

SECTION TABLE OF CONTENTS  
DIVISION 32 - EXTERIOR IMPROVEMENTS

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

11/16

## Table of Contents

PART 1	GENERAL .....	2
1.1	REFERENCES .....	2
1.2	SUBMITTALS .....	3
1.3	QUALITY CONTROL .....	4
1.4	DELIVERY, STORAGE, AND HANDLING .....	5
PART 2	PRODUCTS .....	5
2.1	SYSTEM DESCRIPTION .....	5
2.2	COMPONENTS .....	5
2.3	]2.3 MATERIALS .....	9
PART 3	EXECUTION .....	10
3.1	PREPARATION .....	10
3.2	INSTALLATION .....	10

SECTION 32 31 13

CHAIN LINK FENCES AND GATES

11/16

**PART 1 GENERAL.**

1.1 REFERENCES.

The publications listed below form a part of this specification to the extent referenced. The publications are referred to within the text by the basic designation only.

ASTM INTERNATIONAL (ASTM)

ASTM A90/A90M	(2013; R 2018) Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
ASTM A116	(2011) Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
ASTM A153/A153M	(2016a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A702	(2013) Standard Specification for Steel Fence Posts and Assemblies, Hot Wrought
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM B117	(2019) Standard Practice for Operating Salt Spray (Fog) Apparatus
ASTM C94/C94M	(2020) Standard Specification for Ready-Mixed Concrete
ASTM F567	(2014a) Standard Practice for Installation of Chain Link Fence
ASTM F626	(2014) Standard Specification for Fence Fittings
ASTM F883	(2013) Padlocks
ASTM F1043	(2018) Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework
ASTM F1083	(2018) Standard Specification for Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized)

	Welded, for Fence Structures
ASTM G152	(2013) Operating Open Flame Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G153	(2013) Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials
ASTM G154	(2016) Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials
ASTM G155	(2013) Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Non-Metallic Materials

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-F-191	(Rev K) Fencing, Wire and Post Metal (and Gates, Chain-Link Fence Fabric, and Accessories)
FS RR-F-191/1	(Rev F) Fencing, Wire and Post, Metal (Chain-Link Fence Fabric)
FS RR-F-191/2	(Rev E) Fencing, Wire and Post, Metal (Chain-Link Fence Gates)
FS RR-F-191/3	(Rev E; Am 1) Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails and Braces)
FS RR-F-191/4	(Rev F) Fencing, Wire and Post, Metal (Chain-Link Fence Accessories)

1.2 SUBMITTALS.

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for information only. When used, a designation following the "G" designation identifies the government officer that will review the submittal for the Government.

SD-02 Shop Drawings

Fence Assembly; G,COR

Location of Gate, Corner, End, and Pull Posts; G,COR

Gate Assembly; G,COR

Gate Hardware and Accessories; G,COR

Erection/Installation Drawings; G,COR

SD-03 Product Data

Fence Assembly; G,COR Gate

Assembly; G,COR  
Gate Hardware and Accessories; G,COR  
Zinc Coating; G,COR  
PVC Coating; G,COR  
Aluminum Alloy Coating; G,COR  
Fabric; G,COR  
Stretcher Bars; G,COR  
Concrete; G,COR

SD-04 Samples

Fabric; G,COR

Posts; G,COR

Braces; G,COR

Line Posts; G,COR

Sleeves; G,COR

Top Rail; G,COR

Bottom Rail; G,COR

Tension Wire; G,COR

Stretcher Bars; G,COR

Gate Posts; G,COR

Gate Hardware and Accessories; G,COR

Padlocks; G,COR

Wire Ties; G,COR

SD-07 Certificates

Certificates of Compliance

SD-08 Manufacturer's Instructions

Fence Assembly

Gate Assembly

Hardware Assembly

Accessories

### 1.3 QUALITY CONTROL.

### 1.3.1 Certificates of Compliance

Submit certificates of compliance in accordance with the applicable reference standards and descriptions of this section for the following:

- a. Zinc coating
- b. PVC coating
- c. Aluminum alloy coating
- d. Fabric
- e. Stretcher bars
- f. Gate hardware and accessories
- g. Concrete

### 1.4 DELIVERY, STORAGE, AND HANDLING.

Deliver materials to site in an undamaged condition. Store materials off the ground to provide protection against oxidation caused by ground contact.

## **PART 2 PRODUCTS.**

### 2.1 SYSTEM DESCRIPTION.

Provide fencing materials conforming to the requirements of ASTM A116, ASTM A702, ASTM F626.

Submit reports of listing chain-link fencing and accessories regarding weight in ounces for zinc coating, and chemical composition and thickness of aluminum alloy coating.

Submit manufacturer's catalog data for complete fence assembly, gate assembly, hardware assembly and accessories.

### 2.2 COMPONENTS.

#### 2.2.1 Fabric

FS RR-F-191 and detailed specifications as referenced and other requirements as specified.

FS RR-F-191/1; Type I, zinc-coated steel, II, aluminum-coated steel, III, aluminum alloy, or IV, polyvinyl chloride (PVC) coated over zinc- or aluminum-coated steel. Mesh size, 2 inches. Provide selvage knuckled at one selvage and twisted and barbed at the other or twisted and barbed at both selvages or knuckled at both selvages. Height of fabric, as indicated.

Provide fabric consisting of No. 9-gage wires woven into a 2 inch diamond mesh, with dimensions of fabric and wire conforming to ASTM A116, with 2.0 ounces per square foot zinc galvanizing.

Provide one-piece fabric widths for fence heights up to 12 feet.

#### 2.2.1.1 Top and Bottom Selvages

Provide knuckled selvages at top and bottom for fabric with 2 inch mesh and up to 60 inches high, and if over 60 inches high, provide twisted and barbed top selvage and knuckled bottom selvage.

Knuckle top and bottom selvages for 1-3/4 inch and 1 inch mesh fabric.

#### 2.2.2 Posts Rails and Braces

FS RR-F-191/3 line posts; Class 1, steel pipe, Grade A or B 2, aluminum pipe 3, formed steel sections 4, steel H sections or 5, aluminum H sections. End, corner, and pull posts; Class 1, steel pipe, Grade A or B, 2, aluminum pipe, 6, steel square sections or 7, aluminum square sections. Braces and rails; Class 1, steel pipe, Grade A or B 2, aluminum pipe or 3, formed steel sections, in minimum sizes listed in FS RR-F-191/3 for each class and grade size. Provide PVC color coating, minimum thickness, 0.01 inch.

#### 2.2.3 Line Posts

Minimum acceptable line posts are as follows:

Up to 6 feet high:

Grade A: 1.900 inch O.D. pipe weighing 2.72 pounds per linear foot.

Grade B: 2.375 inch O.D. pipe weighing 3.12 pounds per linear foot.

Over 6 feet high:

2.0 inch O.D. pipe weighing 3.65 pounds per linear foot.

#### 2.2.4 End, Corner, and Pull Posts

Provide minimally acceptable end, corner, and pull posts as follows:

Up to 6 feet high:

Grade A: 2.375 inch O.D. pipe weighing 3.65 pounds per linear foot.

Grade B: 2.375 inch O.D. pipe weighing 3.12 pounds per linear foot.

Over 6 feet high:

Grade A: 2.875 inch O.D. pipe weighing 5.79 pounds per linear foot.

Grade B: 2.875 inch O.D. pipe weighing 4.64 pounds per linear foot.

#### 2.2.5 Sleeves

Provide sleeves for setting into concrete construction of the same material as post sections, sized 1 inch greater than the diameter or dimension of the post. Weld flat plates to each sleeve base to provide anchorage and prevent intrusion of concrete.

#### 2.2.6 Top Rail

Provide top rails with a minimum of 1.660 inches O.D. pipe rails. Grade A weighing 2.27 pounds per linear foot. Grade B weighing 1.82 pounds per linear foot. Provide expansion couplings 6 inches long at each joint in

top rails.

#### 2.2.7 Center Rails Between Line Posts

For fencing over 6-feet high, provide 1.660 inches O.D. pipe center rails, Grade A weighing 2.27 pounds per linear foot or Grade B weighing 1.82 pounds per linear foot.

#### 2.2.8 Bottom Rail

Provide bottom rail conforming to minimum sizes specified in FS RR-F-191/3 for each class and grade unless members are to be oversized.

#### 2.2.9 Post-Brace Assembly

Provide bracing consisting of 1.660 inches O.D. pipe Grade A weighing 2.27 pounds per linear foot or Grade B weighing 1.82 pounds per linear foot and 3/8 inch adjustable truss rods and turnbuckles.

#### 2.2.10 Stretcher Bars

Provide bars that have one-piece lengths equal to the full height of the fabric with a minimum cross section of 3/16 by 3/4 inch, in accordance with ASTM F626.

#### 2.2.11 Stretcher Bar Bands

Provide bar bands for securing stretcher bars to posts that are steel, wrought iron, or malleable iron spaced not over 381 millimeter 15 inches on center. Bands may also be used in conjunction with special fittings for securing rails to posts. Provide bands with projecting edges chamfered or eased.

#### 2.2.12 Post Tops

Provide tops that are steel, wrought iron, or malleable iron designed as a weathertight closure cap. Provide one cap for each post, unless equal protection is provided by a combination post-cap and wire supporting arm. Provide caps with an opening to permit through passage of the top rail.

#### 2.2.13 Gate Posts

Provide a gate post for supporting each gate leaf as follows:

Up to 6-feet wide:

2.875 inch O.D. pipe Grade A weighing 5.79 pounds per linear foot.  
Grade B weighing 4.64 pounds per linear foot.

Over 6 feet wide and up to 13 feet wide:

2.875 inch O.D. pipe Grade A weighing 5.79 pounds per linear foot.  
Grade B weighing 4.64 pounds per linear foot.

Over 13-feet and up to 18-feet wide:

Provide 6.625 inch O.D. pipe weighing 18.97 pounds per linear foot.

Over 18-feet wide:

Provide 8.625 inch O.D. pipe weighing 24.70 pounds per linear foot.

#### 2.2.14 Gates

FS RR-F-191/2; Type II, double swing. Shape and size of gate frame, as indicated. Framing and bracing members, round of steel or aluminum alloy. Steel member finish, zinc-coated, PVC-coated over zinc- or aluminum-coated steel. Provide gate frames and braces of minimum sizes listed in FS RR-F-191/3 for each Class and Grade, except that steel pipe frames are a minimum of 1.90 inches o.d., 0.120 inches minimum wall thickness and aluminum pipe frames and intermediate braces are 1.869 inches o.d. minimum, 0.940 lb/ft of length. Gate fabric, is as specified for fencing fabric. Coating for steel latches, stops, hinges, keepers, and accessories, is galvanized PVC, minimum thickness of 0.01 inch. Provide fork or plunger bar type gate latches. Special gate frames, as indicated on drawings. Provide intermediate members as necessary for gate leaves more than 8 feet wide, to provide rigid construction, free from sag or twist. Provide truss rods or intermediate braces for gate leaves less than 8 feet wide. Attach gate fabric to gate frame in accordance with manufacturer's standards, except that welding is not permitted. Arrange padlocking latches to be accessible from both sides of gate, regardless of latching arrangement.

For gate leaves up to 6 feet high or 6 feet wide, provide perimeter gate frames of 1.66 inch O.D. pipe Grade A weighing 2.27 pounds per linear foot. Grade B weighing 1.82 pounds per linear foot.

For gate leaves over 6 feet high or 6 feet wide, provide perimeter gate frames of 1.90 inch O.D. pipe Grade A weighing 2.72 pounds per linear foot. Grade B weighing 2.28 pounds per linear foot.

Provide gate frame assembly that is welded or assembled with special malleable or pressed-steel fittings and rivets to provide rigid connections. Install fabric with stretcher bars at vertical edges; stretcher bars may also be used at top and bottom edges. Attach stretcher bars and fabric to gate frames on all sides at intervals not exceeding 15 inches. Attach hardware with rivets or by other means which provides equal security against breakage or removal.

Provide diagonal cross-bracing, consisting of 3/8 inch diameter adjustable-length truss rods on welded gate frames, where necessary to obtain frame rigidity without sag or twist. Provide non-welded gate frames with diagonal bracing.

#### 2.2.15 Gate Hardware and Accessories

Provide gate hardware and accessories that conforms to ASTM A116 and ASTM F626, and be as specified:



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

Provide latch that permits operation from either side of the gate, with a padlock eye provided as an integral part of the latch.

Provide stops and holders of malleable iron for vehicular gates. Provide stops that automatically engage the gate and hold it in the open position until manually released.

Provide double gates with a cane bolt and ground-set keeper, with latch or locking device and padlock eye designed as an integral part.

#### 2.2.17 Wire Ties

Provide 9-gage galvanized steel wire for tying fabric to line posts, spaced 12 inches on center. For tying fabric to rails and braces, space wire ties 24 inches on center. For tying fabric to tension wire, space 2.7 millimeter 0.105-inch hog rings 600 millimeter 24 inches on center.

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

FS RR-F-191/4. Provide wire ties constructed of the same material as the fencing fabric. Provide accessories with polyvinyl (PVC) coatings similar to that specified for chain-link fabric or framework.

### 2.3 MATERIALS.

#### 2.3.1 Zinc Coating

Provide hot-dip galvanized (after fabrication) ferrous-metal components and accessories, except as otherwise specified.

Provide zinc coating of weight not less than 1.94 ounces per square foot, as determined from the average result of two specimens, when tested in accordance with ASTM A90/A90M.

Provide zinc coating conforming to the requirements of the following:

- a. Pipe: FS RR-F-191/3 Class 1 Grade A in accordance with ASTM F1083 or Grade B in accordance with ASTM F1043.
- b. Hardware and accessories: ASTM A153/A153M, Table 1
- c. Surface: ASTM F1043
- d. External: Type B-B surface zinc with organic coating, 0.97 ounce per square foot minimum thickness of acrylated polymer.
- e. Internal: Surface zinc coating of 0.97 ounce per square foot minimum.

Provide galvanizing repair material that is cold-applied zinc-rich coating conforming to ASTM A780/A780M.

#### 2.3.2 Tension Wire

Provide galvanized, coiled spring wire, No. 7-gage. Provide zinc coating

that weighs not less than 1.2 ounces per square foot.

### 2.3.3 Concrete

Provide concrete conforming to ASTM C94/C94M, and obtaining a minimum 28-day compressive strength of 3,000 psi.

### 2.3.4 Grout

Provide grout of proportions one part Portland cement to three parts clean, well-graded sand and a minimum amount of water to produce a workable mix.

## **PART 3 EXECUTION.**

Submit manufacturer's erection/installation drawings and instructions that detail proper assembly and materials in the design for fence, gate, hardware and accessories.

Provide complete installation conforming to ASTM F567.

### 3.1 PREPARATION.

Ensure final grading and established elevations are complete prior to commencing fence installation.

#### 3.1.1 Clearing and Grading

Clear fence line of trees, brush, and other obstacles to install fencing for a distance of 5 feet inside; and 5 feet outside the fence. Establish a graded, compacted fence line prior to fencing installation.

### 3.2 INSTALLATION.

#### 3.2.1 Security

Install new chain link fencing, remove existing fencing, and perform related work to provide continuous security for facility. Schedule and fully coordinate work with Contracting Officer and cognizant Security Officer.

#### 3.2.2 Fence Installation

Install fence on prepared surfaces to line and grade indicated. Secure fastening and hinge hardware in place to fence framework by peening or welding. Allow for proper operation of components. Coat peened or welded areas with a repair coating matching original coating. Install fence in accordance with fence manufacturer's written installation instructions except as modified herein.

##### 3.2.2.1 Post Spacing

Provide line posts spaced equidistantly apart, not exceeding 10 feet on center. Provide gate posts spaced as necessary for size of gate openings. Do not exceed 500 feet on straight runs between braced posts. Provide corner or pull posts, with bracing in both directions, for changes in direction of 15 degrees or more, or for abrupt changes in grade. Submit drawings showing location of gate, corner, end, and pull posts.

#### 3.2.2.2 Top and Bottom Tension Wire

Install top and bottom tension wires before installing chain-link fabric, and pull wires taut. Place top and bottom tension wires within 8 inches of respective fabric line.

#### 3.2.3 Excavation

Provide excavations for post footings which are drilled holes in virgin or compacted soil, of minimum sizes as indicated.

Space footings for line posts 10 feet on center maximum and at closer intervals when indicated, with bottoms of the holes approximately 3 inches below the bottoms of the posts. Set bottom of each post not less than 36 inches below finished grade when in firm, undisturbed soil. Set posts deeper, as required, in soft and problem soils and for heavy, lateral loads.

Uniformly spread soil from excavations adjacent to the fence line or on areas of Government property, as directed. Remove excavated soil from Government property.

When solid rock is encountered near the surface, drill into the rock at least 12 inches for line posts and at least 18 inches for end, pull, corner, and gate posts. Drill holes at least 1 inch greater in diameter than the largest dimension of the placed post.

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

#### 3.2.4 Setting Posts

Remove loose and foreign materials from holes and moisten the soil prior to placing concrete.

Provide tops of footings that are trowel finished and sloped or domed to shed water away from posts. Set hold-open devices, sleeves, and other accessories in concrete.

Keep exposed concrete moist for at least 7 calendar days after placement or cured with a membrane curing material, as approved.

Grout all posts set into sleeved holes in concrete with an approved grouting material.

Maintain vertical alignment of posts in concrete construction until concrete has set.

#### 3.2.4.1 Earth and Bedrock

Provide concrete bases of dimensions indicated on the manufactures installation drawings, except in bedrock. Compact concrete to eliminate voids, and finish to a dome shape. In bedrock, set posts with a minimum of 1 inch of grout around each post. Work grout into hole to eliminate voids, and finish to a dome shape.

#### 3.2.4.2 Concrete Slabs and Walls

Set posts into zinc-coated sleeves, set in concrete slab or wall, to a minimum depth of 12 inches. Fill sleeve joint with lead, non-shrink grout, or other approved material. Set posts for support of removable fence sections into sleeves that provide a tight sliding joint and hold posts aligned and plumb without use of lead or setting material.

#### 3.2.4.3 Bracing

Brace gate, corner, end, and pull posts to nearest post with a horizontal brace used as a compression member, placed at least 12 inches below top of fence, and a diagonal tension rod or two diagonal tension rods.

##### a. Tolerances

Provide posts that are straight and plumb within a vertical tolerance of 1/4 inch after the fabric has been stretched. Provide fencing and gates that are true to line with no more than 1/2 inch deviation from the established centerline between line posts. Repair defects as directed.

#### 3.2.5 Concrete Strength

Provide concrete that has 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 wire, or fabric are installed. Do not stretch fabric and wires or hang gates until the concrete has attained its full design strength.

Take samples and test concrete to determine strength as specified.

#### 3.2.6 Top Rails

Provide top rails that run continuously through post caps or extension arms, bending to radius for curved runs. Provide expansion couplings as recommended by the fencing manufacturer.

#### 3.2.7 Center Rails

Provide single piece center rails between posts set flush with posts on the fabric side, using special offset fittings where necessary.

#### 3.2.8 Brace Assembly

Provide bracing assemblies at end and gate posts and at both sides of corner and pull posts, with the horizontal brace located at mid-height of the fabric.

Install brace assemblies so posts are plumb when the diagonal rod is under proper tension.

Provide two complete brace assemblies at corner and pull posts where required for stiffness and as indicated.

### 3.2.9 Tension Wire Installation

Install tension wire by weaving them through the fabric and tying them to each post with not less than 7-gage galvanized wire or by securing the wire to the fabric with 10-gage ties or clips spaced 24 inches on center.

### 3.2.10 Fabric Installation

Provide fabric in single lengths between stretch bars with bottom barbs placed approximately 1-1/2 inches above the ground line. Pull fabric taut and tied to posts, rails, and tension wire with wire ties and bands.

Install fabric on the security side of fence, unless otherwise directed.

Ensure fabric remains under tension after the pulling force is released.

### 3.2.11 Stretcher Bar Installation

Thread stretcher bars through or clamped to fabric 4 inches on center and secured to posts with metal bands spaced 15 inches on center.

### 3.2.12 Gate Installation

Install gates plumb, level, and secure, with full opening without interference. Install ground set items in concrete for anchorage as recommended by the fence manufacturer. Adjust hardware for smooth operation and lubricated where necessary.

### 3.2.13 Tie Wires

Provide tie wires that are U-shaped to the pipe diameters to which attached. Twist ends of tie-wires not less than two full turns and bent so as not to present a hazard.

### 3.2.14 Fasteners

Install nuts for tension bands and hardware on the side of the fence opposite the fabric side. Peen ends of bolts to prevent removal of nuts.

### 3.2.15 Zinc-Coating Repair

Clean and repair galvanized surfaces damaged by welding or abrasion, and cut ends of fabric, or other cut sections with specified galvanizing repair material applied in strict conformance with the manufacturer's printed instructions.

### 3.2.16 Accessories Installation

#### 3.2.16.1 Post Caps

Design post caps to accommodate top rail. Install post caps as recommended by the manufacturer.

### 3.2.17 Grounding

Ground fencing as indicated on drawings and specified.

Ground fences on each side of all gates, at each corner, at the closest approach to each building located within 50 feet of the fence, and where the fence alignment changes more than 15 degrees. Grounding locations cannot exceed 650 feet. Bond each gate panel with a flexible bond strap to its gate post. Ground fences crossed by power lines of 600 volts or more at or near the point of crossing and at distances not exceeding 150 feet on each side of crossing. Provide ground conductor consisting of No. 6 AWG solid copper wire. Provide copper-clad steel rod grounding electrodes 3/4 inch by 10 foot long. Drive electrodes into the earth so that the top of the electrode is at least 6 inches below the grade. Where driving is impracticable, bury electrodes a minimum of 12 inches deep and radially from the fence, with top of the electrode not less than 2 feet or more than 8 feet from the fence. Clamp ground conductor to the fence and electrodes with bronze grounding clamps to create electrical continuity between fence posts, fence fabric, and ground rods. Total resistance of the fence to ground cannot exceed 25 ohms.

### 3.3 CLOSEOUT ACTIVITIES.

Remove waste fencing materials and other debris from the work site.

-- End of Section --