thickness, thermally fused to zinc-coated steel core wire: Per ASTM F668 Class 2b. Core wire tensile strength 75,000 psi (517 MPa).
- B. Size: Helically wound and woven to height of 6 feet (as indicated on drawings) with 2 inch diamond mesh, 9 gauge, with a core wire diameter of .148 inches and a minimum breaking strength of 1290 lbf. Color ASTM F 934. Midnight Black as indicated on the drawings.
- C. Selvage of fabric knuckled at top and at bottom.

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D. Furnish one piece of fabric widths for all project chain-link fencing.

2.3 POST, FOR GATES AND FENCING

A. ASTM F1083, Grade SK-40A, round, zinc-coated steel. Dimensions and weights of posts shall conform to the tables in the ASTM Specification. Provide post braces and truss rods for each gate, corner, pull or end post. Provide truss rods with turnbuckles or other equivalent provisions for adjustment.

B. Polyolefin Coated finish: In accordance with ASTM F1043, apply supplemental color coating of minimum 10 mils (0.254mm) of thermally fused polyolefin in midnight black color to match existing fabric as indicated on drawings and after fabrication. Coating before fabrication will not be allowed.

C. Where color coated fencing is called for in the Drawings and Specifications, all posts, braces, rails and visible hardware shall have the same supplemental color coating.

D. Hardware color of chain-link fencing shall match ornamental fencing color where chain-link fencing and ornamental fencing are joined. This includes chain-link fencing hardware, strapping and fasteners surrounding ornamental fence post. Submittal and approval required for chain-link to ornamental fencing connection.

2.4 TOP RAIL AND BOTTOM RAIL

ASTM F1083, Grade SK-40A, round, zinc-coated steel. Dimensions and weights of posts shall conform to the tables in the ASTM Specification; fitted with suitable expansion sleeves and means for securing rail to each gate, corner, and end posts.

2.5 TOP AND BOTTOM TENSION WIRE

ASTM A817 and ASTM F626, zinc-coated, having minimum coating the same as the fence fabric.

2.6 ACCESSORIES

Accessories as necessary caps, rail and brace ends, wire ties or clips, braces and tension bands, tension bars, truss rods, and miscellaneous accessories conforming to ASTM F626

2.7 GATES

ASTM F900, type as shown. Gate framing, bracing, latches, and other hardware zinc-coating weight shall be the same as the FABRIC. Gate leaves more than 2400 mm (8 feet) wide shall have either intermediate members and diagonal truss rods, or shall have tubular members as necessary to provide rigid construction, free from sag or twist. Gates less than 2400 mm (8 feet) wide shall have truss rods or intermediate braces. Attach gate fabric to the gate frame by methods standard with the manufacturer, welding will not be permitted. Arrange latches for padlocking so that padlock will be accessible from both sides of the gate regardless of the latching arrangement.

2.8 CHAIN-LINK CANTILEVER SLIDE GATE

- A. Gate Frames: Fabricate chain-link cantilever slide gate in accordance with ASTM F 1184, Type II, Class 2, using 50 mm (2-inch) square aluminum members, ASTM B 221, alloy and temper 6063-T6, weighing 1.4 Kgs/M (0.94 lb/ft). Weld members together forming rigid one-piece frame integral with top track. Provide two truck assemblies for each gate leaf.
- B. Gate Fabric assembly: Install fabric with hook bolts and tension bars at all four sides. Attach to gate frame not more than 375 mm (15 inches) on center.
- C. Bracing: Provide diagonal adjustable length truss rods of 9 mm (3/8") galvanized steel, in each panel of gate frames
- D. Top track/rail: Enclosed combination one-piece track and rail, aluminum extrusion with weight of 6 mm (3.72 lb/ft). Track to withstand reaction load of 900 Kg (2,000#).
- E. Truck assembly: Swivel type, zinc die cast, with 4 sealed lubricant ball bearing rollers, 50 mm (2 inches) in diameter by 14 mm (9/16") in width, and 2 side rolling wheels to ensure truck alignment in track. Mount trucks on post brackets using 22 mm (7/8") diameter ball bolts with 13 mm (1/2") shank. Truck assembly to withstand same reaction load as track, 970 Kg (2,000 #).
- F. Gate hangers, latches, brackets, guide assemblies, and stops: Malleable iron or steel, galvanized after fabrication. Provide positive latch with provisions for padlocking. These fittings do not receive PVC coating.

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- G. Bottom guide wheel assemblies: Each assembly shall consist of two, 75 mm (3") diameter rubber wheels, straddling bottom horizontal gate rail, allowing adjustment to maintain gate frame plumb and in proper alignment. Attach one assembly to each guidepost. These fittings do not receive PVC coating.
- H. Gates posts: Galvanized steel 100 mm (4") OD Schedule 40 pipe, ASTM F 1083, weighing 14 Kgs/M (9.1 lb/ft). Provide 1 latch post and 2 support posts for single slide gate.
- I. Gate finish: all members, PVC Vinyl Coated (except track/ bottom guide wheel assemblies) 250 to 375 microns (10 to 15 mils) thick thermally fused, ASTM Class-2b, black color, or as approved during the submittal process.

2.9 GATE HARDWARE

- A. Manufacturer's standard products, installed complete. The type of hinges shall allow gates to swing through 180 degrees, from closed to open position. Hang and secure gates in such a manner that, when locked, they cannot be lifted off hinges.
- B. Provide stops and keepers for all double gates. Provide keepers for all gates over 8 feet in width. Latches shall have a plunger-bar arranged to engage the center stop. Arrange latches for locking. Center stops shall consist of a device arranged to be set in concrete and to engage a plunger bar. Keepers shall consist of a mechanical device for securing the free end of the gate when in full open position.
- C. Padlocks for gates are specified under Section 08 71 00, DOOR HARDWARE. Padlocks shall have chains that are securely attached to the gate or gate post.
- D. Equip gate openings with padlock conforming to Fed Spec FF-P-110H, Type EPC, size 50 mm (2 inch). Padlocks shall have chains that are securely attached to the gate or gate post. Before padlocks are delivered to project, submit sample to COR for approval. Approved sample may be incorporated in work. Key padlock as directed by the COR.

2.9 POLYOLEFIN COATED ACCESSORIES

- A. Chain-link fence accessories as required: ASTM F 626, Provide items required to complete fence system. Galvanize each ferrous metal item and finish to match adjacent framing and fencing.

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- B. Post Caps: Formed steel, cast malleable iron, or aluminum alloy weather tight closure cap for tubular posts. Provide one cap for each post. Where top rail is used, provide tops to permit passage of top rail.
- C. Top rail and brace rail ends: Pressed steel per ASTM F626, for connection of rail and brace to terminal posts.
- D. Top rail sleeves: 7" (178 mm) expansion sleeve with spring, allowing for expansion and contraction of top rail.
- E. Wire ties: 9 gauge [0.148" (3.76 mm)] galvanized steel wire for attachment of fabric to line posts. Double wrap 13 gauge [0.092" (2.324 mm)] for rails and braces. Hog ring ties of 12-1/2 gauge [0.0985" (2.502 mm)] for attachment of fabric to tension wire.
- F. Brace and tension (stretcher bar) bands: Pressed steel. At square post provide tension bar clips.
- G. Tension (stretcher) bars: One piece lengths equal to 2 inches (50 mm) less than full height of fabric with a minimum cross-section of 3/16" x 3/4" (4.76 mm x 19 mm) or equivalent fiber glass rod. Provide tension (stretcher) bars where chain-link fabric meets terminal posts.
- H. Tension wire: Thermally fused polyolefin applied to metallic coated steel wire: Per ASTM F 1664 Class 2 b, 6 gauge, [0.192" (4.88mm)] diameter core wire with tensile strength of 75,000 psi (517 MPa).
- I. Truss rods and tightener: Steel rods with minimum diameter of 5/16" (7.9 mm). Capable of withstanding a tension of minimum 2,000 lbs.
- J. Nuts and bolts are galvanized but not polyolefin coated. Field spray color coat nuts and bolts, as approved by COR.
- K. Color coated fencing called for in the drawings shall be constructed as a complete color coated chain-link fence system of the uniform specified color.

2.10 CONCRETE

ASTM C94/C94M, using 19 mm (3/4 inch) maximum-size aggregate, and having minimum compressive strength of 25 mPa (3000 psig) at 28 days. Non-shrinking grout shall consist of one part Portland cement to three parts clean, well-graded sand, non-shrinking grout additive and the minimum amount of water to produce a workable mix.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install fence by properly trained crew, on previously prepared surfaces, to line and grade as shown. Install fence in accordance with ASTM F567 and with the manufacturer's printed installation instructions, except as modified herein or as shown. Maintain all equipment, tools, and machinery while on the project in sufficient quantities and capacities for proper installation of posts, chain-links and accessories.
- B. A Registered Professional Land Surveyor or Registered Civil Engineer specified in Section 01 00 00, GENERAL REQUIREMENTS, shall stake out and certify the fence alignment to meet the requirements as shown.

3.2 EXCAVATION

Excavation for concrete-embedded items shall be of the dimensions shown, except in bedrock. If bedrock is encountered before reaching the required depth, continue the excavation to the depth shown or 450 mm (18 inches) into the bedrock, whichever is less, and provide a minimum of 50 mm (2 inches) larger diameter than the outside diameter of the post. Clear loose material from post holes. Grade area around finished concrete footings as shown and dispose of excess earth as directed by the Resident Engineer.

3.3 POST SETTING

Install posts plumb and in alignment. Set post in concrete footings of dimensions as shown, except in bedrock. Thoroughly compact concrete so as it to be free of voids and finished in a slope or dome to divert water running down the post away from the footing. Straight runs between braced posts shall not exceed 150 m (500 feet). Install posts in bedrock with a minimum of 25 mm (one inch) of non-shrinking grout around each post. Thoroughly work non-shrinking grout into the hole so as to be free of voids and finished in a slope or dome. Cure concrete and grout a minimum of 72 hours before any further work is done on the posts.

3.4 POST CAPS

Fit all exposed ends of post with caps. Provide caps that fit snugly and are weathertight. Where top rail is used, provide caps to

accommodate the top rail. Install post caps as recommended by the manufacturer and as shown.

3.5 SUPPORTING ARMS

Design/install supporting arms, when required, to be weathertight. Where top rail is used, provide arms to accommodate the top rail. Install supporting arms as recommended by the manufacturer and as shown.

3.6 TOP RAILS

Install rails before installing chain-link fabric. Provide suitable means for securing rail ends to terminal and intermediate post. Top rails shall pass through intermediate post supporting arms or caps as shown. The rails shall have expansion couplings (rail sleeves) spaced as recommended by the manufacturer. Where fence is located on top of a wall, install expansion couplings over expansion joints in wall.

3.7 BOTTOM TENSION WIRE

Install and pull taut tension wire before installing the chain-link fabric.

3.8 ACCESSORIES

Supply accessories (posts braces, tension bands, tension bars, truss rods, and miscellaneous accessories), as required and recommended by the manufacturer, to accommodate the installation of a complete fence, with fabric that is taut and attached properly to posts, rails, and tension wire.

3.9 FABRIC

- A. Pull fabric taut and secured with wire ties or clips to the top rail and tension wire close to both sides of each post and at intervals of not more than 600 mm (24 inches) on centers. Secure fabric to posts using stretcher bars and ties or clips.
- B. Fabric shall be installed with bias cutting as detailed on plans. Bias cutting required at locations indicated on the drawings.

3.11 GATES

Install gates plumb, level, and secure for full opening without interference. Set keepers, stops and other accessories into concrete as required by the manufacturer and as shown. Adjust hardware for smooth operation and lubricate where necessary.

3.12 REPAIR OF GALVANIZED SURFACES

Use galvanized repair compound, stick form, or other method, where galvanized surfaces need field or shop repair. Repair surfaces in accordance with the manufacturer's printed directions. Paint to match surrounding color.

3.13 FINAL CLEAN-UP

Remove all debris, rubbish and excess material from the station.

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