**SECTION 32 31 13
CHAIN LINK FENCING AND GATES**

**BASED ON DFD MASTER SPECIFIATION DATED 10/01/12**

This section has been written to cover most (but not all) situations that you will encounter. Depending on the requirements of your specific project, you may have to add material, delete items, or modify what is currently written. The Division of Facilities Development expects changes and comments from you.

**P A R T 1 - G E N E R A L**

**SCOPE**

The work under this section shall consist of providing all work, materials, labor, equipment, and supervision necessary to provide a fully functioning fence and gate installation as provided for in these specifications and on the drawings.

Included are the following topics:

PART 1 - GeneraL

Scope
Related Work
Reference
Continuity of Existing Security Fencing
Owner Furnished Materials
Provisions for Future
Record Drawings

PART 2 - Materials

General
Fence Height
Line Posts
Required Arms, Rails, and Tension Wires
Tennis Court Fences
Baseball Backstops
Required Coatings
Fabric
Fabric Fasteners
Materials to be Furnished
Schedule of Fencing Materials
Schedule of Gate Materials
Gates
Gate Hardware
Post Tops
Barbed Wire
Concertina
Tension Wire
Stretcher Bars
Ground Rods
Concrete

PART 3 - Execution

Site Work
Concrete Footings
Posts and Braces
Post Bracing Assembly
Stretcher Bars
Ground Rods
Fabric
Grade Clearance
Gates
Barbed Wire
Concertina
Cleanup

**RELATED WORK**

***(The designer must determine and designate whether the fencing work will be undertaken by the General or Site Work Contractor and should revise these specifications accordingly.)***

Applicable provisions of Division 1 govern work under this Section.

00 00 00 – (Section Title)

00 00 00 – (Section Title)

**REFERENCE**

Unless otherwise specified in these specifications or otherwise shown on the drawings, conform all work under this section to Section 616.2.3 of the Wisconsin Department of Transportation, Standard Specifications for Road and Bridge Construction, current edition.

**CONTINUITY OF EXISTING SECURITY FENCING**

***(Note to the designer: discuss the interruption of any security fencing with the security and maintenance personnel of the institution to determine how interruptions can best be made with minimum disruption. If work is required outside of regular work hours, this must be indicated in the specifications and/or working drawings. Add specifics regarding locations, hours, lengths of disruption, etc.)***

Do not interrupt or change existing security fencing without prior written approval from the engineer. When interruption is required coordinate the schedule with the Owner agency to minimize disruptions. Unless specifically stated, all work involved in interrupting or changing existing security fencing is to be done during normal working hours.

Verify the locations of any water, drainage, gas, sewer, electric, drainage, gas, sewer, electric, telephone or steam lines which may be encountered in the excavation of fence bases.

**OWNER FURNISHED MATERIALS**

***(This article is intended to alert the Contractor that the Owner will be furnishing some equipment or materials that will have to be received, stored, installed and/or which will need final connection for the completed project. In some cases, it may be appropriate to refer to other sections for a more complete description of the equipment being furnished or the work involved in installation.)***

**PROVISIONS FOR FUTURE WORK**

***(Note to the designer: in this subsection explain what future extensions, options, or additions to the currently proposed work may need to be preserved by the contractor in this work.)***

**RECORD DRAWINGS**

Maintain record drawings of all fencing installations and points of connection made as part of this project and for future connection on original drawings prepared by the installing contractor/subcontractor. Include copies of record drawings with the Operating and Maintenance instructions.

**P A R T 2 - M A T E R I A L S**

**GENERAL**

All materials furnished shall be new materials unless otherwise specified. Salvaged materials may be used only when specified.

**FENCE HEIGHT**

The height of the fence shall be as shown on the plans or specified. The designated height of the fence shall be the fabric height.

**LINE POSTS**

Line posts **(may/may not)** be driven posts.

**REQUIRED ARMS, RAILS, AND TENSION WIRES**

Provide rampart arm, top rail/tension wire, intermediate rail, and bottom rail/tension wire in accordance with the drawings.

**TENNIS COURT FENCES**

Provide a top rail, bottom rail and intermediate rail at 5' above the bottom rail for tennis court fences.

**BASEBALL BACKSTOPS**

Provide a top rail, bottom rail and intermediate rails at five (5) feet and ten (10) feet above the bottom rail for baseball backstops. No bracing assemblies will be required on backstops.

**REQUIRED COATINGS**

All steel items used shall be galvanized, aluminum or zinc aluminum alloy coated.

**FABRIC**

Provide 9 gauge aluminum coated, two (2) inch mesh fabric, with **[barbed/knuckled]** selvedge on **[top/bottom]** conforming to ASTM A-491.

**FABRIC FASTENERS**

Provide fabric fasteners of steel wire clips and tie wires galvanized in accordance with ASTM A-641, Class III, or aluminum coated in conformance with fence fabric specifications.

Provide fasteners for posts, top and intermediate rails, bottom rails, top tension wires and braces of 9 gauge steel or 0.179 inch diameter aluminum tie wires.

Provide fasteners for bottom tension wire of not smaller than 12 gauge or 0.149 inch diameter aluminum tie wires.

**MATERIALS TO BE FURNISHED**

Furnish materials in accordance with the following schedules for the fence height specified:

***Note to the Designer: The following is formatted as a 9 column TABLE.***

 **SCHEDULE OF FENCING MATERIALS**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | MIN. | MIN. | MIN. | MIN. | MAX. |
|  | TYPE |  | SIZE | WALL | SECT | YIELD | WGT | POST |
|  | AND |  | O.D. | THICK | MODUL | STRENGTH | (LBS/ | SPACE |
|  | HEIGHT | POST TYPE | (IN) | (IN) | (IN3) | (PSI) | FT.) | (FT.) |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| Line Posts | "H" Section-Alum. | 1.875x1.625 | - | - | 0.503 | 29,000 | 0.91 | 10 |
| SIX FEET | "C" Section-Steel | 1.875x1.625 | - | 0.120 | 0.372 | 40,000 | 2.34 | 10 |
| OR LESS |  | SCH 40 Pipe-Steel | 1.90  | 0.145 | 0.326 | 25,800 | 2.72 | 10 |
|  |  | SCH 40 Pipe-Alum. | 1.90 | 0.145 | 0.326 | 25,000 | 0.93 | 10 |
|  |  | Pipe-Steel | 1.90 | 0.090 | 0.221 | 45,000 | 1.74 | 10 |
|  |  | Square-Steel | 2.0x2.0 | 0.102 | 0.466 | 42,000 | 2.72 | 10 |
|  |  | Square-Aluminum | 2.0x2.0 | 0.110 | 0.470 | 29,000 | 0.94 | 10 |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| Line Posts | "H" Section-Alum. | 1.875x1.625 | - | - | 0.503 | 29,000 | 0.91 | 10 |
| SEVEN FEET | "C" Section-Steel | 1.875x1.625 | - | 0.120 | 0.372 | 40,000 | 2.34 | 10 |
|  |  | SCH 40 Pipe-Steel | 1.90 | 0.145 | 0.326 | 25,800 | 2.72 | 8 |
|  |  | SCH 40 Pipe-Steel | 2.375 | 0.154 | 0.560 | 25,800 | 3.65 | 10 |
|  |  | SCH 40 Pipe-Alum. | 1.90 | 0.145 | 0.326 | 25,000 | 0.93 | 8 |
|  |  | SCH 40 Pipe-Alum. | 2.375 | 0.154 | 0.560 | 25,000 | 1.26 | 10 |
|  |  | Pipe-Steel | 1.90 | 0.110 | 0.260 | 45,000 | 1.94 | 10 |
|  |  | Square-Steel | 2.0x2.0 | 0.102 | 0.466 | 42,000 | 2.72 | 10 |
|  |  | Square-Aluminum | 2.0x2.0 | 0.110 | 0.470 | 29,000 | 0.94 | 10 |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| Line Posts | "H" Section-Alum. | 1.875x1.625 |  | - | 0.503 | 29,000 | 0.91 | 10 |
| EIGHT FEET | "C" Section-Steel | 1.875x1.625 |  | 0.120 | 0.372 | 40,000 | 2.34 | 10 |
|  |  | SCH 40 Pipe-Steel | 2.375 | 0.154 | 0.560 | 25,800 | 3.65 | 10 |
|  |  | SCH 40 Pipe-Alum. | 2.375 | 0.154 | 0.560 | 25,000 | 1.26 | 10 |
|  |  | Pipe-Steel | 1.90 | 0.110 | 0.260 | 45,000 | 1.94 | 10 |
|  |  | Square-Steel | 2.0x2.0 | 0.102 | 0.466 | 42,000 | .72 | 10 |
|  |  | Square-Aluminum | 2.0x2.0 | 0.110 | 0.470 | 29,000 | 0.94 | 10 |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| Line Posts | "H" Section-Alum. | 1.875x1.625 |  | - | 0.503 | 29,000 | 0.91 | 7 |
| TEN FEET | "H" Section-Alum. | 2.25 x 1.95 |  | - | 0.804 | 29,000 | 1.22 | 10 |
| NO WIND- | "C" Section-Steel | 1.875x1.625 |  | 0.120 | 0.372 | 40,000 | 2.34 | 7 |
| SCREEN OR |  | "C" Section-Steel | 2.25x1.70 | 0.121 | 0.506 | 45,000 | 2.73 | 10 |
| HARDWARE |  | SCH 40 Pipe-Steel | 2.375 | 0.154 | 0.560 | 25,800 | 3.65 | 7 |
| CLOTH |  | SCH 40 Pipe-Steel | 2.875 | 0.203 | 1.063 | 25,800 | 5.79 | 10 |
|  |  | SCH 40 Pipe-Alum. | 2.375 | 0.154 | 0.560 | 25,000 | 1.26 | 7 |
|  |  | SCH 40 Pipe-Alum. | 2.875 | 0.203 | 1.064 | 25,000 | 2.00 | 10 |
|  |  | Pipe-Steel | 2.875 | 0.110 | 0.636 | 45,000 | 3.25 | 10 |
|  |  | Pipe-Steel | 2.375 | 0.120 | 0.456 | 45,000 | 2.64 | 10 |
|  |  | Square-Steel | 2.0x2.0 | 0.102 | 0.466 | 42,000 | 2.72 | 9 |
|  |  | Square-Aluminum | 2.0x2.0 | 0.110 | 0.470 | 29,000 | 0.94 | 7 |
|  |  | Square-Aluminum | 2.5x2.5 | 0.175 | 1.606 | 29,000 | 2.90 | 10 |
|  |  | Square-Aluminum | 3.0x3.0 | 0.155 | 1.513 | 29,000 | 2.00 | 10 |
|  |  |  |  |  |  |  |  |  |
|  |  | SCH 40 Pipe-Steel | 4.0 | 0.226 | 2.386 | 25,800 | 9.10 | 8 |
| Line and |  | Pipe-Steel | 2.875 | 0.160 | 0.878 | 45,000 | 4.64 | 6 |
| Corner |  | Square-Steel | 2.5x2.5 | 0.188 | 1.244 | 42,000 | 5.88 | 7 |
| Posts |  | Square-Aluminun | 2.5x2.5 | 0.175 | 1.606 | 29,000 | 2.90 | 6 |
| TEN FEET |  | Square-Aluminum | 3.0x3.0 | 0.155 | 1.513 | 29,000 | 2.00 | 6 |
| WITH WIND- |  |  |  |  |  |  |  |  |
| SCREEN OR |  |  |  |  |  |  |  |  |
| HARDWARE CLOTH |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| Twenty Foot |  | SCH 40 Pipe-Steel | 4.0 | 0.226 | 2.386 | 25,800 | 9.10 | 10 |
| Baseball |  | Pipe-Steel | 2.875 | 0.160 | 0.878 | 45,000 | 4.64 | 6 |
| Backstops |  | Square-Steel | 2.5x2.5 | 0.188 | 1.244 | 42,000 | 5.88 | 8 |
|  |  | Square-Aluminum | 2.5x2.5 | 0.175 | 1.606 | 29,000 | 2.90 | 7 |
|  |  | Square-Aluminum | 3.0x3.0 | 0.155 | 1.513 | 29,000 | 2.00 | 7 |
|  |  |  |  |  |  |  |  |  |
|  |  | SCH 40 Pipe-Steel | 2.375 | 0.154 | 0.560 | 25,800 | .65 | -- |
| Corner and |  | SCH 40 Pipe-Alum. | 2.375 | 0.154 | 0.560 | 25,000 | 1.26 | -- |
| Brace Posts |  | Pipe-Steel | 2.375 | 0.095 | 0.373 | 45,000 | 2.31 | -- |
| SEVEN FEET |  | Pipe-Steel | 1.90 | 0.120 | 0.281 | 45,000 | 2.28 | -- |
| OR LESS |  |  |  |  |  |  |  |  |
|  |  | Square-Steel | 2.0x2.0 | 0.102 | 0.466 | 42,000 | 2.72 | -- |
|  |  | Square-Aluminum | 2.0x2.0 | 0.110 | 0.470 | 29,000 | 0.94 | -- |
|  |  | Formed-Steel | 3.5x3.5 | 0.134 | 0.932 | 35,000 | 5.14 | -- |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| Corner and |  | SCH 40 Pipe-Steel | 2.875 | 0.203 | 1.064 | 25,800 | 5.79 | -- |
| Brace Posts |  | SCH 40 Pipe-Alum. | 2.875 | 0.203 | 1.064 | 25,000 | 2.00 | -- |
| EIGHT FEET |  | Pipe-Steel | 2.875 | 0.110 | 0.636 | 45,000 | 3.25 | -- |
| OR TEN FEET |  | Pipe-Steel | 2.375 | 0.130 | 0.485 | 45,000 | 3.11 | -- |
|  |  | Square-Steel | 2.0x2.0 | 0.102 | 0.466 | 42,000 | 2.72 | -- |
|  |  | Square-Aluminum | 2.5x2.5 | 0.175 | 1.606 | 29,000 | 2.90 | -- |
|  |  | Square-Aluminum | 3.0x3.0 | 0.155 | 1.5l3 | 29,000 | 2.00 | -- |
|  |  | Formed-Steel | 3.5x3.5 | 0.134 | 0.932 | 35,000 | 5.14 | -- |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
| Rails and |  | SCH 40 Pipe-Steel | 1.66 | 0.140 | 0.235 | 25,800 | 2.27 | -- |
| Braces |  | SCH 40 Pipe-Alum. | 1.66 | 0.140 | 0.235 | 25,000 | 0.78 | -- |
|  |  | Pipe-Steel | 1.66 | 0.085 | 0.156 | 45,000 | 1.43 | -- |
|  |  | "C" SectionSteel | 1.625x1.25 | 0.074 | 0.165 | 35,000 | 1.35 | -- |
|  |  |  |  |  |  |  |  |  |

Gate Posts shall conform to manufacturer's specifications for various width gates. Minimum sizes shall be as follows:

 ***Note to the Designer: The following is formatted as a 8 column Table:***

**SCHEDULE OF GATE MATERIALS**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  | MIN. | MIN. | MIN. | MIN. |
|  | TYPE |  | SIZE | WALL | SECT | YIELD | WGT |
|  | AND |  | O.D. | THICK | MODUL | STRENGTH | (LBS/ |
|  | HEIGHT | POST TYPE | (IN) | (IN) | (IN3) | (PSI) | FT.) |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| Gate Posts | SCH 40 Pipe-Steel | 2.875 | 0.203 | 1.064 | 25,800 | 5.79 |  |
| LEAF WIDTH | SCH 40 Pipe-Alum. | 2.875 | 0.203 | 1.064 | 25,000 | 2.00 |  |
| SIX FEET | Pipe-Steel | 2.875 | 0.160 | 0.878 | 45,000 | 4.64 |  |
| OR LESS | Square-Steel | 2.0x2.0 | 0.102 | 0.466 | 42,000 | 2.72 |  |
|  |  | Square-Aluminum | 2.5x2.5 | 0.175 | 1.606 | 29,000 | 2.90 |
|  |  | Square-Aluminum | 3.0x3.0 | 0.155 | 1.513 | 29,000 | 2.00 |
|  |  | Formed-Steel | 3.5x3.5 | 0.134 | 0.932 | 35,000 | 5.14 |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| Gate Posts | SCH 40 Pipe-Steel | 4.0 | 0.226 | 2.386 | 25,800 | 9.10 |  |
| LEAF WIDTH | Pipe-Steel | 2.875 | 0.160 | 0.878 | 45,000 | 4.64 |  |
| SEVEN TO | Square-Steel | 2.5x2.5 | 0.188 | 1.244 | 42,000 | 5.88 |  |
| THIRTEEN | Square-Aluminum | 2.5x2.5 | 0.175 | 1.606 | 29,000 | 2.90 |  |
| FEET | Square-Aluminum | 3.0x3.0 | 0.155 | 1.513 | 29,000 | 2.00 |  |
|  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |
| GATE | SCH 40 Pipe-Steel | 1.90 | 0.145 | 0.326 | 25,800 | 2.72 |  |
| FRAMES | SCH 40 Pipe-Alum. | 1.90 | 0.145 | 0.326 | 25,000 | 0.93 |  |
|  |  | Pipe-Steel | 1.90 | 0.090 | 0.221 | 45,000 | 1.74 |
|  |  | Pipe-Steel | 1.66 | 0.111 | 0.196 | 45,000 | 1.83 |
|  |  | Square-Steel | 2.0x2.0 | 0.102 | 0.466 | 42,000 | 2.72 |
|  |  | Square-Aluminun | 2.0x2.0 | 0.110 | 0.470 | 29,000 | 0.94 |
|  |  |  |  |  |  |  |  |

**GATES**

Provide additional horizontal and vertical members as necessary to assure proper gate operation and attachment to fabric and hardware.

Provide diagonal braces made of crossed adjustable length three-eight inch diameter truss rods on non-welded gate frames and on welded frames where corner rigidity is not sufficient to prevent sag.

Gate frames shall be covered with the same fabric as the fence.

Weld or assemble gate frames with malleable or pressed steel fittings and rivets to provide rigid connections. Install fabric with stretcher bars at vertical edges. Attach to frame at fifteen (15) inches o.c. all sides. Provide caps for all gate frame work ends.

**GATE HARDWARE**

Provide heavy duty hinges of malleable iron, pressed or forged steel, non-lift-off type, adjusted to permit 180 degree gate opening. Provide two (2) hinges for each leaf.

Provide heavy duty forked type or plunger bar type latches for all single leaf gates. Provide center stop and keeper for all double leaf gates. Provide spring latch for all sliding gates. Provide padlock eye as an integral part of all latches.

Provide heavy duty track, ball bearing hanger sheaves framing and supports, guides, stays stops and bracing necessary for sliding gates.

**POST TOPS**

Provide cast or malleable iron ornamental tops on all posts except 3.5" x 3.5" roll formed sections. Tops shall have an opening for the top rail to pass through.

Post tops shall be fitted with a 45 degree extension arm for supporting three strands of barbed wire and with an opening for the top rail or tension wire. Extension arms shall be capable of supporting a 200 pound downward pull at the outermost end of the arm.

**BARBED WIRE**

Provide two (2) strand 12 1/2 gauge minimum barbed wire with 14 gauge minimum four (4) point barbs.

Galvanized wire shall conform to ASTM A-121, Class III.

Aluminum coated wire shall conform to ASTM A-585, Class II.

Aluminum alloy wire shall be 6061 conforming to ASTM B-211. Minimum tensile strength shall be 50,000 psi.

**CONCERTINA**

Provide a **(single/double)** barbed tape product consisting of a 24 inch diameter coil **(placed inside a 36 inch diameter coil)** fabricated from AISI 430 stainless steel with a minimum Rockwell hardness of 37. Barbs shall be in groups of 4 on 4 inch centers. Coil tapes shall be cold clenched around a **(hot dipped galvanized/stainless steel)** core wire having a minimum tensile strength of 220,000 psi.

Provide attaching clips of approximately 0.065 inch thick x 0.375 inch wide stainless steel, or 9 gauge stainless steel wire, or stainless steel hog rings, all capable of withstanding a pull of 200 pounds.

**TENSION WIRE**

Provide 7 gauge tension wire conforming to the fence fabric used, complete with end clamps.

**STRETCHER BARS**

Provide stretcher bars of one piece lengths equal to the full fabric height with a minimum cross section of 3/16" x 3/4". Provide one (1) stretcher bar for each gate and end post and two (2) for each corner and pull post, except roll form posts with integral loops.

**GROUND RODS**

Provide a one-half inch diameter six (6) foot long copper clad rod to provide a ground. Provide one (1) for each 1,000' of fence and one for each separated fence section.

**CONCRETE**

All concrete for post base construction shall be a five (5) bag mix, and shall be mixed to obtain a low slump. Maximum aggregate size shall be one (1) inch. Two (2) percent to four (4) percent entrained air is allowed.

**P A R T 3 - E X E C U T I O N**

**SITE WORK**

Prior to fence construction remove and dispose of all trees, brush, logs, stumps and other debris for a width of at least twelve (12) inches each side of the proposed fence alignment.

**CONCRETE FOOTINGS**

Excavate holes for footings to neat dimensions in firm ground to insure the post will be centered. Remove rock or other obstructions encountered to the required depth. Use forms in unstable soil and allow them to remain in place for at least twenty-four (24) hours after concrete is poured. Backfill, after forms are removed, with suitable material thoroughly compacted in place in layers to prevent settlement.

Footings shall be **[\_\_\_\_\_\_\_\_ ( )]** deep and **[\_\_\_\_\_\_\_\_ ( )]** minimum diameter. The bottom of the post shall be three (3) inches above the bottom of the hole. Corner, gate and end post bases shall be **[\_\_\_\_\_\_\_\_ ( )]** minimum diameter. Gate posts larger than four (4) inches o.d. shall have a base with a minimum diameter of eighteen (18) inches. Concrete bases shall be domed at the post and have a smooth troweled finish. Concrete footings shall cure for seven (7) days before placing tension wires.

**POSTS AND BRACES**

Set posts in a vertical position at the required location and alignment. Set tops at the required elevation to provide a smooth profile at the top rail or tension wire without abrupt changes and in conformity with the general contour and which meets the approval of the Engineer.

Place an end post at each end of each run of fence. Place a corner post whenever a break of 30 degrees or more occurs in the horizontal alignment. Set an intersection post in line with an intersecting chain link fence and brace it to the adjacent posts of the intersecting fence.

Place an intermediate braced post where the vertical alignment changes by more than 5 degrees, or a change in fence grade of more than nine (9) percent occurs.

Place an intermediate braced post at 660' intervals for fence with a top rail and at 1,000' intervals for fence with a top tension wire on all long runs of fence. Set an intermediate brace post at the approximate midpoint when runs of fence are less than 1,320' but more than 660' for fence with top rail, or less than 2,000' but more than 1,000' for fence with top tension wire.

Where driven posts are specified, all end, corner, gate and brace posts must be set in concrete. Driven posts shall be driven a minimum of thirty-two (32) inches into undisturbed soil.

**POST BRACING ASSEMBLY**

Post bracing assemblies consist of one (1) or more brace rails and a three-eighths (3/8) inch truss rod as hereafter specified. Provide brace rails the same size as the top rail. Provide truss rods with an adjustable take-up adapter.

Install a single bracing assembly at each gate and end post location.

Install a double bracing assembly at each corner post and all intermediate braced posts.

Provide the bracing assembly with one horizontal brace rail and one (1) diagonal truss rod on all fences which have a top rail. Locate the horizontal brace rail in accordance with the manufacturer's specifications.

Provide the bracing assembly with one horizontal brace rail and one diagonal brace rail and one diagonal truss rod on all fences which do not have a top rail. Locate the horizontal rail in accordance with the manufacturer's specifications.

**STRETCHER BARS**

Provide one (1) stretcher bar for each gate and end post and two (2) for each corner and pull post, except roll form posts with integral loops. Attach to posts with heavy duty pressed steel or malleable iron bands spaced at fifteen (15) inches o.c.

**GROUND RODS**

Connect at least three (3) fence wires to the ground rod by clamping, bolting or brazing. Ground rod shall be installed on line with fence.

Install ground rods as specified for each run of fence and install additional rods for each 1,000' on long runs of fence.

**FABRIC**

Install, stretch, and anchor tension wires to each end, corner, gate and brace post and properly attach to each line post before the fabric is placed. Pass top tension wire thru the post top rail opening. Install top, intermediate and bottom rails at proper locations.

Hang fabric on the inside (**[playing/secure]** side) of all installations at running tracks, baseball diamonds and tennis courts.

Attach the end of the fabric to the end, corner, gate or brace posts (except roll form posts with integral loops) by means of a stretcher bar threaded through the end loops of the fabric and stretched to remove all slack with proper stretching equipment. Secure the stretched fabric to posts, rails and tension wires with specified fabric fasteners. Install fabric fasteners on all posts at not greater than fourteen (14) inches o.c. and on rails and bottom tension wires at not more than twenty-four (24) inches o.c. Where a top tension wire is installed, fasten to the fabric at not more than eighteen (18) inches o.c.

Repeat stretching operations at approximately every 100' for each run of fence.

Make splices in fabric by interweaving a wire picket through each end loop of each piece of fabric. Each splice shall be subject to the Engineers approval.

**GRADE CLEARANCE**

For tennis courts and baseball diamonds provide a clearance from the bottom of the fabric to the new finished grade of one (1) inch.

For fences around the edge of running tracks, provide a clearance of six (6) inches.

For line and property fences provide a clearance of three (3) inches.

For security fence installations, install the fence with **[\_\_\_\_\_]** inches clearance.

**GATES**

Install gates plumb and level and adjust for smooth operation as intended, without binding or hanging up.

**BARBED WIRE**

Install barbed wire properly fastened to the rampart arms.

**CONCERTINA**

Install concertina in accordance with project drawings and manufacturer's recommendations. Clip, wire tie, or hog ring adjacent concertina coils together so as to form a concertina effect. Securely attach to tension wires, rampart arms, and fence fabrics so as to prevent audible noise to be generated from movement of the concertina by the wind and to assure a return of the concertina to its original position after disturbance.

**CLEANUP**

After chain link fence construction is completed clean up all storage and work areas. Replace or repair as required all landscape features damaged or disturbed under this contract.

END OF SECTION