SECTION 323113 - 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. Chain-Link Fences
2. Motorized operated horizontal slide Fortress Structural Cantilever Slide Gates
3. Manual swinging gates
4. Pre-wired, self-contained, slide gate operator for Fortress Structural Cantilever Slide Gates, including all selected attachments and accessory equipment.

B. Related Sections include the following:
1. Division 16 Electrical service and connections.
2. Division 31 Section "Earth Moving" for site excavation, fill, and backfill where chain-link fences and gates are located.

1.3 SUBMITTALS

A. Product Data:
1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for chain-link fences and gates. Provide manufacturer’s catalog cuts with printed specifications and installation instructions
   a. Fence and gate posts, rails, and fittings.
   b. Chain-link fabric, reinforcements, and attachments.
   c. Motorized operators
   d. Fortress Structural Cantilever Slide Gates
2. Furnish two (2) copies of operation and maintenance data covering the installed products.

B. Shop Drawings: Show locations of fences, , posts, rails, tension wires, details of extended posts. 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. Include complete details of gate construction, gate height and post spacing dimensions.

C. Certification of Performance Criteria
1. Manufacturer of gate system shall provide certification stating the gate system includes the following material components that provide superior performance and longevity. Alternate designs built to minimum standards that do not include these additional structural features shall not be accepted.
2. Gate track system shall be keyed to interlock into gate frame member (providing 200% additional strength when compared to weld only keyless systems). When interlocked with and welded to the "keyed" frame top member, gate track forms a composite structure.

3. Gate shall have a minimum counterbalance length of 50% opening width which provides a 36% increase in lateral resistance (when compared to ASTM minimum of 40% counterbalance). If gate is ever to be automated, counterbalance section shall be filled with fabric or other specified material.
4. To provide superior structural integrity, intermediate vertical members shall be used - with spacing between verticals to be less than 50% of the gate frame height.
5. Entire gate frame (including counterbalance section) shall include 2 adjustable stainless steel cables (minimum 3/16") per bay to allow complete gate frame adjustment (maintaining strongest structural square and level orientation).
6. Gate truck assemblies shall be tested for continuous duty and shall have plated steel bearings meeting ASTM B 117-07 salt spray test with no red rust after 790 hours. Bearings shall be specifically designed for roller applications with full compliment ball bearings, shock resistant outer races, and captured seals.
7. Gate truck assemblies shall be supported by a minimum 5/8" plated steel bolt with self aligning capability, rated to support a 2,000 # reaction load.
8. Hanger brackets shall be hot dipped galvanized steel with a minimum 3/8" thickness that is also gusseted for additional strength.
9. Gate top track and supporting hangar bracket assemblies shall be certified by a licensed professional engineer to withstand a 2,000 lb. vertical reaction load without exceeding allowable stresses.
10. Submit affidavits from the manufacturer demonstrating that the gate operator has been tested to 200,000 cycles without breakdown
11. Each operator shall bear a label indicating that the operator mechanism has been tested for full power and pressure of all hydraulic components, full stress tests of all mechanical components and electrical tests of all overload devices

D. Certifications:
1. Gate in compliance with ASTM F 2200-05, Standard Specification for Automated Vehicular Gate Construction.
2. Gate operator shall be in compliance with UL 325 as evidenced by UL listing label attached to gate operator.
3. The aluminum welders and welding process must be certified per specifications.
4. Manufacturer shall supply gate design performance certification as per section 1.3 C.

1.4 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.

B. UL Standard: Provide gate operators that comply with UL 325.

C. ASTM F 2200-05 - Standard Specification for Automated Vehicular Gate Construction. See 2.01 C.

D. ASTM F 1184-05 - Standard Specification for Industrial and Commercial Horizontal Slide Gates, Type II, Class 2. See 3.02 B.

E. American Welding Society AWS D1.2 Structural Welding Code. See 2.01 D and 2.03 D.

F. Operator Installer: A minimum of three years experience installing similar equipment, factory trained and authorized within previous three years, or obtain other significant manufacturer endorsement of technical aptitude, if required, during the submittal process.

G. Emergency Access Requirements: Comply with requirements of authorities having jurisdiction for automatic gate operators serving as a required means of access.

H. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

PART 2 - PRODUCTS

2.1 CHAIN-LINK FENCE FABRIC

A. General: Insert height, limited to 12 feet (3.6 m). Provide fabric in one-piece heights measured between top and bottom of outer edge of selvage knuckle. Comply with ASTM A 392, CLFMI CLF 2445, and requirements indicated below:

1. Steel Wire Fabric: Polymer-coated wire with a diameter of 0.148 inch (3.76 mm).

   a. Mesh Size: 2 inches (50 mm).
   b. Polymer Coating: ASTM F 668, Class 2b over metallic-coated steel wire.

      1) Color: Black, complying with ASTM F 934.

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

2. Selvage: Knuckled at both selvages.

2.2 INDUSTRIAL FENCE FRAMING

A. Posts and Rails: Comply with ASTM F 1043 for framing, ASTM F 1083 for Group IC round pipe, and the following:

1. Group: IA, round steel pipe, Schedule 40 IC, round steel pipe, yield strength 50,000 psi (345 MPa).
2. Fence Height: As indicated on drawings.
3. Strength Requirement: Heavy industrial according to ASTM F 1043.
4. Post Diameter and Thickness: According to ASTM F 1083.
5. Post Size and Thickness: According to ASTM F 1083.

   a. Top Rail: 1.66 inches.
   b. Steel Line Post:
      1) Height up to and including 6 feet – 1.900 inches
      2) Height over 6 feet – 2.375 inches
   c. Steel End, Corner and Pull Post:
      1) Height up to and including 6 feet – 2.375 inches
      2) Height over 6 feet – 2.875 inches
   d. Swing Gate Post for fabric height over 6 feet:: According to ASTM F 900 and as follows:
      1) Gate leaf width up to and including 6 feet: 2.875 inches OD pipe, 4.64-lb/ft weight
      2) Gate leaf width over 4 feet to 10 feet: 4.000 inches OD pipe, 8.65-lb/ft weight.

6. Coating for Steel Framing:

   a. Metallic Coating:

1) Type I Steel Pipe: Type A, consisting of not less than minimum 2.0-oz./sq. ft. (0.61-kg/sq. m) average zinc coating per ASTM A 123/A 123M or 4.0-oz./sq. ft. (1.22-kg/sq. m) zinc coating per ASTM A 653/A 653M.

b. Polymer coating over metallic coating.

2.3 TENSION WIRE

A. General: Provide horizontal tension wire at the following locations:

1. Location: Extended along bottom of fence fabric.

B. Metallic-Coated Steel Wire: 0.177-inch- (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), with the following minimum coating weight:

a. Class 1: Not less than 0.8 oz./sq. ft. (244 g/sq. m) of uncoated wire surface.
b. Matching chain-link fabric coating weight.

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 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 (152 mm) long.
2. Rail Clamps: Line and corner boulevard clamps for connecting intermediate and bottom 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 (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. 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. Aluminum: ASTM B 211 (ASTM B 211M); Alloy 1350-H19; 0.148-inch- (3.76-mm-) diameter, mill-finished wire.

H. Finish:

1. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz. /sq. ft. (366 g /sq. m) zinc.

2. Match Fence materials.

2.5 BARBED WIRE

A. Zinc-Coated Steel Barbed Wire: Comply with ASTM A 121, grade for the following two-strand barbed wire:

1. Standard Size and Construction: 0.099-inch- diameter line wire with 0.080-inch- diameter, 2-point round barbs spaced not more than **4** o.c.

B. 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 5 inches o.c.

C. Aluminum Barbed Wire: Mill finished, ASTM B 211. 2-strand, 0.099-inch- diameter line wire with 0.080-inch- diameter, 4-point barbs spaced not more than 5 inches o.c., for the following alloys:

1. Line Wire: Alloy 5056-H32**.**
2. Barb Wire: Alloy 5000-H38 or Alloy 6061-T94.

2.6 CAST-IN-PLACE CONCRETE

A. Materials: Portland cement complying with ASTM C 150, Type I aggregates complying with ASTM C 33, and potable water.

1. Concrete Mixes: Normal-weight concrete with not less than 3000-psi (20.7- MPa) compressive strength (28 days), 3-inch (75-mm) slump, and 1-inch (25-mm) maximum size aggregate.

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 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: Match chain-link fabric, complying with ASTM F 934.

2.8 CANTILEVER SLIDE GATE

A. MANUFACTURERS:
1. Basis of Design: as manufactured by Tymetal Corp., 2549 State Route 40, Greenwich, NY 12834 - (800) 328 - 4283.
2. Approved Equals – Subject to compliance with specified requirements, products from the following manufactures will be acceptable.
   a. Elite Fence Products, Inc.
   b. Payne Fence Products.

3. Gate manufacturer shall certify gate is manufactured in compliance with ASTM F 2200-05, Standard Specification for Automated Vehicular Gate Construction.
    a. Gate manufacturer shall provide independent certification as to the use of a documented Welding Procedure Specification and Procedure Qualification Record to insure conformance to the AWS D1.2 welding code. Upon request, Individual Certificates of Welder Qualification documenting successful completion of the requirements of the AWS D1.2 code shall also be provided.

B. Dimensions: Fortress Structural Cantilever Slide Gate dimensions shall be as shown on the drawings, and the following sizes:
1. 40’ wide x 10’ high – (1) required
2. 32’ wide x 10’ high – (1) required

C. GATE CONSTRUCTION DETAILS
1. Gate Frame:
    a. The gate frame shall be fabricated from 6063-T6 aluminum alloy extrusions. The top member shall be a 3" x 5" aluminum structural channel/tube extrusion weighing not less than 3.0 lb/lf (4.4kg/m). To maintain structural integrity this frame member shall be "keyed" to interlock with the "keyed" track member. If fabricated as a single horizontal piece, the bottom member shall be a 2" x 5" aluminum structural tube weighing not less than 2.0 lb/lf. If fabricated in two horizontal pieces, the bottom member shall be a 5" aluminum structural channel weighing not less than 2.65 lb/lf, and the two horizontal pieces or sections shall be spliced in the field (the gate frame shall be fabricated in one or multiple sections depending on size requirements or project constraints).
2. Vertical Members (Chain Link):
    a. The vertical members at the ends of the opening portion of the frame shall be "P" shaped in cross section with a nominal base dimension of no less than 2” x 2” (51mm x 51mm) and weighing not less than 1.6 lb/lf (2.3kg/m). Major 2” x 2” (51mm x 51mm) vertical members weighing not less than 1.1lb/lf shall separate each bay and shall be spaced at less than gate height intervals.
    b. Intermediate 1” x 2” (25mm x 51mm) vertical members weighing not less than .82 lb/lf (1.2kg/m) shall alternate between the 2” x 2” major members.
3. Gate Track:
    a. The gate frame shall have separate semi-enclosed “keyed” tracks, extruded from 6005A-T61 or 6105-T5 aluminum alloy, weighing not less than 2.9 lb/lf. Track members are to be located on each side of the top member. When interlocked and welded to the “keyed” top member, it forms a composite structure with the top of the gate frame. Welds are to be placed alternately along the top and side of the track at 9" (229mm) centers with welds being a minimum of 2"(51mm) long.
    b. All welds on the gate frame shall conform to Welding Procedure Specification and Procedure Qualification Record to insure conformance to the AWS D1.2 Structural Welding Code. All individual welders shall be certified to AWS D1.2 welding code. See 1.02 D.
4. Gate Mounting:
    a. The gate frame is to be supported from the track by four (4) swivel type, self-aligning, 4-wheeled, sealed lubricant, ball-bearing truck assemblies.
    b. The bottom of each support post shall have a bracket equipped with a pair of 3” (76mm) UHMW guide wheels Wheel cover protectors shall be included with bottom guides to comply with UL325.
5. Gap protectors shall be provided and installed, compliant with ASTM F 2200-05.
6. Diagonal "X" bracing of 3/16" (5mm) minimum diameter stainless steel aircraft cable shall be installed throughout the entire gate frame.
7. The gate shall be completed by installation of approved filler as specified.
    a. Chain Link: as specified herein. Fabric shall be attached at each end of the gate frame by standard fence industry tension bars and tied at each 2” x 2” (51mm x 51mm) vertical

member with standard fence industry ties. ASTM F2200 requires attachment method that leaves no leading or bottom edge protrusions (cannot exceed 0.5 inch).

D. POSTS:
1. Double sets of support posts shall be minimum 4" O.D. (102mm) round Schedule 40 or 4” x 4” x 3/16” wall square steel tubing, grade 500. Gate posts shall be galvanized or coated and supported in concrete footings.

E. FINISH:
1. Gate to be color coated with polyester powder as specified. Gate (including track member) and all accessories shall be pretreated chemically by sand blasting or other acceptable method to ensure proper coating adherence.
2. Color: As approved by Associate from manufacturer’s standard and premium colors.

F. WARRANTY:
1. The truck assembly shall be warranted against manufacturing defects by the manufacturer for a period of (5) five years from date of sale.

2.9 GATE OPERATORS

A. General: Provide factory-assembled automatic operating system designed for gate size, type, weight, and operation frequency. Provide operation control system with characteristics suitable for Project conditions, with remote-control stations, safety devices, and weatherproof enclosures; coordinate electrical requirements with building electrical system.

1. Provide operator designed so motor may be removed without disturbing limit-switch adjustment and without affecting auxiliary emergency operator.
2. Provide operator with UL approval.
3. Provide electronic components with built-in troubleshooting diagnostic feature.
4. Provide unit designed and wired for both right-hand/left-hand opening, permitting universal installation.

B. Manufacturer
1. Basis of Design - HySecurity gate operators model SlideDriver 40 UPS (222 DE ST) with Smart Touch Controller. Subject to compliance with specified requirements, products from other manufacturers will be acceptable.

C. Comply with NFPA 70.

D. Operations
1. Operation shall be by means of a metal rail passing between a pair of solid metal wheels with polyurethane treads. Operator motors shall be hydraulic, geroller type, and system shall not include belts, gears, pulleys, roller chains or sprockets to transfer power from operator to gate panel. The operator shall generate a minimum horizontal pull of 300 (136 kg) pounds without the drive wheels slipping and without distortion of supporting arms. Operator shall be capable of handling gates weighing up to 4000 pounds (1,814 kg). Gate panel velocity shall not be less than 1.0 feet (.30 m) per second and shall be stopped gradually to prevent shock loads to the gate and operator assembly. The “soft stop” feature of the gate operator shall be controlled by two adjustable hydraulic brake valves (one for each direction).
2. Standard mechanical components shall include as a minimum:
   a. Supporting arms: Cast aluminum channel. Arms shall incorporate a fully bushed, 1-1/2" (38 mm) bronze bearing surface, acting on arm pivot pins. (item 2 below)
   b. Arm pivot pins: 3/4" (19 mm) diameter, stainless steel, with integral tabs for ease of removal.

c. Tension spring: 2-1/2" (63.5 mm) heavy duty, 800 pound (363 kg) capacity.
d. Tension adjustment: Finger tightened nut, not requiring the use of tools.
e. Drive release: Must instantly release tension on both drive wheels, and disengage them from contact with drive rail in a single motion, for manual operation.
f. Limit switches: Fully adjustable, toggle types, with plug connection to control panel.
g. Electrical enclosure: Oversized, metal, with hinged lid gasketed for protection from intrusion of foreign objects, and providing ample space for the addition of accessories.
h. Chassis: 1/4" (6.35 mm) steel base plate, and 12 Ga. (2.66 mm) sides and back welded and ground smooth.
i. Cover: 16 Ga. (1.52 mm) galvanized sheet metal with a textured paint finish. All joints welded, filled and ground smooth. Finished corners square and true with no visible joints.
j. Finish: Prime painted, with a textured finish coat, proven to withstand 1000-hour salt spray test.
k. Drive wheels: two 6" (152 mm) Dia. metal hub with polyurethane tread.
l. Drive rail: Shall be extruded 6061 T6, not less than 1/8" (3.175 mm) thick. Drive rail shall incorporate alignment pins for ease of replacement or splicing. Pins shall enable a perfect butt splice.
m. Hydraulic hose: Shall be 1/4" (6.35 mm) synthetic, rated to 2750 PSI (19 MPa).
n. Hydraulic valves: Shall be individually replaceable cartridge type, in an integrated hydraulic manifold.
o. Hose fittings: At manifold shall be quick-disconnect type, others shall be swivel type.
p. Hydraulic fluid: High performance type with a viscosity index greater than 375 and temperature range -40F to 167F (-40C to 75C) degrees.
q. A zero to 2000 PSI (13.79 MPa) pressure gauge, mounted on the manifold for diagnostics, shall be a standard component.
r. The hydraulic fluid reservoir shall be formed from a single piece of metal, non-welded, and shall be powder painted on the inside and the outside, to prevent fluid contamination.

3. Minimum standard electrical components:
   a. Pump motor: Shall be minimum 2 HP, 56C, 24 V DC motor.
   b. All components shall have overload protection.
   c. Controls: Smart Touch Controller Board with 256K of program memory containing:
      1) inherent entrapment sensor;
      2) built in “warn before operate” system;
      3) built in timer to close;
      4) liquid crystal display for reporting of functions;
      5) 26 programmable output relay options;
      6) anti-tailgate mode;
      7) built-in power surge/lightning strike protection;
      8) menu configuration, event logging and system diagnostics easily accessible with a PC and HySecurity’s free START software;
      9) RS232 port for connection to laptop or other computer peripheral and RS485 connection of Master/Slave systems or network interface.
   d. Low voltage sensor to protect batteries from over discharge. Last operation can be programmed for fail secure or fail open
   e. AC power loss operation: the operation can be programmed to open immediately or stay open after next normal operation, or remain in normal operation until batteries are low
   f. Control circuit: 24VDC.
   g. Permanently sealed, maintenance free, lead acid batteries in separate insulated and ventilated enclosure.
   h. Battery enclosure is NEMA 3R min 30”x30”x12” (.76m x .76m x .30m), pre-galvanized and painted dark gray enamel.
   i. 20 amp, fully automatic, regulated battery charger.
4. Required external sensors:. Specify photo eyes or gate edges or a combination thereof to be installed such that the gate is capable of reversing in either direction upon sensing an obstruction.
5. Optional control devices: card reader, key-switch, radio control, vehicle detectors.
6. Other options:

a. Lock for operator cover.
b. Electric Solenoid gate panel deadbolt lock.
c. Drive wheel manual release indicator switch.
d. Heater with thermostat control.
e. Weather-stripped drive rail slot in chassis, and snow wiper blades for drive rail.
f. Through Beam or Reflective type photo eyes, open and close direction.
g. Gate edge and transmitter radio reversing device.
h. HY-5A plug in loop detectors.
i. Key operated cable manual release (secure side of gate).
j. 115/208/230 VAC single phase only. (50 Hertz is available by custom order)

E. Concrete base/pad mounted as designated by manufacturer for size and configuration. Concrete foundation shall extend min. 32" below grade.

F. Factory Testing
1. Fully assemble and test, at the factory, each gate operator to assure smooth operation, sequencing and electrical connection integrity. Apply physical loads to the operator to simulate field conditions. Tests shall simulate physical and electrical loads equal to the fully rated capacity of the operator components.
2. Check all mechanical connections for tightness and alignment. Check all welds for completeness and continuity. Check welded corners and edges to assure they are square and straight.
3. Inspect painted finish for completeness. Touch up imperfections prior to shipment.
4. Check all hydraulic hoses and electrical wires to assure that chafing cannot occur during shipping or operation.

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. Do not begin installation before final grading is completed, unless otherwise permitted by Architect.
2. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Stake locations of fence lines, gates, and terminal posts. Do not exceed intervals of 500 feet (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.

B. The complete system shall be adjusted and tested to assure it is performing properly.

3.4 GATE INSTALLATION

A. Equipment in this section shall be installed in strict accordance with the manufacturer's printed instructions unless otherwise shown on the contract drawings.

B. The gate and installation shall conform to ASTM F 1184-05 standards for aluminum cantilever slide gates, Type II, Class 2.

C. Automated gate and installation shall also comply with ASTM F 2200-05 and UL 325.

D. Install gate operator in accordance with the manufacturer's printed instructions, current at the time of installation. Coordinate locations of operators with contract drawings, other trades and shop drawings. Installer shall insure that the electric service to the operator is at least 20 AMPS. Operator wattage is 1000

3.5 CHAIN-LINK FENCE INSTALLATION

A. Post Excavation: Drill or hand-excavate holes for posts to diameters and spacing indicated, in firm, undisturbed soil.
1. If not indicated on Drawings, excavate holes for each post to minimum diameter recommended by fence manufacturer, but not less than four times the largest cross section of post.
2. Unless otherwise indicated, excavate hole depths approximately 3 inches lower than the post bottom, with bottom of posts set not less than 36 inches below finish grade surface.

B. Post Setting: Center and align posts in holes 3 inches above bottom of excavation. Space a maximum of 10 feet o.c., unless otherwise indicated.

1. Verify that posts are set plumb, aligned, and at correct height and spacing, and hold in position during setting with concrete.
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 (50 mm) 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 15 degrees or more.

D. Line Posts: Space line posts uniformly at 10 feet (3 m) o.c.

E. 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 midheight of fabric 6 feet (1.83 m) 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.

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- (3.05-mm-) diameter hog rings of same material and finish as fabric wire, spaced a maximum of 24 inches (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 6 inches (150 mm) 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. Bottom Rails: Install, spanning between posts.

I. Chain-Link Fabric: Apply fabric to outside of enclosing framework. Leave 2 inches (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.

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 (380 mm) o.c.

K. 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 12 inches (300 mm) o.c. and to braces at 24 inches (610 mm) 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. Barbed Wire: Install barbed wire uniformly spaced**,** angled toward security side of fence. Pull wire taut and install securely to extension arms and secure to end post or terminal arms.

END OF SECTION 323113