

SECTION 32 31 13 – SECURITY CHAIN LINK FENCING

PART 1 - GENERAL

1.01 SUMMARY

A. Section Includes

1. Fence fabric installation to standards required for proper performance of fence mounted intrusion detection system. (See Div. 17).
2. Removal of existing fencing systems as indicated.
3. Conformance to ODMH/SAO requirements for site access, staging, storage, security, employee screening and conduct.
4. Coordination of the perimeter installation detection system.
5. Razor Mesh Fence
6. Fence, framework, fabric and accessories.
 - a) Ground set.
 - b) Roof mounted.
 - c) Custom brackets.
7. Barbed tape.
8. Excavation for post bases.
9. Concrete anchorage for posts and center drop for gates.
10. Special care for roof mounted work.
11. Field quality control.

B. Related Sections:

1. Special Conditions: Section 00811
2. Earthwork: Section 02200
3. Concrete: Section 03300
4. Structural Steel: Section 05200
5. Detection system: Section 17100
6. Division 16
 - a) Grounding of framing.

- C. Allowances: See Section 01022 – Unit price Allowances for description of work under this Sections affected by allowances

1.02 REFERENCE STANDARDS

A. American Society for Testing and Materials (ASTM):

- | | |
|----------|--|
| A 121-86 | Zinc Coated (Galvanized) Steel Barb Wire |
| A 123-89 | Zinc (Hot-Dipped Galvanized) Coatings on Iron and Steel Products |

A 153-82(1987)	Zinc Coating (Hot-Dip) on Iron and Steel Hardware
A 392-89	Zinc-Coated Steel Chain-Link Fence Fabric
A 780-90	Practice for Repair of damaged Hot-Dip Galvanized Coatings
A 817-90	Metallic-Coated Steel Wire for Chain-Link Fence Fabric
A 824-86	Metallic-Coated Steel marcelled Tension Wire for use With Chain Link Fence
B 117-90	Standard Method Of Salt Spray (Fog) Testing
F 567-84	Installation of Chain-Link Fence
F 626-90	Fence Fittings
F 669-90a	Strength Requirements of Metal Posts and Rails for Industrial Chain Link Fence
F 1083-90	Pipe, Steel, Hot-Dipped Zinc-Coated (Galvanized) Welded for Fence Structures
F 1234-89	Protective Coatings on Steel Framework for Industrial Fences

1.03 SYSTEM DESCRIPTIONS

A. Fence:

1. Perimeter fence tied into existing gates.
2. Roof mounted fence as shown on the drawings.

B. Design Requirements:

1. Maximum unsupported Fabric Area: Not to exceed the following:
 - a. Interior Fence Line: 70 square feet.
 - b. Exterior Fence Line and Sallyport: 70 square feet.
2. All laps in fabric to be backed by framing member.

C. Performance Requirements:

1. Load Resistance: Components to return to original position when applied force is released.
 - a. Post Deflection at Mid-Height: $\frac{3}{4}$ inch maximum when a force of 50 pounds is applied perpendicular to fence at mid-height.
 - b. Fence Fabric Deflection: 2 inch maximum when a force of 30 pounds is applied in center of panel, perpendicular to plane of fence fabric.
2. Corrosion Resistance, Framing: ASTM B 117. Components to withstand salt spray test for time designated below with maximum 5 percent red rust.
 - a. Exterior: 1,000 hours.
 - b. Interior: 650 Hours

1.04 QUALITY ASSURANCE

- A. Manufacturer: Company specializing in commercial quality chain link fencing installation with 5 years experience.
- B. Contractor: The Fence Contractor installing the fence shall be responsible for installing the fence to the requirements of the fence detection systems specified for this project. This Contractor shall provide a joint installation warranty with the detection system installers to maintain the performance requirements set forth herein and in

Division 17 for a period of 5 years. The intent of this warranty is to provide sole-source responsibility for the integrity of the security and detection of the entire perimeter.

- C. Installation: ASTM F 567

1.05 SUBMITTALS

- A. Submit in accordance with Section 01340.
- B. Shop Drawings: Include plan layout, grid, spacing of components, accessories, fittings, hardware, anchorages, and schedule of components. Identify and show type of fasteners proposed. Show details of existing gates and including keepers and attachment to framing.
- C. Product data: Complete Description of components.
- D. Manufacturer's installation instructions.
- E. Samples: Submit two samples 12x12 inches in size, illustrating (each) fence fabric finish.
- F. Project Schedule to include target dates for preparation and approvals of Project and Contract Submittals, mobilization and start-up, work locations, sequencing, intermediate construction milestones, project completion and close-out. Coordinate items in proposed project schedule with ODMH/SRO at Pre-Construction Meeting prior to final submittal.
- G. Close-Out Submittal-Project Record Documents: Accurately record actual locations of installed work, as described in the General Conditions.
- H. Provide Fence and Component Manufacturer's inspection, repair and maintenance recommendation at Project Completion.
- I. Test Data, Light-Wall Tubular Framing: Where Submit test, data acceptable to Associate, substantiating protective coating for light-wall tubular framing meets or exceeds corrosion resistance requirements; see PERFORMANCE REQUIREMENTS above.

PART 2 – PRODUCTS

2.01. MANUFACTURERS

- A. Framework
 - 1. Allied and Tube & Conduit Corp.
 - 2. American Security Fence Corp.
 - 3. Anchor Fence, Inc.
 - 4. Cyclone Fence/United States Steel Corp.

- B. Fabric:
1. Cargill
 2. Master-Halco
 3. Southeastern-Wire Co.
 4. Semmerling Corp.
 5. Guardian Wire & Steel Co.
 6. Safeguards Products: (Razor Mesh Fence)

- C. Hardware:
1. Master-Halco
 2. Merchant Metals Inc,
 3. Stephen's Pipe and Steel Inc.

- D. Reinforced Barb Tape:
1. Allied Tube & Conduit Corp., "Silent Swordsman".
 2. American Security Fence Corp., "Razor Ribbon II".
 3. Michael Industries, Inc., "Saberazor".

2.02. MATERIALS

- A. Framework: Closed steel sections, one piece without joints. See FINISHES below. Provide one of the following:
1. Type I: Heavy-wall pipe, ASTM F 1043; 1C, galvanized Heavy walled pipe. Minimum yield strength 25,000 psi. Coating conforming to ASTM F 124 Type B on pipe exterior and interior.
 2. Type II: light-wall tubing, cold-formed and welded, ASTM F 669, Group 1C; minimum yield strength 50,000psi. The product of the yield strength and section modulus shall not be less than that for Type I material.
- B. Fabric: Aluminum coated steel wire, interwoven; ASTM A 491; .40 oz. per sq ft.
1. Typical:
 - a. Size: 2 inch diamond mesh
 - b. Gage (core): 9 gage (0.148 inch diameter).
- C. Barbed Tape:
1. Barbed Tape Obstacle shall be constructed of a 24"± 2" (packaged) diameter coil within a 30" ± 2" (packaged) diameter coil. Each inner coil (24") loop shall contain 19 ± 1 barb clusters. Each outer coil (30") shall contain 24 ± 1 barb clusters. Each barb cluster shall have 4 needle-sharp barbs with an average barb length of 1.2". Each unit shall contain 31 outer coil loops and 31 inner coil loops. Inner and outer coils shall have coil loops clipped together at three (3) points about the circumference to produce the concertina effect. Stainless steel clips shall be .375" by .065" and mechanically closed to withstand a minimum pull load of 200 pounds. Each complete unit shall cover 20 LF at an inner and outer attachment spacing of 16" ± 2".

The barbed tape shall be fabricated from type 430 stainless steel conforming to ASTM A-176 with a minimum hardness of Rockwell (30N) 35-40. The stainless steel strip shall be 1" wide before fabrication by .025" thick and shall have clusters of four (4) barbs, each a minimum of 1.2" long, punched at 4" centers.

Fabricated barbed tape shall be permanently cold-clenched around a .098" Diameter 301 Austenitic stainless steel conforming to ASTM A-580 with a minimum tensile strength of 130,000 psi. The finished reinforced tape shall be a minimum of .325" wide in the throat area and shall exhibit two cut-resistant flanges. These flanges shall taper off in the immediate vicinity of the barb clusters to allow maximum barb penetration.

The two coils will be attached at each end by two (2) 18 gauge s/s tie wires.

- D. Barbed Wire: ASTM A 121, Class 3 galvanized coating.
 - 1. Line Wire: Two strands, 12.5 gage (0.0999 inch diameter), twisted.
 - 2. Barbs: 14 gage (0.080 Inch Diameter).
- E. Concrete: As specified in Section 03 30 53
- F. Bituminous paint: #46-457 "Tnemecol" by Tnemec or approved equal by Koppers or Valsper.
- G. Accessories:
 - 1. Fittings: ASTM F 626 except tension rods 3/8 inch diameter; ferrous.
 - 2. Tension Wire: ASTM A 824, minimum 7 gage metallic coated steel, marcelled, single strand, finish to match fabric.
 - 3. Sleeves: Galvanized steel pipe or tubing.
 - 4. Custom Brackets: As detailed; steel pipe, steel bars ASTM A 36, steel plate, welded construction, hot-dip galvanized after fabrication. See FINISHES below.

2.03. Components

- A. Framing: Fabricate in accordance with the following schedule for framing up to 16'-0" in height with post spacing not to exceed 10'-0". Components not shown to comply with requirements of ASTM F 669, Table 2 for Heavy Industrial Fence.

DESCRIPTION	O.D. <u>Inches</u>	TYPE I <u>lbs/ft</u>	TYPE III <u>lbs/ft</u>
Line Posts			
Up to 6'-0"	1.90	2.72	2.28
Up to 13'-0"	2.875	5.79	4.64
Up to 14'-0"	4.0	7.58	5.71
Up to 16'-0"	4.0	9.11	6.56

End, Comer and Terminal Posts

Up to 6'-0"	2.375	3.65	3.12
12'-0" to 15'-0"	6.625	-	-
Up to 16'-0"	6.625	18.97	-
Rails and Post Braces	1.66	2.27	1.83
Gate Posts:			
Leafs up to 6'-0" wide	2.875	5.79	4.46
Leafs up to 12'-0" wide	4.0	9.11	6.56
Leafs up to 18'-0" wide	6.625	18.98	-

- B. Gate Frames: Steel pipe or tubing, constructed with welded corners or fittings and truss rods. Welds to be painted two coats zinc rich paint.
 - 1. Round: 1.9 inch O.D Minimum weight in pounds per lineal foot as follows:
 - a. Type I (Schedule 40): 2.72 plf.
 - b. Type II (Steel Tubing), 2.28 plf.
 - 2. Square: 2 inches. Minimum 2.52 pounds per lineal foot.
- C. Fabric and Fabric Selvage:
 - 1. Exposed fabric to 6'-0": Top barbed. Bottom knuckled.
 - 2. Exposed Fabric to 12'-0": Three pieces.
 - a) Bottom Course: 18 inches high. Top and bottom knuckled.
 - b) Intermediate Course: 6'-6" high. Top and bottom knuckled.
 - c) Top Course: 6'-0" high. Top barbed. Bottom knuckled.
 - 3. Fabric in Contact with Earth: Factory coat with bituminous paint to a height not less than 2 inches above finish grade. Coating to cover all surfaces including ends.
- D. Caps: Cast steel or malleable iron, galvanized sized to post dimension, set screw retained.
- E. Fittings: Sleeves, bands, clips, rail ends, tension bars, fasteners and fittings: Steel.
- F. Extension Arms: cast steel to accommodate three strands of barbed wire, single arm, vertical and sloped to 45 degrees as indicated.

2.04. FINISHES

- A. Framing: Provide finish according to framing type as follows.
 - 1. Type I (heavy wall pipe): Galvanized, ASTM F 1234, Type A; 1.8 oz/sq. ft. coating
 - 2. Type II (light wall tubing)
 - a) External Finish: Hot-dip zinc coating minimum 1.0 oz/sq. ft. followed by a cromate conversion coating and clear acrylic coating minimum 0.5 oz/sq. ft.

- b) Internal Finish: Provide one of the following:
 - 1. Hot-dip zinc coating minimum 1.0 oz/sq. ft. or
 - 2. Zinc-rich based coating having a minimum zinc powder loading of 91 percent by weight and capable of providing galvanic protection.
- B. Fabric and Wire Products: See MATERIALS above.
- C. Accessories:
 - 1. Fittings: Galvanized, minimum 1.2 oz/sq. ft., ASTM F 626.
 - 2. Hardware: Galvanized, ASTM A 153.
 - 3. Plates, Bars, Locks, fabrications: Galvanized, ASTM A 123.

3.01 PREPARATION

- A. Roof Mounted Fencing: Protect roof system, including exposed zinc or aluminum/zinc finish, from damage of any type from work under this Section. Verify special procedures required with Lead Contractor. Protection and work procedures on roof must be acceptable to roof manufacturer, Lead Contractor, and Associate. In general, provide the following:
 - 1. Protection: Untreated plywood over all roof area receiving work, minimum 8 foot wide. Plywood must not be pressured treated with chemicals of any type. Treated wood may cause discoloration and early failure of finish.
 - 2. Traffic not permitted on roof access without protection.
 - 3. Material storage or stockpiling not permitted.

3.02 INSTALLATION

- A. General:
 - 1. See "Design requirements" under SYSTEM DESCRIPTION in Part 1 above.
 - 2. Install framework, fabric and accessories in accordance with ASTM F 567.
 - 3. Provide fence height indicated.
 - 4. All framing and threaded connections to be on the least accessible (secure) side of fence fabric.
- B. Posts:
 - 1. Double Posts: Provide double posts where indicated near interior Sallyport gates, free of connections to adjacent fence framing.
 - 2. Erect ground set posts in concrete footings.
 - 3. Tolerances:
 - a. Ground Set
 - 1. Inner Row: 10 feet maximum.
 - 2. Outer Row: 10 feet maximum
 - b. Roof Mounted: Existing support sleeves at 10 foot centers.
- C. Concrete Footings:

1. Sizes: Not less than the following:
 - a. Depth:

<u>Exposed Fabric Height</u>	<u>Depth Below Finish Grade</u>
1) 12 feet	48 inches
2) 14 feet	54 inches
3) 16 feet	60 inches
 - b. Diameter: 4 times post diameter, except not less than 12 inches.
 - c. Cover Below Post: Minimum 4 inches, maximum 6 inches
 2. Top of footing 2 inches above finish grade. Slope top of concrete for water runoff.
 3. Two-stage concrete placement required:
 - a. 1st Stage: Install to elevation required for bottom of buried fence fabric.
 - b. 2nd Stage: After installation of bottom course of fabric, install remaining portion of footing from exposed portion.
- D. Concrete Deadmen: Intermediate hold-down for bottom rails. 12 inch diameter x 48 inches deep. Two stage placement same as specified for "Concrete Footings" above. Hold-down hardware specified under "rails" below. Provide for inner fence row.
- E. Rails: Provide the following:
1. Top Rail: Continuous, extended through line post tops and splice with 7 inch long rail sleeves. Vertical or 45 degree extension arm fitting as indicated: orient slopped extension arms with slope pointing in direction of escape.
 2. Bottom and Intermediate Rails: Connect to line and terminal posts using boulevards or bands and rail ends.
 3. Bottom Rail Hold-Down: Attach rail to concrete deadmen with galvanizes steel anchor bar, minimum 1-1/2" W x 24" L x 3/8" thick with 90 degree bend on embedded end, and U-bolts.
- F. Braces:
1. Brace each gate and corner post back to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail, one bay from end and gate posts.
 2. Install center and bottom brace rail on corner and gate leaves.
- G. Threaded Connectors: After installation, peen or tack weld.
- H. Bottom tension Wire: Provide where fabric extends beyond bottom rail. Install between terminal posts, stretch taunt.
- I. Fabric: For fence over 8 feet high, install fabric in courses, top and bottom.
1. Roof Mounted Fence: Install bottom of fabric 2 inches above roof surface.
 2. Ground Mounted Fence
 - a. Bottom Course: Position bottom of fabric 12 inches below finished grade.
 - b. Intermediate Course: Lap bottom course nominal 6 inches.
 - c. Upper Course: Position top of fabric so barbs project above top rail. Lap lower course with bottom edge by nominal 6 inches.
 3. Stretch fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.
 4. Attachment:

- a. Fasten fabric to all rails, line posts, braces and bottom tension wire with wire ties maximum 12 inch centers. Where fabric splices occur attach both layers to rails.
 - b. Attach fabric to end, corner and gate posts with tension bars and tension bar clips.
- J. Barbed tape
- 1. General
 - a. Install in accordance with manufacturer's recommendations and approved shop drawings.
 - b. Install coil loops uniformly at manufacturer's recommended spacing with a tolerance of +2 inches, non-cumulative. Maximum clear distance between coils not to exceed 7 inches. Attach barbed tape with stainless steel tie wire. Pull tape in close contact with fence and tension wire to eliminate vibration and rattles caused by wind.
 - 2. Top of Fence: Install on extension arms; see "Posts" above.
 - a. Install tension wire in outermost position of arm.
 - b. Install barbed tape on top of fence and touching tension wire.
 - c. Attach each parallel coil loop to tension wire and top of fence fabric.
 - 3. Side of fence:
 - a. Ground Coil(s): Attach to ground with ground anchors at intervals not to exceed 10 feet. Drive anchors into ground until barb tape is fully captured between anchor hook and ground without distortion. Attach coils to fence where immediately adjacent.
 - b. Elevated Coils: Attach to fence,
 - c. Attach all adjacent coil rows together, vertically and horizontally, at approximately 36-inch centers throughout the stack.
 - 4. Splicing: Connect ends of coils together by:
 - a. Rotate and match curved surfaces of tape.
 - b. Align attachment clips at each end for splicing.
 - c. Overlap two barb clusters and attach together with wire ties. For 30-inch diameter coils, add two additional ties where clips would have been if coil manufactured in continuous roll.
- K. Barbed Wire: Install on extension arms where shown.
- L. Field Touch-Up: Repair all galvanized surfaces damaged by welding or other causes in accordance with ASTM A 780 including Annexes.

3.03 FIELD QUALITY CONTROL

- A. Manufacturer's Representative, Barbed tape: Contractor to contract with barbed tape manufacturer to furnish representative at beginning of installation to instruct Contractor's personnel in the proper installation of barbed tape. Manufacturer's representative to have a minimum of 5 years experience installing / directing installation of barbed tape work required for this project.

- B. Testing
1. Cost: All testing to be performed at Contractor's expense
 2. Criteria; test posts for rigidity and panels tautness. See "performance Requirements" under SYSEM DESCRIPTION in Part 1 above.
 3. Frequency: a. Posts: Every 10th post. B. Fabric panel: Every 10th panel. Failure:
When a post / panel fails to meet criteria:
 - a. Posts
 1. Test next 4 posts on either side of failed post.
 2. Remove, replace and retest all failed posts at no additional cost to Owner.
 - b. Fence Panel:
 1. Test next 4 panels on either side of failed post
 2. Re-Stretch to meet criteria.

END OF SECTION 323113

Section 32 31 14: Decorative Welded Ornamental Fence System

PART 1 - GENERAL

1.01 WORK INCLUDED

The contractor shall provide all labor, materials and appurtenances necessary for installation of the welded ornamental steel fence system.

1.02 RELATED WORK

Section 03 30 53 - Concrete

This specification is based upon Ameristar Fence Products. Additional acceptable manufacturers include the following:

- Ametco Manufacturing Corp., Willoughby, Ohio
- Fortress Iron, Richardson, Texas
- Master Halco, Columbus, Ohio

1.03 SYSTEM DESCRIPTION

The manufacturer shall supply a total fence system of Montage Plus™ / Montage Plus ATF™ Welded Ornamental Steel **Genesis™ with triad finials** design. The system shall include all components (i.e., panels, posts, gates and hardware) required.

1.04 QUALITY ASSURANCE

The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.05 REFERENCES

ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process. ASTM B117 - Practice for Operating Salt-Spray (Fog) Apparatus. ASTM D523 - Test Method for Specular Gloss. ASTM D822 - Practice for Conducting Tests on Paint and Related Coatings and Materials using Filtered Open-Flame Carbon-Arc Light and Water Exposure Apparatus. ASTM D1654 - Test Method for Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments. ASTM D2244 - Test Method for Calculation of Color Differences from Instrumentally Measured Color Coordinates. ASTM D2794 - Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact). ASTM D3359 - Test Method for Measuring Adhesion by Tape Test.

1.06 SUBMITTAL

The manufacturer's literature shall be submitted prior to installation.

1.07 PRODUCT HANDLING AND STORAGE

Upon receipt at the job site, all materials shall be checked to ensure that no damage occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage, and to protect against damage, weather, vandalism and theft.

PART 2 - MATERIALS

2.01 MANUFACTURER

The fence system shall conform to Montage Plus™ / Montage Plus ATF™ Welded Ornamental Steel Genesis™ with triad finials design, extended picket bottom rail treatment, standard picket space 3-Rail style manufactured by Ameristar Fence Products, Inc., in Tulsa, Oklahoma.

2.02 MATERIAL

- A. Steel material for fence panels and posts shall conform to the requirements of ASTM A653/A653M, with a minimum yield strength of 50,000 psi (344 MPa) and a minimum zinc (hot-dip galvanized) coating weight of 0.90 oz/ft² (276 g/m²), Coating Designation G-60.
- B. Material for pickets shall be 3/4" square x 17 Ga. tubing. The rails shall be steel channel, **Montage Plus ATF** profile, 1.5" x 1.4375" x 14 Ga. Picket holes in the rail shall be spaced 4.334" o.c. Posts shall be a minimum of 2-1/2" square x 16 Ga. 12 Ga. Posts may be used for heavy applications. Panels shall be welded & rackable.
- C. Color – Black

2.03 FABRICATION

- A. Pickets, rails and posts shall be pre-cut to specified lengths. Rails shall be pre-punched to accept pickets.
- B. Pickets shall be inserted into the pre-punched holes in the rails and shall be aligned to standard spacing using a specially calibrated alignment fixture. The aligned pickets and rails shall be joined at each picket-to-rail intersection by Ameristar's proprietary fusion welding process, thus completing the rigid panel assembly (Note: The process produces a virtually seamless, spatter-free good-neighbor appearance, equally attractive from either side of the panel).

- C. The manufactured panels and posts shall be subjected to the AmeriCoat™ inline electrode position coating process consisting of a multi-stage pretreatment/wash (with zinc phosphate), followed by a duplex cathodic electrocoat application of an epoxy primer followed by an acrylic topcoat. The minimum cumulative coating thickness of epoxy and acrylic shall be 2 mils (0.058 mm). The color shall be **Black**. The coated panels and posts shall be capable of meeting the performance requirements for each quality characteristic shown in Table 1.
- D. Gates shall be fabricated using welded ornamental panel material and gate ends having 1-3/4” square cross-sectional size. All rail and upright intersections shall be joined by welding. All picket and rail intersections shall also be joined by welding.

PART 3 - EXECUTION

3.01 PREPARATION

All new installation shall be laid out by the contractor in accordance with the construction plans.

3.02 INSTALLATION

Fence post shall be spaced according to the Bracket Table located on Page 11-1 and 11-11, plus or minus 1/2". Fence panels shall be attached to posts with boulevard brackets supplied by the manufacturer. Gate posts shall be spaced according to the gate openings specified in the construction plans. The “Concrete” sections of this specification shall govern post base material requirements.

3.03 CLEANING

The contractor shall clean the jobsite of excess materials; post-hole excavations shall be scattered uniformly away from posts.

Table 1 – Coating Performance Requirements

Quality Characteristics	ASTM Test Method	Performance Requirements
Adhesion	D3359 – Method B	Adhesion (Retention of Coating) over 90% of test area (Tape and knife test).
Corrosion Resistance	B117 & D1654	Corrosion Resistance over 3,500 hours (Scribed per D1654; failure mode is accumulation of 1/8” coating loss from scribe or medium #8 blisters).
Impact Resistance	D2794	Impact Resistance over 60 inch lb. (Forward impact using 0.625” ball).
Weathering Resistance	D822 D2244, D523 (60° Method)	Weathering Resistance over 1,000 hours (Failure mode is 60% loss of gloss or color variance of more than 3 delta-E color units).

SECTION: 32 31 15 Decorative Chain Link Fence System

PART 1 – GENERAL

1.01 WORK INCLUDED

- A. The contractor shall provide all labor, materials and appurtenances necessary for installation of the color chain link fencing system.

1.02 RELATED WORK

- Section 03 30 53 – Case-In-Place Concrete
- Section 04 20 00 – Unit Masonry

1.03 SYSTEM DESCRIPTION

- A. The contractor shall supply a total color chain link fencing system of the design, style and strength defined herein. The system shall include all components (i.e., framework, chain link fabric, gates and fittings) required.

1.04 QUALITY ASSURANCE

- A. The contractor shall provide laborers and supervisors who are thoroughly familiar with the type of construction involved and materials and techniques specified.

1.05 REFERENCES

- A. American Society for Testing and Materials (ASTM) Standards: A90/A90M - Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings. A653/A653M - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process. A924/A924M - Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process. B6 - Specification for Zinc. B117 - Practice for Operating Salt Spray (Fog) Apparatus. D1499 - Practice for Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Plastics. D3359 - Test Methods for Measuring Adhesion by Tape Test. E8/E8M - Test Methods for Tension Testing of Metallic Materials. F567 - Practice for Installation of Chain-Link Fence. F626 - Specification for Fence Fittings. F668 - Specification for Poly (Vinyl Chloride) (PVC)-Coated Steel Chain-Link Fence Fabric. F900 - Specification for Industrial and Commercial Swing Gates. F934 - Specification for Standard Colors for Polymer-Coated Chain Link Fence Materials. F969 - Practice for Construction of Chain-Link Tennis Court Fence. F1043 - Specification for Strength and Protective Coatings on Metal Industrial Chain Link Fence Framework. F1184 - Specification for Industrial and Commercial Horizontal Slide Gates.

B. American Association of State Highway and Transportation Officials (AASHTO)
Standards: M181 - Standard Specification for Chain-Link Fence.

C. United States Federal Supply Service General Services Administration Specifications:
RR-F-191/3 - Federal Specification Sheet for Fencing, Wire and Post, Metal (Chain-
Link Fence Posts, Top Rails and Braces) - Detail Specification.

1.06 SUBMITTAL

A. The manufacturer's literature shall be submitted prior to installation.

1.07 PRODUCT HANDLING AND STORAGE

A. Upon receipt at the job site, all materials shall be checked to ensure that no damages occurred during shipping or handling. Materials shall be stored in such a manner to ensure proper ventilation and drainage and to protect against damage, weather, vandalism and theft.

PART 2 - MATERIALS

2.01. MANUFACTURER

A. This specification is based Ameristar® PermaCoat® PC-40™ Fence Pipe (industrial weight), as manufactured by Ameristar® Fence Products in Tulsa, Oklahoma.

Additional acceptable manufacturers include:

- Ametco Manufacturing Corp., Willoughby, Ohio
- Fortress Iron, Richardson, Texas
- Master Halco, Columbus, Ohio

2.02. MATERIAL – STEEL FRAMEWORK

A. The steel material used to manufacture Ameristar® PermaCoat® PC-40™ Fence Pipe shall be zinc-coated steel strip, galvanized by the hot-dip process conforming to the criteria of ASTM A653/A653M and the general requirements of ASTM A924/A924M.

B. The zinc used in the galvanizing process shall conform to ASTM B6. Weight of zinc shall be determined using the test method described in ASTM A90 and shall conform to the weight range (external and internal) of ASTM F1043, Type B.

C. The framework shall be manufactured in accordance with commercial standards to meet the strength (50,000 psi minimum yield strength) and coating requirements of the following standards: 1.) ASTM F1043, Group IC, Electrical Resistance Welded Round Steel Pipe, heavy industrial weight. 2.) M181, Type I, Grade 2, Electrical Resistance Welded Steel Pipe. 3.) RR-F-191/3, Class 1, Grade B, Electrical Resistance Welded Steel Pipe.

- D. The exterior surface of the electrical resistance weld shall be recoated with the same type of material and thickness as the basic zinc coating.
- E. The manufactured framework shall be subjected to the PermaCoat® process, a complete thermal stratification coating process (multi-stage, high-temperature, multi-layer) including, as a minimum, a six-stage pretreatment/wash (with zinc phosphate), an electrostatic spray application of an epoxy base, and a separate electrostatic spray application of a polyester finish.
- F. The material used for the base coat shall be a (gray color) thermosetting epoxy; the minimum thickness of the base coat shall be two (2) mils. The material used for the finish coat shall be a thermosetting “no-mar” TGIC polyester powder; the minimum thickness of the finish coat shall be two (2) mils. The stratification coated pipe shall demonstrate the ability to endure a salt-spray resistance test in accordance with ASTM B117 without loss of adhesion for a minimum exposure time of 3,500 hours. Additionally, the coated pipe shall demonstrate the ability to withstand exposure in a weather-ometer apparatus for 1,000 hours without failure in accordance with ASTM D1499 and to show satisfactory adhesion when subjected to the cross-hatch test, Method B, in ASTM D3359. The polyester finish coat shall not crack, blister or split under normal use.
- G. The color of all framework shall be Black in accordance with ASTM F934.
- H. The strength of Ameristar® PermaCoat® PC-40™ Fence Pipe shall conform to the requirements of ASTM F1043; the minimum weight shall not be less than 90% of the nominal weight (see Table 1). The strength of line, end, corner and pull posts shall be determined by the use of 4’ or 6’ cantilevered beam test. The top rail shall be determined by a 10’ free-supported beam test (see Table 1). An alternative method of determining pipe strength is by the calculation of bending moment (see Table 1). Conformance with this specification can be demonstrated by measuring the yield strength of a randomly selected piece of pipe from each lot and calculating the section modulus. The yield strength shall be determined according to the methods described in ASTM E8. For materials under this specification, the 0.2 offset method shall be used in determining yield strength. Terminal posts, line posts and top/bottom rails shall be precut to specified lengths.

2.03. MATERIAL – FENCE FABRIC

- A. The material for chain link fence fabric shall be manufactured from galvanized steel wire. The weight of zinc shall meet the requirements of ASTM F668. Galvanized wire shall be PVC-coated to meet the requirements of ASTM F668. The class of the fence fabric shall be Class 2B - Fused and Bonded.
- B. Selvage: Top edge knuckled and bottom edge knuckled.

- C. Color: The coating color for the fence fabric shall be Black. Reference ASTM F668 and ASTM F934.
- D. Wire Size: The size of the steel wire core shall be 8 gauge. The finished size of the coated wire shall be 8 gauge.
- E. Height and Mesh Size: The fabric height shall be as shown on the drawings, Feet high with a mesh size of 8 gauge, 1 3/4”.

2.04. MATERIAL – FENCE FITTINGS

- A. The material for fence fittings shall be manufactured to meet the requirements of ASTM F626. The coating for all fittings shall be the same PermaCoat® color coating system required for the framework (see 2.02); the color of all fittings and fasteners shall be Black in accordance with ASTM F934. All fasteners shall be stainless steel.

2.05. MATERIAL – GATES

- A. Swing gates shall be manufactured and coated to meet the requirements of ASTM F900. Slide gates shall be manufactured to meet the requirements of ASTM F1184. The color of all gates shall be Black in accordance with ASTM F934.

PART 3 – EXECUTION

3.01. PREPARATION

- A. All new installation shall be laid out by the contractor in accordance with the construction plan.

3.02. INSTALLATION

- A. Install chain link fence in accordance with ASTM F567. Fence posts shall be set at spacings of a maximum of 10’ o.c. Gate posts shall be spaced according to the gate openings specified in the construction plans. “Cast-In-Place Concrete” and “Unit Masonry” sections of this specification shall govern post base placement and material requirements. Install fabric on security side and attach with wire ties or clip to line posts at 15 inches o.c. and to rails, braces and tension wire at 24 inches o.c.

3.03. CLEANING

- A. The contractor shall clean the jobsite of excess materials. Post hole excavations shall be scattered uniformly away from posts.

TABLE 1

Fence Industry	Decimal O.D. Equivalent		Pipe Wall Thickness		Weight		Section Modulus Inches	x	Min Yield Strength psi	=	Max. Bending Moment lb. in.	Calculated Load (lbs.)		
	O.D.	Inches	(mm)	Inches	(mm)	lb./ft.						(kg/m)	18' Free Supported	Cantilever
												4'	6'	
1-5/8"	1.688	42.16	.111	2.82	1.84	2.74	1951	x	50,000	=	9,800	327	704	138
2"	1.900	48.26	.120	3.05	2.28	3.35	2810	x	50,000	=	14,050	468	793	195
2-1/2"	2.375	60.33	.130	3.30	3.12	4.64	4851	x	50,000	=	24,405	814	508	358
3"	2.875	73.03	.160	4.06	4.64	6.90	8778	x	50,000	=	43,850	1,483	914	610
4"	4.000	101.60	.180	4.06	6.56	9.76	1,7519	x	50,000	=	89,085	2,970	1,858	1,237

TABLE 2

Finished Gauge	Finished OD (NOM)	Core Diameter (NOM)	PVC Coating Thickness	Mesh Sizes Available	Fabric Extrusion Type	Minimum Breaking Strength
6	.192 (4.88 mm)	.148 (3.78 mm)	.015 - .025 (0.38 - 0.64 mm)	2 (50 mm); 1-3/4 (44 mm)	CLASS 2A	1250#
8	.162 (4.11 mm)	.120 (3.05 mm)	.015 - .025 (0.38 - 0.64 mm)	2 (50 mm); 1-3/4 (44 mm); 1 (25 mm)	CLASS 1, 2A	850#
9	.148 (3.78 mm)	.120 (3.05 mm)	.015 - .025 (0.38 - 0.64 mm)	2 (50 mm); 1-3/4 (44 mm); 1 (25 mm)	CLASS 1, 2A	660#