SECTION 02935
CHAIN LINK FENCE

PART I: GENERAL

1.1 GENERAL REQUIREMENTS
- A. Furnishing and installation of chain link fencing, galvanized steel posts, and gates plus all accessories incidentals and specials necessary for the proper erection and installation of the fence and gates.
- B. The Contractor shall construct chain link fencing including posts, and gates as shown on the Drawings and in accordance with this Specification.

1.2 MEASUREMENT AND PAYMENT
- A. Unit Prices:
  1. Payment for Chain Link Fence shall be on a per linear foot basis to include all necessary hardware, concrete, materials and labor.
  2. No separate payment shall be made for each gate. Gates shall be paid under Chain Link Fence as part of the linear footage.
  3. Refer to Section 01270 – Measurement and Payment for unit price procedures.
- B. Stipulated Price (Lump Sum):
  1. If Contract is Stipulated Price Contract, payment for work in this Section is included in Total Stipulated Price.

1.3 REFERENCES
- A. ASTM – American Society for Testing and Materials.
  1. ASTM A53 – Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
  2. ASTM A90 – Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
  3. ASTM A121 – Standard Specification for Metallic-Coated Carbon Steel Barbed Wire.
  4. ASTM A123 – Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  5. ASTM A153 – Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.
  6. ASTM A392 – Standard Specification for Zinc-Coated Steel Chain-Link Fence Fabric.
- B. CTFS – City of Friendswood Specifications.

1.4 SUBMITTALS
- A. Conform to requirements of Section 01330 – Submittal Procedures.
- B. Submit proposed design mix and test data for each type and strength of concrete.

C. Submit manufacturer's data and details of following items for approval:
   1. Chain Link Fabric Mesh.
   2. Galvanized Posts.
   3. Materials to be used for installation.
   4. Latch and hinge hardware.
   5. Installation instructions for forms.

PART II: PRODUCTS

2.1 FABRIC

A. Wire Fabric for fencing shall be nine gauge (9 Ga) steel with a minimum tensile strength of eighty thousand pounds per square inch (80,000 psi). Mesh size shall be two inches (2 In) between parallel wires. Top salvages knuckled for sixty inch (60 In) or less in height. Top and bottom salvages twisted and barbed for fabric over sixty inches (60 In) in height. Fabric shall be furnished in one-piece.

B. Barbed Wire for mounting on security arms to be twelve and one-half gauge (12 1/2 Ga) with four-point (4 pt) barbs spaced at five inches (5 In) apart. Three (3) strands of barbed wire shall be required.

C. Fabric Ties shall be eleven gauge (11 Ga) steel to fasten fabric to top rail at eighteen inch (18 In) intervals. Ties shall be furnished to fasten the fabric to the bottom tension wire at eighteen inch (18 In) intervals. Ties shall be furnished to attach fabric to line posts at fifteen inch (15 In) intervals.

D. Bottom Tension Wire shall be seven gauge (7 Ga) coil wire.

2.2 RAILS AND POSTS

A. Top Rail shall be one and sixty-six hundredths inch (1.66 In) outside diameter (OD) steel pipe weighing two and twenty-seven hundredths pounds per foot (2.27 lb/ft). Top rail shall be furnished in random lengths not less than eighteen feet (18 Ft) per section and shall be joined with outside sleeve, steel couplings not less than six inches (6 In) long and having a wall thickness not less than seven hundredths of an inch (0.7 In) Couplings shall be designed to allow for expansion and movement of the top rail.

B. Posts shall be furnished in sufficient quantity to provide a maximum spacing of ten feet (10 Ft). Minimum size and weights are as specified in TABLE 4.1 – LINER POST REQUIREMENTS, TABLE 4.2 – CORNER, PULL AND END POST REQUIREMENTS, and TABLE 4.3 – GATE POSTS in this Section.

C. Post Brace Assembly shall be manufacturers standard adjustable brace at end and gate posts, at both sides of corner and pull posts, with horizontal brace located at mid-height of fabric. Brace to be same material as top rail and trussed to line posts with three-eighths inch (3/8 In) diameter rod with adjustable turnbuckles.

D. Post Caps for pipe shall be designed to exclude moisture. Where barbed

wire is specified, extension arms shall be integral with post caps. Where top rail is specified, post caps shall have an opening for the top rail. All post caps shall have a two inch (2 In) skirt for rigidity.

E. Tension bars shall be not less than three-sixteenths of an inch (3/16 In) by three-quarters of an inch (3/4 In) flat steel and not more than two inches (2 In) shorter than the fabric height. One (1) tension bar shall be provided for each gate and end post. Two (2) tension bars shall be provided for each corner and pull post. Tension bars shall be attached to terminal posts with one inch (1 In) twelve gauge (12 Ga) flat steel bands, with carriage bolts at intervals not exceeding fifteen inches (15 In).

F. Barbed Wire Support Arms shall be metal and finish to match fence framework, with provision for anchoring to posts and attaching three (3) rows of barbed wire with each arm. Supporting arms may either be attached to posts or integral with post top weather cap and shall be capable of withstanding two hundred fifty pounds (250 Lb) downward pull at outermost end. Arms shall be at a forty-five degree (45°) angle from vertical.

2.3 GATES

A. Fabricate perimeter frames of gates from metal and finish to match fence framework. Assemble gate frames by welding or with special fittings and rivets for rigid connections, providing security against removal or breakage connections. Provide horizontal and vertical members to ensure proper gate operation and attachment of fabric, hardware, and accessories. Space frame members a maximum of eight feet (8 Ft) apart unless otherwise indicated. Provide same fabric as for fence, unless otherwise indicated. Install fabric with tension bars at vertical edges and at top and bottom edges. Attach tension bars to gate frame not more than fifteen inches (15 In) on center (OC).

1. Install one (1) diagonal cross-bracing consisting of a minimum three-eighths inch (3/8 In) adjustable length truss rods with turn-buckles on gates to ensure frame rigidity without sag or twist.
2. Where barbed wire is indicated above gates extend end members of gate frames one foot (1 Ft) above top member and prepare to receive three (3) strands of wire. Provide necessary clips for securing wire to extensions.

B. Swing gates shall be fabricated with frames a minimum of one and seven-eights inch (1 7/8 In) outside diameter (OD) pipe weighing two and seventy-two hundredths pounds per foot (2.72 Lb/Ft). The top of all gate frames shall align with the fencing top rail. Vehicular gates shall be four inches (4 In) greater in overall height than the adjacent fencing so as to extend to within two inches (2 In) of pavement between curb, if curbs are designated are designated on the Drawings.

1. Corner and tee fittings of malleable iron or pressed steel having means of attaching diagonal members. Hinges of malleable iron

providing for full one hundred eighty degree (180°) swing with bottom hinges to be ball and socket type.

2. Diagonal braces consisting of a minimum one-half inch (1/2 In) truss rods with turn-buckles, two (2) for each gate frame. Vertical gates shall have vertical one and seven-eighths inch (1 7/8 In) outside diameter (OD) pipe brace at the center of each gate leaf.

C. Provide gate hardware and accessories for each gate galvanized in accordance with ASTM A153 and as specified below:
   1. Hinges: Size and material to suit gate size, non-liftoff type, offset to permit one hundred eighty degree (180°) gate opening. Provide three (3) hinges for each leaf over six foot (6 Ft) nominal height.
   2. Latch: Forked type or plunger-bar type to permit operation from either side of gate with padlock eye as integral part of latch.
   3. Provide keeper for vehicle gates which automatically engages gate leaf and holds it in open position until manually released. Keeper to be anchored at least twelve inches (12 In) into a twelve inch by twenty-four inch (12 In x 24 In) concrete footing.
   4. Double gates shall be provided with gate stops consisting of mushroom type flush plate with anchors, set in concrete, and designed to engage center drop rod or plunger bar. Include locking device and padlock eyes as integral part of latch permitting both gate leaves to be locked with single padlock.

D. Roller Gates shall be the responsibility of the Contractor to design using same fabric as for fence. Drawings shall indicate the size of opening for single or double gate application. Design to provide for free flowing opening and closing. Additional rollers or support bearing wheel should be incorporated to minimize binding where necessary.

2.4 GALVANIZING

A. All material used in chain link fencing shall be hot-dip zinc coated as specified by the following:
   1. All posts and pipe shall be one and eight-tenth ounces per square foot (1.8 Oz/SF) in accordance with ASTM A53.
   2. All H-Beam Sections shall be two ounces per square foot (2.0 Oz/SF) in accordance with ASTM A123.
   3. Fence Fabric shall be one and two-tenths ounces per square foot (1.2 Oz/SF) in accordance with ASTM A392, Class I.
   4. Tension and Barbed wire shall be eight-tenths ounce per square foot (0.8 Oz/SF) in accordance with ASTM A121, Class III.
   5. Post Caps, Tension Bars and Miscellaneous fittings shall be in accordance with ASTM A153.
   6. The weight of zinc coating for all items shall be determined in accordance with ASTM A90.

PART III: EXECUTION

3.1 INSTALLATION

A. The fence shall be installed by skilled and experienced fence erectors, and on lines and grades indicated on the Drawings.

3.2 CONSTRUCTION

A. The Contractor shall perform all clearing of brush and debris, which may be necessary for the installation of the fencing.

B. The fencing panels between corner and terminal posts shall generally follow the finished ground elevations. The Contractor shall grade off minor irregularities in the path of the fencing as necessary to limit the variation of grade under bottom edge of fence fabric to a distance of not more than six inches (6 In) and not less than two inches (2 In) from the ground at any point along the fencing.

C. Post Spacing:
   1. Line Posts shall have a maximum spacing of no more than ten feet (10 Ft).
   2. Pull Posts shall not be located more than five hundred feet (500 Ft) and shall be installed at each change in direction exceeding twenty degrees (20°), both vertically and horizontally.
   3. Runs of fencing over five hundred feet (500 Ft) but less than one thousand feet (1,000 Ft) shall have a pull post in the center of the run.

D. Holes
   1. Holes for concrete footings for all posts shall be drilled to the dimension as specified in TABLE 4.4 – HOLES FOR LINE, TABLE 4.5 – HOLES FOR END POSTS, and TABLE 4.6 – HOLES FOR GATE POSTS.
   2. Concrete footings shall be Class A Concrete, NO EXCEPTIONS. Concrete shall be in accordance with Section 03300 – Structural Concrete. All concrete footings shall be cast up to finished grade and crowned one inch (1 In) to shed water. Excess concrete and other material shall be removed and disposed of in accordance with Section 01580 – Waste Material Disposal.

E. The fence fabric shall be erected by securing one (1) end and applying sufficient tension to the other to remove all slack before making attachments. The fabric shall be cut and each span shall be attached independently at all corner posts and pull posts.

F. Fastening to end, pull, corner and gate posts shall accomplished with tension bars which shall be secured to the post with tension bar bands at intervals not to exceed fifteen inches (15 In).

G. Fence fabric shall generally follow the finished contour of the site with the bottom edge of the fabric located two inches (2 In) above the grade.

H. Erect fencing to generally follow ground surface and adjust irregularities in grade. Where depressions or swales are crossed by the fencing,

provide galvanized pipe and ire fabric laced to main fabric to prevent entrance of small animals but permit natural drainage flow.

I. Join top rails with suitable sleeve-type couplings, making rigid connections with provisions for expansion and contraction. Pass rail through base line post barbed wire extension arm and fasten securely to terminal post.

J. Brace all terminal posts with brace member securely fastened to terminal and first line post. Tie terminal post near ground line to line post at brace member with steel tension rod complete with turn-buckle.

PART IV: TABLES

TABLE 4.1 LINE POST REQUIREMENTS

FABRIC HEIGHT (FT)	POST OUTSIDE DIA. (IN)	PIPE SECTION (LB/FT)	H-BEAM SECTION (LB/FT)	EMBEDMENT LENGTH (IN)
0 to 4	1.90	2.27	2.70	24
4 to 8	2.375	3.65	4.10	24
8 to 12	2.875	5.79	5.79	24

TABLE 4.2 CORNER POST, PULL POST AND END POST REQUIREMENTS

FABRIC HEIGHT (FT)	POST OUTSIDE DIA. (IN)	PIPE SECTION (LB/FT)	EMBEDMENT LENGTH (IN)
0 to 4	2.75	3.65	30
4 to 8	2.875	5.79	36
8 to 12	3.50	9.10	36

TABLE 4.3 GATE POST REQUIREMENTS

FABRIC HEIGHT (FT)	POST OUTSIDE DIA. (IN)	PIPE SECTION (LB/FT)	EMBEDMENT LENGTH (IN)
0 to 4	2.875	5.79	36
4 to 8	4.00	9.11	36
8 to 12	6.625	18.79	42

TABLE 4.4 HOLES FOR LINE POSTS

FABRIC HEIGHT (FT)	MINIMUM HOLE DIA. (IN)	MINIMUM HOLE DEPTH (IN)	POST EMBEDMENT (IN)
0 to 4	9	30	24
4 to 8	9	30	24
8 to 12	9	30	24

TABLE 4.5 HOLES FOR END POSTS

FABRIC HEIGHT (FT)	MINIMUM HOLE DIA. (IN)	MINIMUM HOLE DEPTH (IN)	POST EMBEDMENT (IN)
0 to 4	12	36	30
4 to 8	12	42	36
8 to 12	12	42	36

TABLE 4.6 HOLES FOR GATE POSTS

FABRIC HEIGHT (FT)	MINIMUM HOLE DIA. (IN)	MINIMUM HOLE DEPTH (IN)	POST EMBEDMENT (IN)
0 to 4	12	42	36
4 to 8	18	42	36
8 to 12	18	48	42

END OF SECTION