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DIVISION 02 - SITE CONSTRUCTION

SECTION 02825

CHAIN LINK FENCES AND GATES

06/04

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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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SECTION 02825

CHAIN LINK FENCES AND GATES
06/04

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NOTE: This section covers steel fencing, including posts, fabric, gates, barbed wire, and miscellaneous accessories. Colored fabric and accessories may be used if required. Specifications must be revised to suit.

Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

Drawings must indicate plan layout, fence height, gate size and operation, barbed wire arrangement, spacing of posts and braces, size of post footings, and special features.

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PART 1 GENERAL

1.1 REFERENCES

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NOTE: The following references should not be manually edited except to add new references. References not used in the text will automatically be deleted from this section of the project specification.

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The publications listed below form a part of this section to the extent referenced:

ASTM INTERNATIONAL (ASTM)

ASTM A 116	(2000) Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
ASTM A 121	(1999) Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire
ASTM A 153/A 153M	(2004) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

ASTM A 390	(1995; R 2001) Standard Specification for Zinc-Coated (Galvanized) Steel Poultry Fence Fabric (Hexagonal and Straight Line)
ASTM A 584	(1997) Standard Specification for Aluminum Coated Steel Woven Wire Fence Fabric
ASTM A 702	(1989; R 2000) Standard Specification for Steel Fence Posts and Assemblies, Hot Wrought
ASTM A 780	(2001) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM A 90/A 90M	(2001) Standard Test Method for Weight (Mass) of Coating on Iron or Steel Articles with Zinc or Zinc Alloy
ASTM C 94/C 94M	(2003a) Standard Specification for Ready-Mixed Concrete
ASTM F 1083	(1997; R 2003) Standard Specification for Pipe, Steel Hot-Dipped Zinc Coated (Galvanized) Welded, for Fence Structures
ASTM F 1234	(1993) Standard Specification for Protective Coating on Steel Framework for Fences
ASTM F 626	(1996a; R 2003) Standard Specification for Fence Fittings
ASTM F 669	(1998) Standard Specification for Strength Requirements of Metal Posts and Rails for Industrial Chain Link Fence

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-F-191/3D	(2001) Fencing, Wire and Pest, Metal (Chain Link Fence Posts, Top Rails and Braces) (Detail Specification)

1.2 SUBMITTALS

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NOTE: Review submittal description (SD) definitions in Section 01330, "Submittal Procedures," and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.
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The following shall be submitted in accordance with Section 01330, "Submittal Procedures," in sufficient detail to show full compliance with the specification:

SD-02 Shop Drawings

Erection/Installation Drawings shall be submitted for the following items in accordance with paragraph entitled, "Assembly and Installation," of this section.

Fence Assembly
Gate Assembly
Gate Hardware and Accessories

SD-03 Product Data

Manufacturer's catalog data shall submitted for the following items:

Fence Assembly
Gate Assembly
Gate Hardware and Accessories

SD-04 Samples

Contractor shall submit the following samples described within this section:

Fabric
Line Posts
Sleeves
Top Rail
Tension Wire
Barbed Wire Supporting Arms
Barbed Wire
Stretcher Bars
Gate Posts
Gate Hardware and Accessories
Wire Ties

SD-07 Certificates

Certificates of compliance shall be submitted in accordance with the applicable reference standards and descriptions of this section for the following items:

Zinc Coating
Fabric
Barbed Wire
Stretcher Bars
Gate Hardware and Accessories
Concrete

SD-08 Manufacturer's Instructions

Manufacturer's instructions shall be submitted for the following items:

Fence Assembly
Gate Assembly
Hardware Assembly
Accessories

1.3 ASSEMBLY AND INSTALLATION

Contractor shall provide manufacturer's instructions that detail proper assembly and materials in the design for fence, gate, hardware and accessories.

Erection/Installation drawings shall be submitted along with manufacturer's catalog data for Complete fence assembly, gate assembly, hardware assembly and accessories.

PART 2 PRODUCTS

2.1 GENERAL

Fencing materials shall conform to the requirements of ASTM A 116, ASTM A 121, ASTM A 390, ASTM A 584, ASTM A 702, ASTM F 626, and as specified.

2.2 ZINC COATING

Ferrous-metal components and accessories, except as otherwise specified, shall be hot-dip galvanized after fabrication.

Weight of zinc coating shall not be less than 1.8 ounces per square foot 550 gram per square meter, as determined from the average result of two specimens, when tested in accordance with ASTM A 90/A 90M.

Zinc coating shall conform to the requirements of the following:

Pipe: FS RR-F-191/3D Class 1 [Grade A in accordance with ASTM F 1083] [Grade B in accordance with ASTM F 669] and ASTM F 1234.

Hardware and accessories: ASTM A 153/A 153M, Table 1

Surface (ASTM F 1234):

External: Type B-B surface zinc with organic coating, 0.9 ounce per square foot 275 gram per square meter minimum thickness of acrylated polymer.

Internal: Surface zinc coating of 0.9 ounce per square foot 275 gram per square meter minimum.

Galvanizing repair material shall be a cold-applied zinc-rich coating conforming to ASTM A 780.

2.3 FABRIC

Fabric shall consist of No. 9-gage 3.8 millimeter wires woven into a [1-inch] [1-3/4-inch] [2-inch] [25] [45] [50] millimeter diamond mesh, with dimensions of fabric and wire conforming to ASTM A 116, ASTM A 121, ASTM A 390, ASTM A 584, ASTM A 702 and ASTM F 626, with 1.2 ounces per square foot 366 gram per square meter zinc galvanizing.

Fence heights to 12 feet 3600 millimeter shall have one-piece fabric widths.

2.4 TOP AND BOTTOM SELVAGES

Fabric with 2 inch 50 millimeter mesh and up to 60 inches 1500 millimeter

high shall be knuckled on both top and bottom selvages, over if 60 inches 1500 millimeter high, it shall be twisted and barbed on the top selvage and knuckled on the bottom selvage.

Top and bottom selvages shall be knuckled for 1-3/4-inch and 1-inch 45 millimeter and 25 millimeter mesh fabric.

2.5 LINE POSTS

Minimum acceptable line posts shall be as follows:

Up to 6-feet 1800 millimeter high:

Grade A: 1.900 inch DN50 O.D. pipe weighing 2.72 pounds per linear foot 4.05 kilogram per linear meter.

Grade B: 2.375 inch DN60 O.D. pipe weighing 3.12 pounds per linear foot 4.65 kilogram per linear meter.

Over 6-feet 1800 millimeter high:

2.0 inch DN50 O.D. pipe weighing 3.65 pounds per linear foot 5.44 kilogram per linear meter.

2.6 END, CORNER, AND PULL POSTS

Minimum acceptable end, corner, and pull posts shall be as follows:

Up to 6 feet 1800 millimeter high:

Grade A: 2.375 inch DN50 O.D. pipe weighing 3.65 pounds per linear foot 5.44 kilogram per linear meter.

Grade B: 2.375 inch DN60 O.D. pipe weighing 3.12 pounds per linear foot 4.65 kilogram per linear meter.

Over 6 feet 1800 millimeter high:

Grade A: 2.875 inch DN70 O.D. pipe weighing 5.79 pounds per linear foot 8.62 kilogram per linear meter.

Grade B: 2.875 inch DN70 O.D. pipe weighing 4.64 pounds per linear foot 6.91 kilogram per linear meter.

2.7 SLEEVES

Sleeves for setting into concrete construction shall be of the same material as post sections. Size shall be 1-inch 25 millimeter greater than the diameter or dimension of the post. Flat plates shall be welded to each sleeve base to provide anchorage and prevent intrusion of concrete.

2.8 TOP RAIL

Rails shall be a minimum of 1.660 inches DN40 O.D. pipe [Grade A weighing 2.27 pounds per linear foot 3.38 kilogram per linear meter.] [Grade B weighing 1.82 pounds per linear foot 2.71 kilogram per linear meter.] Expansion couplings 6-inches 150 millimeter long shall be provided at each joint in top rails.

2.9 CENTER RAILS BETWEEN LINE POSTS

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NOTE: Center rails are not normally required for fencing less than 6 feet 1800 millimeter high. Edit as required.
****

For fencing over 6-feet 1800 millimeter high, center rails shall be 1.660 inches DN40 O.D. pipe [Grade A weighing 2.27 pounds per linear foot 3.38 kilogram per linear meter] [Grade B weighing 1.82 pounds per linear foot 2.71 kilogram per linear meter.]

2.10 POST-BRACE ASSEMBLY

Bracing shall consist of 1.660 inches DN40 O.D. pipe [Grade A weighing 2.27 pounds per linear foot 3.38 kilogram per linear meter] [Grade B weighing 1.82 pounds per linear foot 2.71 kilogram per linear meter] and 3/8 inch 10 millimeter adjustable truss rods and turnbuckles.

2.11 TENSION WIRE

Wire shall be galvanized, No. 7-gage 3.7 millimeter, coiled spring wire, provided at the bottom of the fabric only. Zinc Coating shall weigh not less than 1.6 ounces per square foot 490 gram per square meter.

2.12 BARBED WIRE SUPPORTING ARMS

Supporting arms for barbed wire shall be steel, wrought iron, or malleable iron, complete with provisions for anchorage to posts and for attaching 3 rows of barbed wire to each arm. Supporting arms may either be attached to posts or integral with the post top weather cap.

[Contractor shall provide a single vertical arm for each post where barbed wire is indicated.]

[Contractor shall provide a single 45-degree arm for three strands of wire for each post where barbed wire is indicated.]

[Contractor shall provide a double V of two 45-degree arms for six strands of wire, one set for each post where barbed wire is indicated.]

[Contractor shall provide an overhead A of two 45-degree arms and cross-bracing for 5 strands of wire, one set for each post where barbed wire is indicated.]

2.13 BARBED WIRE

Wire shall conform to ASTM A 116, ASTM A 121, ASTM A 390, ASTM A 584, ASTM A 702 and ASTM F 626, two-strand, 12-1/2-gage 2.6 millimeter wire with 14-gage 2.0 millimeter 4-point round barbs spaced 5 inches 125 millimeter on center.

2.14 STRETCHER BARS

Bars shall be one-piece lengths equal to the full height of the fabric with a minimum cross section of 3/16 by 3/4 inch 5 by 20 millimeter, in accordance with ASTM A 116, ASTM A 121, ASTM A 390, ASTM A 584, ASTM A 702 and ASTM F 626.

2.15 POST TOPS

Tops shall be steel, wrought iron, or malleable iron designed as a weathertight closure cap. One cap shall be provided for each post, unless equal protection is provided by a combination post-cap and barbed-wire supporting arm. Caps shall have an opening to permit through passage of the top rail.

2.16 STRETCHER BAR BANDS

Bar bands for securing stretcher bars to posts shall be steel, wrought iron, or malleable iron spaced not over 15 inches 380 millimeter on center. Bands may also be used in conjunction with special fittings for securing rails to posts. Bands shall have projecting edges chamfered or eased.

2.17 GATE POSTS

Contractor shall provide a gate post for supporting each gate leaf as follows:

[Up to 6-feet 1800 millimeter wide:

2.875 inch DN75 O.D. pipe [Grade A weighing 5.79 pounds per linear foot 8.62 kilogram per linear meter.] [Grade B weighing 4.64 pounds per linear foot 6.91 kilogram per linear meter.]]

[Over 6 feet 1800 millimeter wide and up to 13 feet 4000 millimeter wide:

2.875 inch DN75 O.D. pipe [Grade A weighing 5.79 pounds per linear foot 8.62 kilogram per linear meter.] [Grade B weighing 4.64 pounds per linear foot 6.91 kilogram per linear meter.]]

[Over 13-feet 4000 millimeter and up to 18-feet 5500 millimeter wide:

Provide 6.625 inch DN150 O.D. pipe weighing 18.97 pounds per linear foot 28.26 kilogram per linear meter.]

[Over 18-feet 5500 millimeter wide:

Provide 8.625 inch DN220 O.D. pipe weighing 24.70 pounds per linear foot 36.79 kilogram per linear meter.]

2.18 GATES

[For gate leaves up to 6-feet 1800 millimeter high or 6-feet 1800 millimeter wide, perimeter gate frames shall be 1.66 inch DN32 O.D. pipe [Grade A weighing 2.27 pounds per linear foot 3.38 kilogram per linear meter.] [Grade B weighing 1.82 pounds per linear foot 2.71 kilogram per linear meter.]]

[For gate leaves over 6 feet 1800 millimeter high or 6 feet 1800 millimeter wide, perimeter gate frames shall be 1.90 inch DN40 O.D. pipe [Grade A weighing 2.72 pounds per linear foot 4.05 kilogram per linear meter.] [Grade B weighing 2.28 pounds per linear foot 3.40 kilogram per linear meter.]]

Gate frame assembly shall be welded or assembled with special malleable or pressed-steel fittings and rivets to provide rigid connections. Fabric shall be installed with stretcher bars at vertical edges; stretcher bars may also be used at top and bottom edges. Stretcher bars and fabric shall

be attached to gate frames on all sides at intervals not exceeding 15 inches. 380 millimeter. Hardware shall be attached with rivets or by other means that will provide equal security against breakage or removal.

Where barbed wire is indicated above gates, the end members of gate frames shall be extended approximately 1-foot 300 millimeter above the top member with provision for attaching the wire. Vertical support arms shall be provided at intermediate points, spaced the same as line posts.

Diagonal cross-bracing, consisting of 3/8-inch 10 millimeter diameter adjustable-length truss rods on welded gate frames, shall be provided where necessary to obtain frame rigidity without sag or twist. Nonwelded gate frames shall have diagonal bracing.

2.19 GATE HARDWARE AND ACCESSORIES

Gate hardware and accessories shall conform to ASTM A 116, ASTM A 121, ASTM A 390, ASTM A 584, ASTM A 702, ASTM F 626, and be as specified:

Hinges shall be malleable iron, forged steel, or pressed steel to suit gate size, non-lift-off type, offset to permit 180-degree opening.

Latch shall permit operation from either side of the gate, with a padlock eye provided as an integral part of the latch.

Stops and holders of malleable iron shall be provided for vehicular gates. Stops shall automatically engage the gate and hold it in the open position until manually released.

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NOTE: Delete the following paragraph when double gates are not required.
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Double gates shall be provided with a cane bolt and ground-set keeper, with latch or locking device and padlock eye designed as an integral part.

****
NOTE: Delete the following paragraph if manual sliding gates are not required.
****

Manufacturer's standard heavy-duty track ball-bearing hanger sheaves, overhead framing and supports, guides, stays, bracing, and accessories shall be provided as required for easy operation of manual sliding gates.

2.20 MISCELLANEOUS HARDWARE

Miscellaneous hardware shall be provided as required and shall be hot-dip galvanized.

2.21 WIRE TIES

Wires for tying fabric to line posts shall be 16-gage 1.6 millimeter galvanized steel wire spaced 12 inches 300 millimeter on center. For tying fabric to rails and braces, wire ties shall be spaced 24 inches 600 millimeter on center. For tying fabric to tension wire, 0.105-inch 2.7 millimeter hog rings shall be spaced 24 inches 600 millimeter on center.

Manufacturer's standard procedure will be accepted if of equal strength and durability.

2.22 CONCRETE

Concrete shall conform to ASTM C 94/C 94M. Mix shall be designed to obtain concrete with a minimum 28-day compressive strength of 2,500 psi 17250 kilopascal.

PART 3 EXECUTION

3.1 GENERAL

Fencing installation shall not begin before the final grading has been completed and finish elevations have been established, unless otherwise approved.

3.2 EXCAVATION

Excavations for post footings shall be [drilled holes] in virgin or compacted soil, of minimum sizes as indicated.

Footings shall be spaced for line posts 10 feet 3000 millimeter on center maximum and at closer intervals when indicated.

Bottoms of the holes shall be approximately 3-inches 75 millimeter below the bottoms of the posts. Bottom of each post shall be set not less than 36-inches 925 millimeter below finished grade when in firm, undisturbed soil. Posts shall be set deeper, as required, in soft and problem soils and for heavy, lateral loads.

Soil from excavations shall be [spread uniformly adjacent to the fence line or on areas of Government property, as directed.] [removed from Government property.]

When solid rock is encountered near the surface, the Contractor shall drill into the rock at least 12 inches 300 millimeter for line posts and at least 18 inches 450 millimeter for end, pull, corner, and gate posts. Holes shall be drilled at least 1 inch 25 millimeter greater in diameter than the largest dimension of the placed post.

If solid rock is below the soil overburden, Contractor shall drill to the full depth required except that penetration into rock need not exceed the minimum depths specified above.

3.3 SETTING POSTS

Loose and foreign materials shall be removed from holes and the soil moistened prior to placing concrete.

Tops of footings shall be trowel finished and sloped or domed to shed water away from posts. Hold-open devices, sleeves, and other accessories shall be set in concrete.

Exposed concrete shall be kept moist for at least 7 calendar days after placement or cured with a membrane curing material, as approved.

[Posts set into sleeved holes in concrete shall be grouted in with an approved grouting material.]

[Posts set in concrete construction shall be set vertically, with tops aligned and held in position until concrete has set.]

3.4 CONCRETE STRENGTH

Concrete shall have attained at least 75 percent of its minimum 28-day compressive strength, but in no case sooner than 7 calendar days after placement, before rails, tension wires, barbed wire, or fabric are installed. Fabric and wires shall not be stretched or gates hung until the concrete has attained its full design strength.

****
NOTE: Delete the following paragraph if the referenced section is not included.
****

[Samples and test concrete shall be taken to determine strength as specified in Section 03305, "Cast-In-Place Concrete (Short Section)."]

3.5 TOP RAILS

Top rails shall run continuously through post caps or extension arms, bending to radius for curved runs. Expansion couplings shall be provided as recommended by the fencing manufacturer.

3.6 CENTER RAILS

Center rails shall be one piece between posts set flush with posts on the fabric side, using special offset fittings where necessary.

3.7 BRACE ASSEMBLY

Contractor shall provide bracing assemblies at end and gate posts and at both sides of corner and pull posts, with the horizontal brace located at midheight of the fabric.

Brace assemblies shall be installed so posts are plumb when the diagonal rod is under proper tension.

Two complete brace assemblies shall be provided at corner and pull posts where required for stiffness and as indicated.

3.8 TENSION WIRE INSTALLATION

Tension wires shall be installed by weaving them through the fabric and tying them to each post with not less than 7-gage 3.9 millimeter galvanized wire or by securing the wire to the fabric with 10-gage 3.5 millimeter ties or clips spaced 24 inches 600 millimeter on center.

3.9 FABRIC INSTALLATION

Fabric shall be provided in single lengths between stretch bars with bottom barbs placed approximately 1-1/2-inches 40 millimeter above the ground line. Fabric shall be pulled taut and tied to posts, rails, and tension wires with wire ties and bands.

Fabric shall be installed on the security side of fence, unless otherwise directed.

Fabric shall remain under tension after the pulling force is released.

3.10 STRETCHER BAR INSTALLATION

Stretcher bars shall be threaded through or clamped to fabric 4 inches 100 millimeter on center and secured to posts with metal bands spaced 15 inches 380 millimeter on center.

3.11 BARBED WIRE INSTALLATION

Three parallel strands of barbed wire shall be installed on the security side of the fence as specified or indicated. Wire shall be pulled taut and fastened securely to each support arm.

3.12 GATE INSTALLATION

Gates shall be installed plumb, level, and secure, with full opening without interference. Ground-set items shall be installed in concrete for anchorage as recommended by the fence manufacturer. Hardware shall be adjusted for smooth operation and lubricated where necessary.

3.13 TIE WIRES

Tie wires shall be U-shaped to the pipe diameters to which attached. Ends of tie wires shall be twisted not less than two full turns and bent so as not to present a hazard.

3.14 FASTENERS

Nuts for tension bands and hardware shall be installed on the side of the fence opposite the fabric side. Ends of bolts shall be peened to prevent removal of nuts.

3.15 ZINC-COATING REPAIR

Galvanized surfaces damaged by welding or abrasions, and cut ends of fabric, barbed wire, or other cut sections shall be cleaned and repaired with specified galvanizing repair material applied in strict conformance with the manufacturer's printed instructions.

3.16 TOLERANCES

Posts shall be straight and plumb within a vertical tolerance of 1/4 inch 6 millimeter after the fabric has been stretched. Fencing and gates shall be true to line with no more than 1/2 inch 15 millimeter deviation from the established centerline between line posts. Defects shall be repaired as directed.

-- End of Section --