



Designation: **F1999–00 (Reapproved 2006) F1999 – 14**

Standard Practice for Installation of Rigid Poly(Vinyl Chloride) (PVC) Fence Systems¹

This standard is issued under the fixed designation F1999; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This practice covers the minimum requirement for and methods of installation for rigid poly(vinyl chloride) (PVC) fencing systems and fence accessories in areas where the maximum frost penetration does not exceed 30 in. [76 cm]. In all cases, refer also to the specific manufacturer's instructions for installation.

1.2 This practice is intended to guide those responsible for or concerned with installation of rigid (PVC) fence systems.

1.3 This practice does not preclude any test method that is proven to give equal or better performance under any weather, soil, or frost conditions.

1.4 End-use and applicable code requirements shall be considered in the choice of fence style, spacing, height, and installation method.

1.4.1 Paddock fencing for livestock may need to be more durable than perimeter fence.

1.4.2 Residential fence styles may not be designed for balcony or guardrail use.

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in brackets are for information only.

1.6 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*²

A706/A706M Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement

D2564 Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems

F964 Specification for Rigid Poly (Vinyl Chloride) (PVC) Exterior Profiles Used for Fencing and Railing

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *clip*—a component used to lock rails into routed posts.

3.1.2 *corner post*—a post that accepts fence rails so that a fence ends in one direction and starts in another, more or less, perpendicular direction.

3.1.3 *end cap*—a component to cover the open end of a rail or other extrusion.

3.1.4 *end post*—the end or last vertical structural support member of the fence.

3.1.5 *exterior profile*—a rigid poly(vinyl chloride) (PVC) extrusion that conforms to Specification **F964**.

3.1.6 *gate*—a hinged panel for passage into or out of a fenced area.

3.1.7 *hinge post*—the post to which a gate is attached.

3.1.8 *notch*—a method of creating a tab used to lock rails into routed posts.

3.1.9 *outside brackets*—components used to fasten rails to the outside of posts, when routed posts are not used.

¹ This practice is under the jurisdiction of ASTM Committee **F14** on Fences and is the direct responsibility of Subcommittee **F14.30** on Rigid Polymer Fence Systems. Current edition approved ~~June 1, 2006~~ Aug. 1, 2014. Published ~~June 2006~~ August 2014. Originally approved in 2000. Last previous edition approved in ~~2000~~ 2006 as **F1999–00**/F1999–00(2006). DOI: ~~10.1520/F1999-00R06~~ 10.1520/F1999-14.

² For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

- 3.1.10 *picket*—a vertical member in a fence panel, between or attached to the horizontal members.
- 3.1.11 *picket cap*—a component used to cover or decorate the open end(s) of picket.
- 3.1.12 *post cap*—a component used to cover the top of a post.
- 3.1.13 *posts*—the vertical structural support members of the fence.
- 3.1.14 *rails*—the horizontal members which insert into or attach to the posts. They serve as the sole sections between posts or as back rails to which picket verticals are attached.
- 3.1.15 *routed posts*—posts with holes cut into them to allow rails to be inserted.
- 3.1.14 *terminal post*—the end or last vertical structural support member of the fence.

4. Materials

- 4.1 *Exterior Profiles*, in accordance with Specification **F964**.
- 4.2 *Solvent Cement*—Poly(Vinyl Chloride) (PVC) solvent cement in accordance with Specification **D2564**.
- 4.3 *Reinforcing Steel Rods*, in accordance with Specification **A706/A706M** low-alloy steel deformed bars for concrete reinforcement.

5. Protection of Material in Transportation and Storage

5.1 Exterior profiles shall be supported in a manner that will prevent sagging, twisting, or bending. Fence products shall be stored in a manner that prevents accumulation of dust and dirt. Exposure to sunlight is not harmful.

6. Site Preparation

- 6.1 Unless otherwise specified in the contract or purchase order, the purchaser shall indicate the location of fence lines, gates, and terminal posts with suitable stakes. Stake intervals shall not exceed 500 ft [152.5 m] or line of sight.
- 6.2 Unless otherwise specified in the contract or purchase order, the purchaser shall indicate the location of all underground utilities, USC&G benchmarks, property monuments, and other underground structures.
- 6.3 Unless otherwise specified in the contract or purchase order, the purchaser shall perform all necessary site clearing and grading. Clearance on both sides of the fence line is required.

7. Installation of Posts

- 7.1 *Preparation of Post Holes:*
 - 7.1.1 Set posts in concrete in holes of diameter and depth as follows. Intended use and local conditions shall determine post footing dimensions, that is, under normal conditions the diameter shall be 4 in. [101 mm] greater than the largest cross section of the post. The depth shall be a minimum of 24 in. [609 mm] plus an additional 3 in. [76 mm] for each 1-ft [305-mm] increased fence height over 4 ft [1.22 m].
 - 7.1.2 In areas where frost is common, the footing shall extend a minimum of 6 in. [152.4 mm] below the maximum frost level.

TABLE 1 Thermal Expansion in Inches [Millimetres] for PVC Fence Profiles^A

Rail Length, ft [m]	80°F Temperature Change	100°F Temperature Change	120°F Temperature Change
6 [1.8]	3/32 [2.38]	1/8 [3.2]	5/32 [3.97]
8 [2.44]	1/8 [3.2]	5/32 [3.97]	3/16 [4.76]
10 [3.05]	5/32 [3.97]	3/16 [4.76]	1/4 [6.4]
12 [3.6]	3/16 [4.76]	7/32 [5.55]	9/32 [7.14]
14 [4.27]	7/32 [5.55]	9/32 [7.14]	11/32 [8.73]
16 [4.88]	1/4 [6.4]	5/16 [7.94]	3/8 [9.53]

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^AThese values are calculated using a coefficient of linear thermal expansion of 4.4 × 10⁻⁵ in./ in./ °F.

7.2 *Preparation of Post*—To secure post vertically, provide a means such as, but not limited to, notching, drilling, roughing, pinning, etc.

7.3 *Installation of Posts*—This practice includes three post setting methods. ~~Method 1 should be used where there are mucky or loose soil conditions.~~ Careful consideration should be taken to choose the correct method based on soil types at the installation location.

7.3.1 *Method 1*—Partially fill holes with concrete, then set the post into the concrete leaving approximately 2 to 4 in. [51 to 101 mm] of concrete below the bottom of the post (see Fig. 1). Continue filling the hole with concrete to within 6 to 9 in. [152.4 to 228.6 mm] of the top. Fill the remainder of the hole with soil or fine rocks. Where frost is not likely, the hole may be filled to ground level with concrete (see Note 1). The post shall extend a minimum of 18 in. [457.2 mm] into the concrete (see Fig. 2). Check to see that the post remains plumb until the concrete has set.

NOTE 1—Filling hole to top with concrete in frost areas will enhance upheaval of post and footers as concrete freezes faster than fill.

7.3.2 *Method 2*—Tap the post into the bottom of the hole until the desired height of the post above ground level is reached (see Note 2 and Fig. 3). Add concrete around the post to the level specified in 7.3.1. Check to see that the post remains plumb until the concrete has set.

NOTE 2—This method should not be used where there are mucky or loose soil conditions as without concrete under the post, it may sink if downward pressure is applied.

7.3.3 *Method 3*—Tap the post into the bottom of the hole until the desired height of the post above ground level is reached (see Fig. 4). Fill the hole one fourth of the depth with concrete, then add fine rocks or gravel to one half of the depth of the hole, then add concrete to three fourths of the depth of the hole. Fill the remainder of the hole with soil, gravel, or fine rocks (see Note 1). Check to see that the post remains plumb until the concrete has set.

7.3.4 *Method 4*—Place 4–6 inches of crushed stone in the bottom of the post holes, then set the post into the hole and continue filling in around the post with crushed stone to within four inches of grade. Compact the stone with a solid instrument, such as a breaker bar or heavy steel rod. Fill the remainder of the hole with soil or fine rocks.

NOTE 3—This method looks very similar to Fig. 1, with crushed stone in place of the concrete.

NOTE 4—Method 4 is to be used in soil types that tend to crack open when dry as to help reduce post settling during dry conditions.

8. Installation of Rails and Sections

8.1 Explanation or contraction values for fence profiles are given in Table 1. Rails shall extend into routed posts with sufficient distance between notches or clips, etc. and the inside wall of the post to accommodate the given contraction. When two rails are inserted into a post, end to end, a gap shall be provided between them for expansion. In all cases, rails shall extend a minimum of 1 in. [25.4 mm] into routed posts. The fractional dimensions shown in Table 1 are applied to both ends of the rail.

8.2 If outside brackets are used, they shall be fastened securely with noncorrosive fasteners in accordance with the manufacturer’s instructions.

9. Installation of Post Caps and Picket Tops, etc.

9.1 Post caps, end caps, and picket caps, if not pre-fastened by the manufacturer, shall be attached in accordance with the manufacturer’s recommendation, or by noncorrosive fasteners, or by solvent cement bonding.

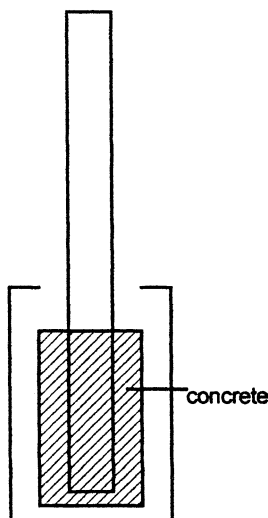


FIG. 1