



Designation: F537 – 01 (Reapproved 2019)

Standard Specification for Design, Fabrication, and Installation of Fences Constructed of Wood and Related Materials¹

This standard is issued under the fixed designation F537; 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.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope

1.1 This specification covers all wood fences, including fences combined with wood and other materials.

1.2 This specification covers three classifications of wood fences. This specification is based on fundamental construction principles combined with long-standing traditional fence building skills, and covers the design, fabrication, and installation practices of wood fences.

1.3 This specification also provides a systematic method of purchase, inspection with basis for rejection, and certification of manufactured wood fences by the fence industry.

1.4 The values stated in inch-pound units are to be regarded as the standard. Acceptable industry-wide SI equivalents are being developed.

1.5 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*²

A641/A641M Specification for Zinc-Coated (Galvanized) Carbon Steel Wire

A809 Specification for Aluminum-Coated (Aluminized) Carbon Steel Wire

B221 Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

D2605 Specification for Volatile Petroleum Solvent (LPG)

for Preparing Pentachlorophenol Solutions (Withdrawn 1992)³

D3225 Specification for Low-Boiling Hydrocarbon Solvent for Oil-Borne Preservatives (Withdrawn 2006)³

D3506 Specification for Inhibited Grade Methylene Chloride for Preparing Pentachlorophenol Solutions (Withdrawn 1992)³

F1043 Specification for Strength and Protective Coatings on Steel Industrial Fence Framework

F1667 Specification for Driven Fasteners: Nails, Spikes, and Staples

2.2 *Federal Standards:*⁴

TT-W-572B Fungicide: Pentachlorophenol

2.3 *Canadian Standards Association Document:*⁵

B111-74 Specification for Wire Nails, Spikes, and Staples

2.4 *National Forest Products Association Standard:*⁶

National Design Specification for Stress Grade Lumber and Its Fastenings

2.5 *Voluntary Product Standards:*⁷

PS 20-70 Softwood Lumber

PS 1-74 Softwood Plywood

2.6 *American Plywood Association Standard:*⁸

Specification for Plywood Design

2.7 *American Wood Preservers Association Standards:*⁹

C1 All Timber Products, Preservative Treatment by Pressure Process

C2 Lumber, Timbers, Bridge Ties, Mine Ties, Preservative Treatment by Pressure Process

C5 Fence Post, Preservative Treatment by Pressure Process

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

⁵ Available from Canadian Standards Association, 178 Rexdale Blvd., Rexdale, Ontario, Canada M9W 1R3.

⁶ Available from National Forest Products Association, 1619 Massachusetts Ave., N.W., Washington, DC 20036.

⁷ Available from U.S. Department of Commerce, National Bureau of Standards, Washington, DC 20234.

⁸ Available from American Plywood Association, 1119 A St., Tacoma, WA 98401.

⁹ Available from American Wood Preservers Association, P.O. Box 849, Stevensville, MD 21666.

¹ This specification is under the jurisdiction of ASTM Committee F14 on Fences and is the direct responsibility of Subcommittee F14.10 on Specific Applications and Other Fence Systems and Components.

Current edition approved Oct. 1, 2019. Published October 2019. Originally approved in 1978. Last previous edition approved in 2014 as F537 – 01(2014). DOI: 10.1520/F0537-01R19.

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.



C9 Plywood, Preservative Treatment by Pressure Process
C16 Wood Used on Farms, Preservative Treatment by Pressure Process
C23 Round Poles and Posts Used For Building Construction, Preservative Treatment by Pressure Process
M 4 Care of Pressure Treated Wood Products

3. Terminology

3.1 Definitions:

3.1.1 *back rails*—rails on which cover material is directly attached.

3.1.2 *boards*—lumber that is up to 1 in. in nominal thickness and 2 in. or wider in nominal width.

3.1.3 *cover material*—the face or fill material attached to a fence structural frame.

3.1.4 *custom fence design*—any fence design that is significantly different from those described in this specification. Custom fence designs are also required to meet all requirements regarding materials, fabrication, installation, workmanship, and structural equivalency as set forth within this specification.

3.1.5 *panel products*—all modular products available in standardized rectangular panels, many of which are suited to exterior applications such as privacy fencing. Examples are plywood, fiberglass, and corrugated metals.

3.1.6 *pickets*—narrow wood members that are sawn, split, sliced, milled, natural round or half-round, and are approximately 2 to 4 in. in face or coverage width.

3.1.7 *posts*—the vertical structural support members of the fence frame.

3.1.8 *rails*—the horizontal structural support members of the fence frame.

3.1.9 *slats or weave boards*—the horizontal or vertical members used in basketweave type fences normally $\frac{3}{8}$ to $\frac{3}{4}$ in. thick and 3 in. or wider in nominal width.

3.1.10 *standard fence design*—any fence structural frame or fence-type classification covered within this specification.

3.2 Definitions of Terms Specific to This Standard:

3.2.1 *boards or pickets*—fence boards or pickets are specified by the desired shape or manufacture of the upright end when installed vertically as described in 3.2.2 through 3.2.9.

3.2.2 *California clipped corners*—corners similar to 3.2.8, except the clip angle is steeper at approximately 65°.

3.2.3 *diamond point*—a board or picket similar to the standard point (3.2.9), except it consists of additional angular cuts, front and back, so that the top appears as a triangle from four angles of view, or pyramid shaped.

3.2.4 *flattop*—a simple flat or 90° square cut end.

3.2.5 *gothic*—a picket or board in which the shape is formed by two arc-shaped cuts that meet at center to form a graceful point at the top.

3.2.6 *handsplit*—pickets, posts, and rails which are split by machine or by hand using an axe or froe, etc.

3.2.7 *pencil point*—a picket or board that is conical in shape, and common to round and half-round pickets.

3.2.8 *standard clipped corners (or dog-eared corners)*—corners which are clipped diagonally (approximately 45°).

3.2.9 *standard point*—a picket or fence board cut to a point at approximately 45° angles.

3.2.10 *posts*—fence posts are specified by the desired shape or manufacture of their above ground tops as described in 3.2.11 through 3.2.15.

3.2.11 *chamfered posts*—in round or square posts, the shallow diagonal cut or easing of the otherwise square-cut end. Usually measures from $\frac{3}{4}$ to $1\frac{1}{2}$ in. along the chamfer.

3.2.12 *diamond-point posts*—the pyramid-shaped ends of post which are formed by angle cuts of approximately 45°.

3.2.13 *domed posts*—rounded ends of either round or square posts.

3.2.14 *flattop fence posts*—the square cut ends of post.

3.2.15 *pencil-point posts*—conically shaped round post tops.

4. Classification of Standard Fence Types

4.1 The generic classifications of wood fencing in 4.2 through 4.5 have gained common recognition throughout the fence industry and are adapted to this specification as a means of identifying a basic fence type. These classifications may be used in all cases as part of the purchase agreement between buyers and sellers of wood fencing; except a detailed description, drawing, or rendering of a custom fence design may be substituted where necessary.

4.2 Type I—Rail Fences:

4.2.1 *Split Rail*—The common country fence of alternating layers of handsplit rails laid up in zigzag tiers.

4.2.2 *Split or Sawn Post and Rail, or Both*—The rustic fence made up of split or sawn rails (two to four rails) installed into slotted split or sawn posts.

4.2.3 *Round Post and Rail*—A fence similar to that described in 4.2.2, except posts and rails are round or natural shaped; normally produced in two, three, and four rail fences. The rails are machined at ends to form a paddle-shaped scarf joint to be installed into post slots or formed into doweled ends for installing into posts with round connections.

4.2.3.1 *Herringbone Pattern Round Post and Rail*—A fence as described in 4.2.3, except it is normally a three-rail fence with small round wood inserts (doweled) which are installed between the upper two rails to form the familiar herringbone pattern.

4.2.3.2 *English Hurdle Fence*—A standard post and rail fence as described in 4.2.2 and 4.2.3, except that two smaller rails are installed diagonally from the fence posts (usually below the bottom rail connection) extending upwards to just above the fence top rail where they intersect and join a third decorative rail of the same approximate size, which extends downward to just below the bottom rail at a perpendicular angle.

4.2.4 *Post and Board*—The fence often referred to as corral fence is normally constructed using sawn wood posts, although



round wood posts are sometimes used, with boards serving as rails. They are commonly constructed in two, three, or four board configurations.

4.2.4.1 *Crossbuck Post and Board*—A fence as described in 4.2.4, except that two boards diagonally cross each other between two standard top and bottom board rails.

4.2.4.2 *Crossbuck Post and Rail*—A fence as in 4.2.4.1, except rails are 2-in. or thicker nominal lumber.

4.2.4.3 *Hurdle Post and Board*—A fence having the same geometric arrangement as the English hurdle fence in 4.2.3.2, except all rails are sawn boards.

4.2.4.4 *Hurdle Post and Rail*—A fence as described in 4.2.4.3, except top and bottom rails are 2 in. or thicker nominal lumber.

4.3 *Type II—Board Fences*: Every design within this type may be supported by sawn wood posts, round wood posts, or metal posts.

4.3.1 *Solid Board Fence*—A fence that is constructed of ordinary wood fence boards which are usually installed vertically, but occasionally horizontally or diagonally, over a rather conventional fence frame of from two to four rails between posts.

4.3.2 *Spaced Board Fence*—A fence as described in 4.3.1, except that open space is provided between the boards either for eye appeal or for ventilation.

4.3.3 *Shadow Box*—A fence that is constructed like a solid board fence (see 4.3.1), except that fence boards are installed alternately from one side of the fence rails to the other, providing interesting shadow lines as well as excellent ventilation. This fence is commonly offered in either vertical or horizontal panels.

4.3.4 *Louver*—A fence which is similar to common board fences (4.3.1) in frame configuration, except that fence boards are installed angularly between the fence rails with the effect of directing sunlight and air in a desirable way. These fences may be constructed with the board louvers installed vertically or horizontally.

4.3.5 *Weave*—A fence similar to the shadow box (4.3.3), except each individual fence board, normally 1 in. nominal in thickness, is alternately attached to one side of the top rail and the opposite side of the bottom rail. It may be constructed vertically as described, or horizontally (minus rails) by alternating installation of the boards directly to the fence posts.

4.3.6 *Basket Weave*—A fence similar to the weave (4.3.5), except basket boards (commonly $\frac{3}{8}$ to $\frac{3}{4}$ in. in thickness) are woven alternately between from one to five small wood members (sometimes 1 by 2, 1 by 3, or 1 by 4-in. nominal), which extend through the height of the weave perpendicularly. The fence may contain either a vertical or horizontal weave, but in either form, the top and bottom rails may be required for rigidity. The basket weave fence requires high quality wood because of its relative thinness.

4.4 *Type III—Picket Fences*: Every design within this type may be supported by sawn wood posts, round wood posts, or metal posts.

4.4.1 *Sawn Picket*—A fence in which the pickets are from 2 to 4-in. nominal width and are installed vertically. The pickets may be installed over two to four back rails of sawn lumber.

The pickets may be installed solid or by specified spacing where desired for light and ventilation.

4.4.2 *Grape Stake Picket*—A fence that is sometimes referred to by the picket type, either handsplit or machine sliced. This is a popular fence in the durable species and is usually constructed with handsplit or machined back rails and posts. It is most often installed with solid picket cover, but can be utilized as a spaced picket fence.

4.4.3 *Stockade Picket*—A fence that is similar to other picket fences, except the pickets are natural, machine milled, round, or sliced to half-round; and are available with bark removed, or with bark on for an added rustic effect. This fence is popular in common wood species, and may be installed to round wood posts and round or half-round back rails, sawn posts, and back rails; or back rails attached to metal posts.

4.4.4 *Wire-Bound Picket*—This fencing is wire-bound, wooden picket fencing, in roll form. It is used for applications such as but not limited to, snow, shade, safety, sand, and screening. The fence is fabricated with a 2- or 4-in. maximum spacing between pickets as specified by the purchaser. Each picket is held firmly by five pairs of zinc-coated wires. Each pair of wires is tightly twisted by rotating a twister head a minimum of $2\frac{1}{2}$ complete revolutions (900° of rotation) for 2-in. spacing and 5 complete revolutions (1800° of rotation) for the 4-in. spacing.

4.4.4.1 The twist rotation shall be in opposite directions between each succeeding picket. The wire shall have a minimum coated diameter of 0.099 in. ($12\frac{1}{2}$ gage) and a minimum zinc coating of 0.30 oz/ft² (Specification A641/A641M, Class 1) or a minimum aluminum coating of 0.32 oz/ft² (Specification A809) as selected by the purchaser. It shall have a minimum tensile strength of 70 000 psi in accordance with Specification A641/A641M or Specification A809, Medium Temper. The wire spacing of top and bottom pairs of wires shall be not less than 3 in. and not more than 6 in. from the ends of the pickets, with the remaining pairs of wires spaced equidistant between the top and bottom wires.

4.4.4.2 The length of roll of fabricated fence shall be 50 ft \pm 6 in. The pickets shall be made of spruce, hemlock, cedar, redwood, fir, or pine, air-dried and rough sawn. The pickets may be stained, painted with a red oxide coating, or pressure-treated in accordance with 9.4 as specified. Picket dimension shall be: length, either 48 or 72 \pm $\frac{3}{16}$ in.; width, $1\frac{1}{2} \pm \frac{1}{16}$ in.; and thickness, $\frac{3}{8} \pm \frac{1}{16}$ in.

4.5 *Type IV—Solid Panel Fences*: Every design within this type may be supported by sawn wood posts, round wood posts, or metal posts.

4.5.1 *Plywood Panel Fences*—A fence which includes any common post and back rail construction with an exterior grade of plywood that is installed on or within the frame.

4.5.2 *Other Panel Product Fences*—Other panel products suitable for exterior use and manufactured in standard panel sizes may be installed within any fence frame that provides adequate lateral support for the panel. Examples include corrugated fiberglass and corrugated metals.



5. Ordering Information

5.1 Complete information describing the desired fence product shall be provided with all purchase orders or inquiries. The information described in 5.1.1 through 5.1.10 shall be included as detailed within this specification:

5.1.1 *Fence-Type Classification or Description*—Provide the standard fence-type classification, as described in Section 4, or substitute a detailed description, drawing, or architectural rendering, depending on the complexity of a custom design, and the requirements of the fence supplier.

5.1.2 *Structural Frame Identification Number*—Provide the fence structural frame identification index number as provided in Tables 1-3 (see also Section 7). Also, specify the maximum post spacing in feet, center to center of posts and the height of the fence, which is the minimum measurement from ground level to the top of the cover material or top of the top rail, whichever is the greater when options are provided for a particular fence frame in the tables. For open post and rail fences, specify the desired number of rails where shown to be optional in Table 1. The fence frames listed in Tables 1-3 and Section 7 provide many common fence frame configurations and may be used for simplified specifying. Alternatively, fence frames of significantly different design may be used if they provide structural integrity equal or superior to those described in Section 7, or if justified by structural engineering as provided in NFPA Specification for Stress Grade Lumber and Its Fastenings and APA Specification for Plywood Design.

5.1.3 *Architectural Class or Grade of Materials*—Include the architectural class of all sawn posts, rails, or boards as provided in Section 6 or their acceptable equivalent commercial lumber grade as provided in Tables 4-7. If handsplit, machine-sliced, or sawn pickets are to be used, specify the architectural class in accordance with Section 6. All other wood products are required to meet their minimum quality standards as established within Section 6.

5.1.4 *Species of Wood*—It is normally desirable for the fence purchaser to specify the commercial species of wood to be used in the fence or its various component parts, as it relates vitally to the appearance, durability, and general performance of the fence structure (see Section 8).

5.1.5 *Preservative Pressure Treatment*—Specify the pressure treatment, where applicable, in accordance with AWP Standards C1, C2, C5, C9, C16, C23, and M 4 (see Section 9).

5.1.6 *Sizes and Details for Cover Material(s)*—Sizes of boards, pickets, and other fence cover materials (such as basketweave stock) shall be included in all purchase orders and inquiries. Unless otherwise noted, all fence boards shall be taken to be 1 in. rough nominal in thickness. Details of cover material selection should be included where necessary (for example, nominal face widths of fence boards or pickets should be specified, including the style in which they are laid-up). Sizes are provided in Section 10.

5.1.7 *Manufacture*—Special shapes or dressed ends of vertical fence boards, pickets, or posts shall be specified by the terminology provided in Section 3. Round post and rail fences may be specified with paddle-shaped scarf joints in cases where rail scarfs are fitted into slotted posts; or rails may be manufactured with doweled ends for installation into posts with special round-hold connections. Other special manufacturing details may be specified by including a detailed description, drawing, or rendering of the fence.

5.1.8 *Post Embedment*—The required fence post installation shall be specified as compact soil embedment, gravel or sand-gravel embedment, or set in concrete collar footings in accordance with Section 11. However, if the fence is installed by the purchaser, only the required post length need be specified, based on the depth of embedment as determined in accordance with Section 11.

5.1.9 *Fastenings and Connections*—This aspect of fence construction may be specified with considerable detail or may

TABLE 1 Open Frame Post and Rail Fences

Fence Type Classification	Structural Frame Identification Index	Nominal Post Size, in.	Nominal Top Rail Size, in.	Nominal Center Rail(s), in.	Nominal Bottom Rail Size, in.	Post Spacings, ft	Above Ground Height of Fence, ft	Total Number of Rails per Section
Split post and rail	No. 1	3½ by 3½	1½ by 1½	...	1½ by 1½	6	3	2
	No. 2	4 by 4	2 by 3	...	2 by 3	8	4	2
	No. 3	4 by 4	2 by 3	2 by 3	2 by 3	8	4	3
	No. 4	4 by 5	2 by 4	...	2 by 4	10	5	2
	No. 5	4 by 5	2 by 4	2 by 4	2 by 4	10	5	3
	No. 6	5 by 5	2 by 3	2 by 3	2 by 3	8	6	3
	No. 7	5 by 5	2 by 4	...	2 by 4	10	6	2
	No. 8	5 by 5	2 by 4	2 by 4	2 by 4	10	6	3
Round post and rail	No. 9	4 diameter	...	3 diameter	...	8	1, 2	1
	No. 10	5 diameter	...	4 diameter	...	8 to 10	1, 2	1
	No. 11	4 diameter	3 diameter	...	3 diameter	8	2, 3, 4	2
	No. 12	4 diameter	3 diameter	3 diameter	3 diameter	8	3, 4, 5	3
	No. 13	5 diameter	4 diameter	...	4 diameter	8 to 10	3, 4, 5	2
	No. 14	5 diameter	4 diameter	4 diameter	4 diameter	8 to 10	4, 5, 6	3
	No. 15	5 diameter	4 diameter	4 diameter	4 diameter	8 to 10	5, 6, 7	4
Sawn post and board	No. 16	3 by 4	1 by 4	...	1 by 4	8	2	2
	No. 17	4 by 4	1 by 4	1 by 4	1 by 4	8	3, 4, 5	3, 4, 5
	No. 18	4 by 4	1 by 6	1 by 6	1 by 6	8	4, 5, 6	3, 4, 5