Preparing Activity: USACE

Superseding
UFGS-32 31 26 (February 2020)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
****

SECTION TABLE OF CONTENTS

DIVISION 32 - EXTERIOR IMPROVEMENTS

SECTION 32 31 26

WIRE FENCES AND GATES

11/21

PART 1 GENERAL

1.1 REFERENCES
1.2 SUBMITTALS
1.3 DELIVERY, STORAGE, AND HANDLING

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION
2.2 COMPONENTS
2.2.1 Fence Fabric
2.2.1.1 Woven Wire
2.2.1.2 Barbed Wire
2.2.2 Gates
2.2.3 Posts
2.2.3.1 Metal Posts for Farm Style Fence
2.2.3.2 Composite Polyester Resin Reinforced Line Posts
2.2.3.3 Wood Posts
2.2.4 Braces and Rails
2.2.5 Padlocks
2.3 MATERIALS
2.3.1 Concrete

PART 3 EXECUTION

3.1 PREPARATION
3.1.1 Clearing
3.1.2 Line and Grade
3.1.3 Excavation
3.2 INSTALLATION
3.2.1 Installation
3.2.2 Post
3.2.3 Barbed Wire
3.2.4 Gate Assembly

3.2.5 Grounding
3.3 CLEAN UP

-- End of Section Table of Contents --

****

USACE / NAVFAC / AFCEC / NASA	**UFGS-32 31 26 (November 2021)**

Preparing Activity: USACE	**Superseding**
	UFGS-32 31 26 (February 2020)

UNIFIED FACILITIES GUIDE SPECIFICATIONS

References are in agreement with UMRL dated July 2023
****

SECTION 32 31 26

WIRE FENCES AND GATES
11/21

****
NOTE: This guide specification covers the requirements for Wire Fences and Gates.

Adhere to UFC 1-300-02 Unified Facilities Guide Specifications (UFGS) Format Standard when editing this guide specification or preparing new project specification sections. Edit this guide specification for project specific requirements by adding, deleting, or revising text. For bracketed items, choose applicable item(s) or insert appropriate information.

Remove information and requirements not required in respective project, whether or not brackets are present.

Comments, suggestions and recommended changes for this guide specification are welcome and should be submitted as a Criteria Change Request (CCR).
****

****
NOTE: This Guide Specification and UFC 4-022-03 use the most generic term "zinc coating" in order not to conflict with requirements contained within referenced standards. The term "zinc coatings" encompasses a wide range of metallic and organic coatings including hot dip galvanizing, zinc plating, electroplating (sometimes called "electro-galvanizing"), metallizing, inorganic zinc paints and organic zinc paints. Detailed zinc coating requirements for fencing components are called out in various references such as ASTM standards.
****

****
NOTE: Select fencing materials throughout this Guide Specification as appropriate to protect

against corrosion. Refer to the Corrosion Prevention & Control (CPC) Fencing Knowledge Area webpage on the Whole Building Design Guide website for additional information on making these selections (https://www.wbdg.org/ffc/dod/cpc-source/fencing-knowledge-area). This website contains a link to a Life Cycle Cost Analysis that was conducted for the DoD to identify the lowest cost materials over the service life of a fencing system.

****

PART 1 GENERAL

****

NOTE: This section covers non security applications for farm style fences. Edit this section throughout for the applicable project.

Include standard drawings STD 872-90-02 through 872-90-13 of fence and gate types as part of the contract drawings; the standard drawings are available at https://pdc.usace.army.mil/library/drawings/fence. Show layout of fence including types and locations of gates, and gate sizes; also indicate the extent of clearing required.

****

1.1 REFERENCES

****

NOTE: This paragraph is used to list the publications cited in the text of the guide specification. The publications are referred to in the text by basic designation only and listed in this paragraph by organization, designation, date, and title.

Use the Reference Wizard's Check Reference feature when you add a Reference Identifier (RID) outside of the Section's Reference Article to automatically place the reference in the Reference Article. Also use the Reference Wizard's Check Reference feature to update the issue dates.

References not used in the text will automatically be deleted from this section of the project specification when you choose to reconcile references in the publish print process.

****

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.

AMERICAN WOOD PROTECTION ASSOCIATION (AWPA)

AWPA U1 (2023) Use Category System: User

Specification for Treated Wood

ASTM INTERNATIONAL (ASTM)

ASTM A116	(2022) Standard Specification for Metallic-Coated, Steel Woven Wire Fence Fabric
ASTM A121	(2022) Standard Specification for Metallic-Coated Carbon Steel Barbed Wire
ASTM A153/A153M	(2023) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A702	(2022) Standard Specification for Steel Fence Posts, Hot Wrought
ASTM A780/A780M	(2020) Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
ASTM C94/C94M	(2022a) Standard Specification for Ready-Mixed Concrete
ASTM D4541	(2022) Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM F626	(2014; R 2019) Standard Specification for Fence Fittings
ASTM F883	(2013; R 2022) Standard Performance Specification for Padlocks
ASTM F900	(2011; R 2017) Standard Specification for Industrial and Commercial Swing Gates
ASTM F1043	(2018; R 2022) Standard Specification for Strength and Protective Coatings on Steel Industrial Fence Framework
ASTM F1083	(2018; R 2022) Standard Specification for Pipe, Steel, Hot-Dipped Zinc Coated (Galvanized) Welded, for Fence Structures
ASTM F1184	(2023; E 2023) Standard Specification for Industrial and Commercial Horizontal Slide Gates
ASTM F1665	(2008; R 2022) Standard Specification for Poly(Vinyl Chloride) (PVC) and Other Conforming Organic Polymer-Coated Steel Barbed Wire Used With Chain-Link Fence

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS RR-F-191/3	(2023; Rev F) Fencing, Wire and Post, Metal (Chain-Link Fence Posts, Top Rails

and Braces)

1.2 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01 33 00 SUBMITTAL PROCEDURES and edit the following list, and corresponding submittal items in the text, to reflect only the submittals required for the project. The Guide Specification technical editors have classified those items that require Government approval, due to their complexity or criticality, with a "G." Generally, other submittal items can be reviewed by the Contractor's Quality Control System. Only add a "G" to an item, if the submittal is sufficiently important or complex in context of the project.

For Army projects, fill in the empty brackets following the "G" classification, with a code of up to three characters to indicate the approving authority. Codes for Army projects using the Resident Management System (RMS) are: "AE" for Architect-Engineer; "DO" for District Office (Engineering Division or other organization in the District Office); "AO" for Area Office; "RO" for Resident Office; and "PO" for Project Office. Codes following the "G" typically are not used for Navy, Air Force, and NASA projects.

The "S" classification indicates submittals required as proof of compliance for sustainability Guiding Principles Validation or Third Party Certification and as described in Section 01 33 00 SUBMITTAL PROCEDURES.

Choose the first bracketed item for Navy, Air Force and NASA projects, or choose the second bracketed item for Army projects.

****

Government approval is required for submittals with a "G" or "S" classification. Submittals not having a "G" or "S" classification are [for Contractor Quality Control approval.][for information only. When used, a code following the "G" classification identifies the office that will review the submittal for the Government.] Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Installation Drawings; G[, [_____]]

SD-03 Product Data

Fence Fabric

Woven Wire

Barbed Wire

[Gates

] Posts

Braces and Rails

[Padlocks
]

1.3 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 a fencing system as described herein.

Submit Installation Drawings clearly indicating fence installation, location of gates, corners, ends, and pull posts; gate assembly, gate hardware, catalog data and accessories.

2.2 COMPONENTS

2.2.1 Fence Fabric

Provide fence fabric conforming to the following requirements.

2.2.1.1 Woven Wire

ASTM A116 [No. 9 farm] [No. 12-1/2 close mesh] [No. 14-1/2 wolf-proof] [No. 13 poultry and garden] [No. 14-1/2 chick] fence; grade, size as indicated.[Provide fittings that conform to ASTM F626.]

2.2.1.2 Barbed Wire

****
NOTE: Use either aluminum-coated or PVC-coated barbed wire for project locations with Environmental Severity Classifications (ESC) C3 thru C5; ESC C1 and C2 locations can use zinc-coated steel. Use PVC-coated barbed wire in areas where coatings are prone to abrasion from blowing sand. See UFC 1-200-01 for determination of ESC for project locations.
****

[ASTM A121 aluminum-coated, Type A,][ASTM F1665 PVC-coated, Class 2b,][ASTM A121 zinc-coated, Type Z, Class 3] with 12.5 gauge wire with 14 gauge, round, 4-point barbs spaced no more than 125 mm 5 inches apart.

2.2.2 Gates

****
NOTE: Show type of gates on the drawings, including degree of swing required. In heavy use conditions

overhead slide gates should be considered if clearances permit, because these gates require less maintenance and repair than cantilever gates. Ground level track and roller systems should be avoided in climates where snow and ice may accumulate. Recessed tracks should never be used in climates where the recess may fill with ice and snow. Where gates are to receive electric locks, the gate post foundations should be lowered to frost depth to help prevent misalignment of the lock components.

****

****

NOTE: Include PVC coating on steel gate frames in locations with ESC C3 thru C5, and high humidity locations. Also, use PVC-coated steel gate frames in areas prone to metal loss caused by blowing sand. High humidity locations are those in ASHRAE climate zones 0A, 1A, 2A, 3A, 3C, 4C, and 5C (as identified in ASHRAE 90.1). See UFC 1-200-01 for determination of ESC for project locations.

****

Provide gate type and swing shown conforming to ASTM F900 or ASTM F1184, ASTM A153/A153M. Provide gate frames conforming to strength and coating requirements of ASTM F1083 for Group IA, steel pipe, nominal pipe size (NPS) 1-1/2. [Provide polyvinyl chloride-coated steel pipe gate frames(Group IA)(Group IC), a nominal pipe size (NPS) 1-1/2, conforming to ASTM F1043. Polyvinyl chloride coating to be minimum thickness 0.25 mm 0.01 inch, fused and adhered to the exterior zinc coating of the framing members.] Provide gate leaves more than 2.44 m 8 feet wide with either intermediate members and diagonal truss rods or tubular members as necessary to provide rigid construction, free from sag or twist. Gate leaves less than 2.44 m 8 feet wide with truss rods or intermediate braces. Provide intermediate braces on all gate frames with an electro-mechanical lock. Attach gate fabric to the gate frame by method standard with the manufacturer. Welding is not permitted. Furnish latches, hinges, stops, keepers, rollers, and other hardware items as required for the operation of the gate. Arrange latches for padlocking so the padlock is accessible from both sides of the gate. Provide stops for holding the gates in the open position.

2.2.3 Posts

2.2.3.1 Metal Posts for Farm Style Fence

****

NOTE: For line posts: use zinc-coated finish on T-sections or U-sections in project locations with ESC C3 thru C5. Use enamel paint finish in project locations with ESC C1 or C2.

When using steel pipe end and corner posts: include PVC coating on zinc-coated steel pipe posts and railings in locations with ESC C3 thru C5, and high humidity locations. Also use PVC coating on zinc-coated steel pipe posts in areas where coatings are prone to abrasion from blowing sand and where

posts are buried in direct contact with soil, regardless of the ESC of the project location. High humidity locations are those in ASHRAE climate zones 0A, 1A, 2A, 3A, 3C, 4C, and 5C (as identified in ASHRAE 90.1).

See UFC 1-200-01 for determination of ESC for project locations.

****

Provide metal line posts conforming to ASTM A702 [zinc-coated][enamel paint finish], [T-section] [U-Section], length as indicated, and accessories conforming to ASTM A702.[Provide FS RR-F-191/3 Steel pipe end and corner posts: Class 1, steel pipe, Grade A Regular Strength, in [minimum sizes listed in FS RR-F-191/3 for each class and grade] [size [_____]].[Provide PVC color coating, minimum thickness, 0.25 mm 0.01 inch fused and adhered to the exterior coating of the post or rail in accordance with ASTM F1043; color to match fabric in accordance with ASTM F934.]]

2.2.3.2 Composite Polyester Resin Reinforced Line Posts

****

NOTE: Consider composite posts as an alternative to PVC coated steel line posts in project locations with ESC C4 or C5. See UFC 1-200-01 for determination of ESC for project locations. It should be noted that DoD research has shown composite posts to provide corrosion protection benefits, but a life cycle cost analysis shows these posts do not overcome their higher first costs over the fencing system's service life. Additionally, posts made from these materials are not readily available in all locations; editor should ensure these are readily available in the local area in the sizes needed for the project before specifying. Since composite posts are non-conductive, fence grounding procedures need to be detailed where grounding of the fence is required.

****

Provide polyester resin reinforced line posts produced from unsaturated polyester resin reinforced with E-glass. Fill posts with an appropriate filler material to form a rigid structural support member. Provide posts that meet the strength requirements of ASTM F1043 for heavy industrial fencing. Protect posts from UV and moisture degradation by a protective veil impregnated with resin (0.2 to 0.3 mm 8 to 12 mil minimum) and an acrylic based (0.05 mm 2 mil minimum) coating system. Provide corrosion and ultraviolet resistant posts as demonstrated when exposed to accelerated environmental test chamber for a minimum of 3,600 hours. Ensure posts show no structural failure (i.e., less than 10 percent loss of strength) as a result of exposure to moisture. Test post coating system strength in accordance with ASTM D4541 for 90 percent adhesion strength. Supply posts that are [green] [black] [brown] in color. Provide outside diameter as specified in ASTM F1043 for round steel pipe.

2.2.3.3 Wood Posts

Provide wood posts cut from sound and solid trees free from short or reverse bends in more than one plane. Make tops convex rounded or

inclined. Provide posts free of ring shake, season cracks more than 6 mm 1/4 inch wide, splits in the end, and unsound knots. Provide posts of size and shape indicated. Treat posts in accordance with AWPA U1.

[2.2.4 Braces and Rails

****
NOTE: Normally, rails will not be specified except where appearance is important and the added cost is justified. When top rails are not specified, use top tension wire. Use bottom tension wire unless a bottom rail is required for fence. Use brace and rail material and finish to match gate framing members. Use brace and rail material and finish to match gate framing members.
****

ASTM F1083, zinc-coated, Group IA, steel pipe, size NPS 1-1/4. Group IC steel pipe, zinc-coated, meeting the strength and coating requirements of ASTM F1043. [Provide braces and rails of [Group IA] [Group IC], steel pipe, size NPS 1-1/4 or Group II, formed steel sections, size 42 mm 1-21/32 inch and be zinc coated (Type A) and polyvinyl chloride-coated conforming to the requirements of ASTM F1043. Polyvinyl chloride coating to be minimum thickness 0.25 mm 0.01 inch, fused and adhered to the exterior zinc coating of the framing members.] Provide Group II, formed steel sections, size 42 mm 1-21/32 inch, that conform to ASTM F1043, if used as braces and rails when Group II line posts are furnished.

]2.2.5 Padlocks

****
NOTE: Type P01 is key operated. Grade 6 is the top grade commercial lock; in Option A the key is captive in cylinder when padlock is unlocked; in Option B the cylinder is removable; Option 6 is environmentally resistant. For combination locks or other options and grades see ASTM F883.
****

Provide padlocks conforming to ASTM F883, TYPE [EPB][_____], size [44 mm 1-3/4 inch][_____]. [Key all padlocks alike]. [Key all padlocks into master key system as specified in Section 08 71 00 DOOR HARDWARE].

2.3 MATERIALS

2.3.1 Concrete

ASTM C94/C94M, using 19 mm 3/4 inch maximum size aggregate, and having minimum compressive strength of 21 MPa 3000 psi at 28 days. Provide grout consisting of one part portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

PART 3 EXECUTION

3.1 PREPARATION

3.1.1 Clearing

Clear the area on each side of the fence as indicated in the plans.

3.1.2 Line and Grade

Install fence to the lines and grades indicated. Space line posts equidistant at intervals not exceeding 3 m 10 feet. Set terminal (corner, gate, and pull) posts at abrupt changes in vertical and horizontal alignment. Provide continuous fabric between terminal posts; however, ensure runs between terminal posts do not exceed 152.4 m 500 feet. Repair any damage to galvanized surfaces, including welding, with paint containing zinc dust in accordance with ASTM A780/A780M.

3.1.3 Excavation

Clear loose material from all post holes. Spread waste material where directed. Eliminate ground surface irregularities along the fence line to the extent necessary to maintain a [25] [50] mm [1] [2] inch clearance between the bottom of the fabric and finish grade.

3.2 INSTALLATION

3.2.1 Installation

Install fence system per approved installation drawings.

3.2.2 Post

For wood posts (Farm Style Fence), excavate to depth indicated and brace post until backfill is completed. Place backfill in layers of 229 mm 9 inches or less, moistened to optimum condition, and compacted with hand tampers or other approved method. Set posts plumb and in proper alignment. Drive metal posts or set in concrete as indicated.

3.2.3 Barbed Wire

Install wire on the side of the post indicated. Pull wire taut to provide a smooth uniform appearance, free from sag. Fasten wire to line posts at approximately 381 mm 15 inch intervals unless indicated otherwise.

3.2.4 Gate Assembly

For farm style fencing, provide standard metal gate assemblies with frame and fittings necessary for complete installation or wood gates as shown.

[3.2.5 Grounding

****

NOTE: Delete this paragraph if grounding is not required. If grounding is required and lightning protection is not part of project design, use the requirements in the second set of brackets in lieu of those in the first set of brackets. Provide fence grounding details when composite type posts are specified where grounding of the fence is required.

****

****

NOTE: Specify solid copper rod for project locations with soil resistivity less than 1,500

ohm-cm. Specify copper clad steel rods for other conditions.
****

[Ground fences crossed by overhead powerlines in excess of 600 volts as specified in Section 26 41 00 LIGHTNING PROTECTION SYSTEM. Ground electrical equipment attached to the fence as specified in [Section 33 71 01 OVERHEAD TRANSMISSION AND DISTRIBUTION] [Section 33 71 02 UNDERGROUND ELECTRICAL DISTRIBUTION].] [Ground fences on each side of all gates, at each corner, at the closest approach to each building located within 15 m 50 feet of the fence, and where the fence alignment changes more than 15 degrees. Space grounding locations so as not to exceed 198 m 650 feet. Bond each gate panel with a flexible bond strap to its gate post. Ground fences crossed by powerlines of 600 volts or more at or near the point of crossing and at distances not exceeding 45 m 150 feet on each side of crossing. Use a ground conductor consisting of No. 8 AWG solid copper wire. Use grounding electrodes 19 mm 3/4 inch by 3.05 m 10 foot long [copper-clad steel][solid copper] rod. Drive electrodes into the earth so that the top of the electrode is at least 152 mm 6 inches below the grade. Where driving is impracticable, bury electrodes a minimum of 305 mm 12 inches deep and radially from the fence. Ensure the top of the electrode is not less than 610 mm 2 feet or more than 2.4 m 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. Test to ensure the maximum total resistance of fence to ground is no greater than 25 ohms.]

]3.3 CLEAN UP

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

-- End of Section --