

SECTION 32 31 13

POLYVINYL CHLORIDE (PVC) FENCE AND GATES
08/10

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 D1784	(2011) Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds
ASTM A153/A153M	(2009) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM C94/C94M	(2014b) Standard Specification for Ready-Mixed Concrete
ASTM F626	(2014) Standard Specification for Fence Fittings

1.2 SUBMITTALS

Government approval is required for submittals with a "G" designation; submittals not having a "G" designation are for Contractor Quality Control approval. When used, a designation following the "G" designation identifies the office that will review the submittal for the Government. Submittals with an "S" are for inclusion in the Sustainability Notebook, in conformance to Section 01 33 29 SUSTAINABILITY REPORTING. Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Fence Assembly; G,LA

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

Gate Assembly[; G,LA

Gate Hardware and Accessories[; G,LA

Erection/Installation Drawings; G

SD-03 Product Data

Fence Assembly; G

Gate Assembly; G

Gate Hardware and Accessories; G

Recycled Material Content; G

Stretcher Bars; G

Concrete; G

SD-04 Samples

Pickets; G

Posts; G

Braces; G

Sleeves; G

Top Rail; G

Bottom Rail; G

Stretcher Bars; G

Gate Posts; G

Gate Hardware and Accessories; G

SD-07 Certificates

Certificates of Compliance; G

SD-08 Manufacturer's Instructions

Fence Assembly; G

Gate Assembly; G

Hardware Assembly; G

Accessories; G

1.3 ASSEMBLY AND INSTALLATION INSTRUCTIONS

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

Submit erection/installation drawings along with manufacturer's catalog data for complete fence assembly, gate assembly, hardware assembly and accessories.

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.

1.5 QUALITY ASSURANCE

1.5.1 Required Report Data

Submit reports of listing of vinyl fencing and accessories regarding Cell classification - ASTM D1784 -14344B and Tensile Strength - 6,500 psi -ASTM D638C. Izod Impact (Ft. lbs./in. notch) 23°C - 5.00°C - 2.0 - ASTM D256.

1.5.2 Certificates of Compliance

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

- a. Extruded PVC
- b. Gate hardware and accessories
- c. Concrete

PART 2 PRODUCTS

2.1 GENERAL

Provide fencing materials conforming to the requirements of ASTM D1784 ASTM F626, and as specified.

Submit manufacturer's data indicating percentage of recycled material content in fence materials, including vinyl fence and gates to verify affirmative procurement compliance.

2.2 Extruded Polyvinyl Chloride

Provide PVC fence materials recognized to be of type indicated and tested to show compliance with indicated performances.

Posts, rails, pickets, gate uprights, post caps, and accessories shall be of high impact, Ultra Violet (U.V.) resistant, rigid PVC, and shall comply with ASTM D 1784, Class 14344B.

- a. Height: 6'H minimum.
- b. Color: White. Color to be approved by Contracting Officer.

2.3 PICKETS

One piece extruded, of lengths indicated.

1. Cross Section: 7/8" X 7" minimum
2. Wall Thickness: 0.060" minimum
3. Corner Radius: 3/16"R minimum
4. Picket Spacing: Full privacy.
5. Pickets per section: 13 pickets.

2.4 TOP RAILS AND BOTTOM RAILS

One piece extruded, of lengths indicated pre-routed to receive pickets at spacing indicated.

1. Cross Section: 2" X 6" Deco Rail minimum
2. Wall Thickness: 0.090" minimum
3. Corner Radius: 5/16"R minimum

2.4.1 PVC POSTS

Fence Posts: One piece extruded, of lengths indicated and pre-routed to receive rails at spacing indicated.

1. Cross Section: 5" x 5" minimum
2. Wall Thickness: 0.170" minimum
3. Corner Radius: 3/8"R minimum

2.5 POST CAPS

Post Caps: Molded, one piece.

1. Cross Section: Match post or gate upright cross section.
2. Thickness: 0.095" minimum.
3. Configuration: Flat or four-sided as required for installation to top of posts and gate.

2.6 SLEEVES

Provide sleeves for setting into concrete construction of the same material as post sections, sized 25 millimeter 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.

2.7 GATE UPRIGHTS

Gate Uprights: One piece extruded, of lengths indicated.

1. Cross Section: 2 ½" X 4" minimum
2. Wall Thickness: 0.120" minimum
3. Corner Radius: 3/16"R minimum

2.8 GATE POSTS

Provide a gate post for supporting each gate leaf as follows at each plan location:

4-feet wide, single swing gate

2.9 ACCESSORIES

Accessories: Manufacturers' standard gate brace, screw caps, rail end reinforcers, and other accessories as required.

A. Stiffener Channels: Galvanized steel structural channel. Configure channels for concealed installation within PVC rails with pre-drilled holes for drainage. Aluminum extruded channel available upon request.

1. Cross Section: 1.775 X 1.700 galvanized steel channel
2. Thickness: 0.040 Gauge (minimum).

B. Fasteners and Anchorage: Stainless Steel. All fasteners to be concealed or colored heads to match. Provide sizes as recommended by fence manufacturer.

C. PVC Cement: As recommended by fence manufacturer.

2.10 GATE HARDWARE AND ACCESSORIES

General: Provide hardware and accessories for each gate according to the following requirements:

A. Hinges: Size and material to suit gate size, non lift-off type, self closing, glass filled nylon with adjuster plate, offset to permit 120 degree gate opening. Provide one pair of hinges for each gate.

1. Color: Black.

B. Latch: Manufacturers' standard self latching, glass filled nylon and stainless steel composition single or dual access gravity latch. Provide one latch per gate.

1. Finish: Match gate hinge finish.

C. Hardware: Stainless Steel. Provide sizes as recommended by fence manufacturer.

1. Finish: Match gate hinge finish.

2.11 CONCRETE

Provide concrete conforming to ASTM C94/C94M, and obtaining a minimum 28-day compressive strength of 20685 kilopascal 3,000 psi.

2.12 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

Provide complete installation conforming to ASTM D1784 CLASS 14344B. Install fence in compliance with manufacturer's written instructions. During installation, PVC components shall be carefully handled and stored to avoid contact with abrasive surfaces. Install components in sequence as recommended by fence manufacturer.

1. Install fencing as indicated on the drawings provided.

2. Variations from the installation indicated must be approved.

3. Variations from the fence and gate installation indicated and all costs for removal and replacement will be the responsibility of the contractor.

3.1 GENERAL

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

3.2 EXCAVATION

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

If not indicated on drawings, excavate holes for each post to a minimum diameter of 12" inches. Unless otherwise indicated, excavate hole depths not less than 30 inches or to frost line.

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

When solid rock is encountered near the surface, drill into the rock at least 305 millimeter 12 inches for line posts and at least 457 millimeter 18 inches for end, pull, corner, and gate posts. Drill holes at least 25.4 millimeter 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.

3.3 SETTING POSTS

Remove loose and foreign materials from holes and the soil moistened 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.

Posts: Install posts in one piece, plumb and in line. Space a maximum of 8'feet o.c. unless otherwise indicated. Enlarge excavation as required to provide clearance indicated between post and side of excavation.

1. Protect portion of posts above ground from concrete splatter. Place concrete around posts and vibrate or tamp for consolidation. Check each post for vertical and top alignment and hold in position during placement and finishing operations.

Terminate top of concrete footings with adjacent grade and trowel to a crown to shed water away from post.

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 set in concrete construction until concrete has set.

After installation of rails and unless otherwise indicated, install reinforcing in posts in opposing corners of post as shown and fill end and gate posts with concrete to level as indicated. Concrete fill shall completely cover the reinforcing steel and gate hardware fasteners. Consolidate the concrete by striking the post face with a rubber mallet, carefully tamping around the exposed post bottom.

Install post caps. Use #8 screws, nylon washers and snap caps.

Remove concrete splatters from PVC fence materials with care to avoid scratching.

3.3.1 Earth and Bedrock

Provide concrete bases of dimensions indicated except in bedrock. Compact concrete to eliminate voids, and finish to a dome shape. In bedrock, set

posts with a minimum of 25.4 mm 1 inch of grout around each post. Work grout into hole to eliminate voids, and finish to a dome shape.

3.3.2 Concrete Slabs and Walls

Set posts into zinc-coated sleeves, set in concrete slab or wall, to a minimum depth of 305 mm 12 inches. Fill sleeve joint with lead, nonshrink 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.

3.3.3 Bracing

Brace gate, corner, end, and pull posts to nearest post with a horizontal brace used as a compression member, placed at least 305 mm 12 inches below top of fence, and a diagonal tension rod.

3.4 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.

3.5 TOP RAILS

Provide top rails as recommended by the fencing manufacturer.

Top and Bottom Rails: Install rails in one piece into routed hole fabricated into posts to receive top and bottom rails, and middle where necessary. Except at sloping terrain, install rails level.

1. Prior to installation of rails into posts, insert concealed steel channel stiffeners in top rail, where necessary. Bottom rails shall include minimum (2) ¼" drainage holes.

2. At posts to receive concrete fill, tape rail ends to prevent seepage when filling post with concrete.

Middle Rails: Where necessary, install middle rails in one piece into routed hole in posts with larger holes facing down. Except at sloping terrain, install middle rails level. Secure mid rail to pickets with 2-#8 x 1-1/2" screws evenly spaced.

1. At posts to receive concrete fill, tape rail ends to prevent seepage when filling post with concrete.

3.6 PICKETS

Pickets: Install pickets in one piece as per manufacturer recommendations. Install pickets plumb.

Fence Installation at Sloping Terrain: At sloping terrain rails may be racked (sloped) or stepped to comply with manufacturers' recommendations.

3.7 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.

- A. Assemble gate per manufacturer's recommendations. Bottom rail shall include minimum (2) ¼" drainage holes.
- B. Assemble gate prior to fence installation to accurately locate hinge and latch post. Align gate horizontal rails with fence horizontal rails.
- C. Install gates plumb, level, and secure for full opening without interference according to manufacturer's instructions.
- D. Gate Latch Installation. Install gate latch according to manufacturer's instructions. Adjust for smooth, trouble-free operation.
- E. Allow minimum 72 hours to let concrete set-up before opening gates

3.8 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.

3.9 TOLERANCES

Provide posts that are straight and plumb within a vertical tolerance of 6.35 millimeter 1/4 inch after the fabric has been stretched. Provide fencing and gates that are true to line with no more than 12.7 millimeter 1/2 inch deviation from the established centerline between line posts. Repair defects as directed.

3.10 SITE PREPARATION

3.10.1 Clearing and Grading

Clear fence line of trees, brush, and other obstacles to install fencing. Establish a graded, compacted fence line prior to fencing installation.

3.11 FENCE INSTALLATION

Install fence on prepared surfaces to line and grade indicated. .

3.11.1 Post Spacing

Provide line posts spaced equidistantly apart, not exceeding 3.048 m 10 feet on center. Provide gate posts spaced as necessary for size of gate openings. Do not exceed 152.4 m 500 feet on straight runs between braced posts. Provide corner or pull posts, with bracing in both directions, for changes in direction of 0.26 rad 15 degrees or more, or for abrupt changes in grade. Provide drawings showing location of gate, corner, end, and pull posts.

3.12 ACCESSORIES INSTALLATION

3.12.1 Post Caps

Install post caps as recommended by the manufacturer.

3.13 GROUNDING

Ground fencing as specified.

Ground all fences crossed by overhead powerlines in excess of 600 volts, and all electrical equipment attached to the fence. 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. Grounding locations can not 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. Provide ground conductor consisting of No. 6 AWG solid copper wire. Provide copper-clad steel rod grounding electrodes 19 mm 3/4 inch by 3.05 m 10 foot long. 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, with top of the electrode 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. Total resistance of the fence to ground cannot exceed 25 ohms

3.14 CLEANUP

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

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