

## CHAIN-LINK FENCES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Special Conditions of Contract, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Chain-Link Fences.
- B. Related Sections include the following:
  - 1. Division 2 Section "Earthwork" for site excavation, fill, and backfill where chain-link fences are located.
  - 2. Division 3 Section "Cast-in-Place Concrete" for concrete equipment bases/pads for controls post concrete fill.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide chain-link fences 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:
      - Egyptian Code of Practice for calculating loads and forces in structural and building Works, Ministerial Decree 45/1993; basic wind pressure equal to 70 kg/m<sup>2</sup>.
      - Or - Uniform Building Code, Exposure C, Basic wind Speed 140 km/hr.
    - b. Fence Height: 3.00 m.
    - c. Line Post Group: IA, ASTM F 1043, Schedule 40 steel pipe.
  - 2. Determine minimum post size, group, and section according to ASTM F 1043 for framework up to 3.66 m high, and post spacing not to exceed 3 m.

## 1.4 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences.
  - 1. Fence posts, rails, and fittings.
  - 2. Chain-link fabric, reinforcements, and attachments.
- B. Shop Drawings: Show locations of fences, posts, rails, tension wires, details of extended posts, extension arms, or other operation, hardware, and accessories. Indicate materials, dimensions, sizes, weights, and finishes of components. Include plans, sections, details of post anchorage, attachment, bracing, and other required installation and operational clearances.
- C. Samples for Initial Selection: Manufacturer's color charts or 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 indicated.
  - 1. Polymer-coated steel wire (for fabric) in 150-mm lengths.
  - 2. Polymer coating, in 150-mm lengths on shapes for posts, rails, wires, and on full-sized units for accessories.
- E. Product Certificates: For each type of chain-link fence, 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:
  - 1. Polymer finishes.

## 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed chain-link fences 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, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
- B. Mockups: Build mockups to set quality standards for fabrication and installation.

1. Include 3 m length of fence complying with requirements.
    - a. Approval of mockups is also for other material and construction qualities specifically approved by Architect in writing.
    - b. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless such deviations are specifically approved by Engineer in writing.
  2. Approved mockups will become part of the completed Work if undisturbed at time of Substantial Completion.
- 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 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 Employer or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
1. Notify Engineer no fewer than two days in advance of proposed interruption of utility services.
  2. Do not proceed with interruption of utility services without Engineer's written permission.

## PART 2 - PRODUCTS

### 2.1 CHAIN-LINK FENCE FABRIC

- A. General: Height indicated 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 3.76 mm.
    - a. Mesh Size: 44 mm.
    - b. Weight of Metallic (Zinc) Coating: ASTM A 392, Type II, Class 1, 366 g/sq.m. with zinc coating applied after weaving.
    - c. Polymer Coating: ASTM D 668, Class 2a over metallic-coated steel wire.
      - 1) Color: As selected by Engineer from manufacturer's full range, complying with ASTM F 934.

- d. Coat selvage ends of fabric that is metallic coated before the weaving process with manufacturer's standard clear protective coating.

## 2.2 FENCE FRAMING

- A. Posts and Rails: Round cold-formed, electric-resistance-welded, steel pipe or tubing, with minimum yield strength of 310 MPa and with outside dimension, minimum wall thickness, and weight complying with ASTM F 761 or ASTM F 654 for the following fence height and strength and stiffness requirements:
  1. Fence Height: As indicated on Drawings.
  2. Duty Rating: Heavy..
  3. Metallic-Coated Steel: Posts, rails, and frames protected with an external coating of not less than 183 g of zinc/sq. m, a chromate conversion coating, and a clear, verifiable polymer film; with an internal protective coating of not less than 183 g of zinc/sq. m or 81 percent, not less than 0.0076-mm thick, zinc pigmented coating.

## 2.3 TENSION WIRE

- A. General: Provide horizontal tension wire at the following locations:
  1. Location: As specified.
- B. Metallic-Coated Steel Wire: 4.5-mm diameter, marcelled tension wire complying with ASTM A 817, ASTM A 824, and the following:
  1. Metallic Coating: Type II, zinc coated (galvanized) by hot-dip process, with the following minimum coating weight:
    - a. 610 g/sq.m.

## 2.4 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 corner, pull, and end post.
- D. Rail Fittings: Provide the following:
  1. Top Rail Sleeves: Pressed-steel or round-steel tubing not less than 152 mm long.
  2. Rail Clamps: Line and corner boulevard clamps for connecting bottom rails in the fence line-to-line posts.

- E. Tension and Brace Bands: Pressed steel.
- F. Tension Bars: Steel, length not less than 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. Finish:
  - 1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 366 g /sq. m zinc.

## 2.5 CAST-IN-PLACE CONCRETE

- A. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM C 33, and potable water. Measure, batch, and mix Project-site-mixed concrete according to ASTM C 94/C 94M.
  - 1. Concrete Mixes: Normal-weight concrete with not less than 20.7- MPa compressive strength after 28 days, 75-mm slump, and 25-mm maximum size aggregate.

## 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 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 2a 2b.
- C. 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.
- D. 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 Engineer.
  - 2. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Stake locations of fence lines, and terminal posts. Do not exceed intervals of 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 50 mm above grade; shape and smooth to shed water.
    - b. Concealed Concrete: Top 50 mm below grade as indicated on Drawings to allow covering with surface material.
    - c. Posts Set into Concrete: Use steel base plates prewelded and anchored into concrete for installing posts. Fill space between post and forms with concrete as specified, vibrate, compact and finish sloped to drain water away from post.

- 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 as indicated on Drawings.
- D. Line Posts: Space line posts uniformly at 3 m o.c.
- E. Post Bracing: 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.
- 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 3.05-mm diameter hog rings of same material and finish as fabric wire, spaced a maximum of 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 150 mm of bottom of fabric and tie to each post with not less than same diameter and type of wire.
- G. Chain-Link Fabric: Apply fabric to inside of enclosing framework. Leave 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.
- H. Tension or Stretcher Bars: Thread through fabric and secure to end, corner, pull, and gate posts with tension bands spaced not more than 380 mm o.c.
- I. 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 300 mm o.c. and to braces at 610 mm o.c.
- J. 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.