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Standard Test Method for Field Evaluation of Wood Preservatives in Round Post-Size Specimens[1]

This standard is issued under the fixed designation D 2278; 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.

ε[1] NOTE—Section 12 was added editorially in January 1995.

1. Scope

1.1 This test method covers the determination of the relative effectiveness of wood preservatives in round posts set in the ground in field plots. Two tests are described, one for small (3 to 5 in. (80 to 130 mm) in diameter) sapwood posts which is the preferred test if major interest lies in testing the preservative when fairly evenly distributed throughout the piece, and the second for large posts (7 to 10 in. (180 to 250 mm) in diameter) which is preferred when the preservative is tested under conditions of gradient retention and distribution normally encountered in commercial operations.

1.2 The requirements for preparation of the material for testing and the test procedures appear as follows:

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1.3 The values stated in inch-pound units are to be regarded as the standard. The SI equivalents of inch-pound units may be approximate.

1.4 *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:*

D 1413 Test Method for Wood Preservatives by Laboratory Soil-Block Cultures[2]

D 1758 Test Method for Evaluating Wood Preservatives by Field Tests with Stakes[2]

D 1760 Specification for Pressure Treatment of Timber Products[2]

3. Summary of Test Method

3.1 Commercial-size round wood posts are impregnated with an appropriate series of retentions of a preservative and are handled in accordance with specified procedures prior to exposure in the field. They are then exposed in the ground to the action of weather, wood-destroying fungi, and insects in one or more selected field plots. Periodic inspections are carried out on each post to determine immediate condition and end of service life. The computed average service life for each group is used to express results at termination of the test. The general pattern of preservative performance in posts may be indicated within 5 to 10 years; however, the test of a given retention group of any preservative is not terminated until at least 60 % of the treated specimens have failed.

4. Test Plot

4.1 *Number and Climatic Location*—Decay test plots can be established over a wider climatic range than can subterranean termite test plots. When information on decay is of primary importance, a plot can be established in a temperate climate where

[1] This test method is under the jurisdiction of ASTM Committee D-7 D07 on Wood and is the direct responsibility of Subcommittee D07.06 on Treatments for Wood Products.

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[2] *Annual Book of ASTM Standards*, Vol 04.10.

termite attack is not serious. When termite as well as decay control is of interest, the plot shall be located in a relatively warm and moist area where subterranean termites are known to be a hazard. The choice of location is optional, but the investigator shall record which type of plot is involved. The location of test plots within a reasonable distance of a weather bureau station is encouraged.

4.2 *General Requirements*—The specific area selected for the plot shall be of essentially uniform soil character, level, moist but well drained land, remote from industrial contamination and large enough to accommodate all anticipated expansion for at least 25 years. It should be protected by fire lanes and should be fenced to prevent access of animals and discourage pilferage of posts. In a plot used essentially or exclusively for decay studies, a preliminary bioassay shall be made to prove that decay-producing organisms are present. If a background of data on the area exists or if wood debris in contact with the ground indicates suitable decay is present, further bioassay may be unnecessary. Otherwise a bioassay for decay can be made as follows: strips of 1/20 to 1/10-in. (1 to 3 mm) veneer of pine or gum sapwood can show rapidly whether fungi in the soil have sufficient decay-producing capacity. Strips of veneer should be buried horizontally approximately 3 in. (80 mm) deep at several places in the plot for at least 3 weeks during warm, moist weather; if the pieces show such evidence of decay as extreme brashness when broken in the hands, the plot is considered suitable. Where the test plot is to yield data on both decay and termites, the bioassay shall also include a test to determine whether or not termites are present. If the examination of wood debris on the ground, such as dead branches, wood chips, or other cellulosic materials, does not give sufficient evidence of good termite distribution, the contemplated test area can be "staked out" with untreated low-density sapwood stakes (¾ by ¾ in. (19 by 19 mm) or other suitable sizes) and these stakes observed for termite activity. If the climate and rainfall are suitable for termite attack and a sufficient number of stakes have been attacked to show reasonable termite activity, the proposed test area will be deemed suitable.

4.3 *Soil and Vegetation*—The ground shall be in its native state or, if it has been used for agricultural purposes, it shall not have been tilled within 3 years of the date of establishment of the test plot. The area shall be capable of actively supporting vegetation, decay fungi, and, optionally, termites. A cover of organic matter or grass is desirable. A sandy loam or silt loam is the preferred soil. No artificial or natural fertilizers shall be applied to the plot during the test period. The following plot details shall be reported:

4.3.1 Vegetative cover,

4.3.2 Depth of the different soil horizons for a distance of 1 ft (300 mm or 0.3 m),

4.3.3 pH of soil samples taken from the first 6 in. (150 mm) of mineral soil directly below the organic matter,

4.3.4 Water-holding capacity of composite soil sample of the upper 6 in. (150 mm) as measured in accordance with Method D 1413, and

4.3.5 General agricultural classification of soil type.

NOTE 1—Ten soil samples from various areas within the selected plot shall be taken and tested separately.

4.4 *Preparation of Plot*—The plot shall be selected so that a minimum of preparation of the plot is necessary (see 4.3).

4.5 *Control of Vegetation*—No chemicals shall be used to control the growth of vegetation either prior to or during the use of the test area. Woody vegetation or rank growths of weeds shall be mechanically removed only under the direct supervision of the persons making the studies. These recommendations are made to prevent damaging the posts and to prevent the use of chemicals that might unduly influence the value of the tests.

4.6 *Reuse of Ground*—Posts may be placed in ground that has been used previously for test purposes, but not sooner than 5 years after the last use. Old holes shall not be used for the placement of new posts.

5. Test Specimens

5.1 *Selection of Wood*—Round posts of pine species having 4 to 10 rings/in. (10 to 25 rings/cm) in the outside 1.5 in. (38 mm) and having not less than a 1.5-in. thickness of sapwood shall be used. Wood shall be free of large knots, excessive resin content, shakes, and other abnormalities and shall show no evidence of insect attack, decay, or heavy infection by mold or stain fungi. The same species of wood shall be used throughout any test designed to furnish data or relative fungicidal and insecticidal value of test preservatives. When the boundary between heartwood and sapwood is difficult to recognize, a color test[3] shall be used to distinguish between the two.

5.2 *Size*—Either of two sizes of posts may be used for this standard. They will be referred to hereinafter as Size S and Size L. The sizes given shall apply to seasoned materials.

5.2.1 *Size S* (*Small*)—Posts shall be 5 to 8 ft (1.5 to 2.5 m) in length. The diameter shall be 3 to 5 in. (80 to 130 mm) or the circumference shall be 9.4 to 15.7 in. (240 to 400 mm) respectively when measured 18 in. (460 mm) from the butt. It may be desirable to measure and segregate the posts into groups for treatment according to diameter dimensions, and later to distribute the size groups evenly between the test series. The average diameter within each series of posts shall be within the range from 4.0 to 4.6 in., (100 to 120 mm) measured 18 in. (460 mm) from the butt.

5.2.2 *Size L* (*Large*)—Posts preferred for this size are usually obtained by cutting a 30-ft (9.1±m) Class 6 or 7 pole into three 10-ft (3±m) sections having mid-point diameters of 7 to 10 in. (180 to 250 mm). An equal number of butt, center, and top cuts for each preservative are put in the ground at each test site.

[3] "Color Tests for Differentiating Heartwood and Sapwood, of Certain Oaks, Pines and Douglas Fir," Forest Products Laboratory Technical Note 253, U.S. Forest Service, revised June 1954.

5.3 *Preparation of Posts*—Whenever practical, selection of test posts shall begin in the woods. Posts shall be as free as possible of fungus infection (molds, sapstain, decay). Posts shall be smoothly hand or machine peeled to remove all cambium. Removal of sapwood shall be kept to a minimum.

5.3.1 Size S posts shall be air-seasoned or artificially dried to limit serious seasoning checks and to prevent fungus infection.

NOTE 2—To reduce fungus infection, it may be helpful to dip posts for not longer than 1 min in a 2.0 weight % solution of sodium pentachlorophenate in water. If this precaution is used, it should be used on all posts within any comparative test, including untreated controls and note should be made in reporting. Removal of at least 1 in. (25 mm) of wood from each end of the posts to determine freedom from infection is recommended. Posts should be seasoned to a moisture content of 20 % or less in the ¼ to 1¼-in. (6 to 32 mm) zone, and the moisture content recorded.

5.3.2 Size L posts should be conditioned in the usual manner for round timbers of the particular species employed in the tests, by air-seasoning, by artificial drying, by steaming, by heating in the preservative, or by a combination of these methods within the limits prescribed in 3.3 of Specification D 1760.

5.4 *Identification of Test Posts*—Identify each test post by burn-branding its code number and if applicable the approved identifying marks as listed in the "Brands Used on Forest Products" (*AWPA M6*)[4] or by attaching an aluminum, Monel, or other weather-resisting metal tag, or both. Identification should be placed at some uniform distance within 18 in. (460 mm) from the top.

6. Treatment Procedure

6.1 *Types of Test and Treatment Methods*:

6.1.1 *Type FC*—The *full-cell* treatment is employed to obtain gradient retentions of preservatives of the water-borne and oil and oil-borne types by varying the concentration of the preservative in the carrier.

6.1.2 *Type EC*—The *empty-cell* treatment is employed to obtain treatments similar to those used commercially. They are applied principally to oil type preservatives such as creosote and oil-borne preservatives such as pentachlorophenol in oil.

6.2 *Number of Posts to be Treated*:

6.2.1 *Size S Posts*—Treat enough posts to permit selection after treatment of at least 10 posts having preservative retentions closely approximating the required retention level for each of the planned graded retentions (see 6.5). The range of retentions in the selected posts shall not exceed the average by more than 10 % for Type FC test posts nor 15 % for Type EC test posts (Note 3). Treat all posts of one treatment group as one charge, or if the number of specimens is too large to be accommodated in the treating cylinder, prepare the charges so as to provide for equal distribution of the posts from each charge among the test plots.

NOTE 3—Posts with lower or higher retentions than the limits set for the chosen retention groups may be retained as pilot posts. Such posts installed in the plot or even used as fencing can be removed at any desired time to provide such useful data as early post condition, fungi causing initial or later attack, or both, as determined by culturing and by measuring preservative losses or changes as determined by chemical analyses of the posts. Making use of pilot posts, therefore, is strongly recommended.

6.2.2 *Size L Posts*—Accept all posts treated as test specimens. However, each post shall be assayed at midpoint (5.10) so that its individual retention will be recorded. Size L posts may be treated either by themselves in an experimental or pilot cylinder or they may be treated in a commercially charge made up in its entirety of other round material of approximately the same cross-sectional dimensions, density, and moisture content.

6.3 *Preservative Analysis*—Analyze each preservative solution prior to treatment. If there is reason to believe that a change in composition occurs during treatment, analyze after each treatment and avoid extended use of the same solution. Store samples of original preservative solutions in suitable sealed containers for possible future reference.

6.4 *Untreated Control Posts*—In order to determine the average life of untreated posts in the test area, install a minimum of 10 untreated posts per 100 treated posts, distributing them in uniform manner over the test area. The untreated posts should be of the same size as the treated posts. When the untreated posts fail, record the causes of failure as well as the length of time that they remained under test. Remove the posts that fail from the test area.

6.5 *Graded Retentions of Preservatives*—In order to provide information as to the minimum effective retention of different preservatives, test each preservative in a geometric series (geometrical factor = 1.5) of two or three graded retentions (Note 5). The spread in the series shall be designed to straddle the expected or predetermined effective retention. This retention may be based on experience, or on assumptions from the results of soil-block tests (Method D 1413) and stake tests (Method D 1758). The retention nearest the expected effective retention should be at or near the middle of the series.

NOTE 4—*Examples*—The illustrations of the two and three-grade series are guides rather than mathematically precise retention requirements. The amount of preservative absorbed will vary inversely as the specific gravity of the test posts and some variation from the suggested retention levels is to be expected. *Two-grade retentions* (geometrical factor = 1.5): *Creosote or 5 % pentachlorophenol-petroleum solution* 7.0 and 10.5 lb/ft,^{3} (112 and 168 kg/m^3) *pentachlorophenol* 0.35 and 0.53 lb/ft,^{3} (5.6 kg/m^3 and 8.5 kg/m^3) Fluor chrome arsenate phenol (FCAP) 0.35 and 0.53 lb/ft.^{3} (5.6 kg/m^3 and 8.5 kg/m^3) *Three-grade retentions* (geometrical factor = 1.5): *Creosote or pentachlorophenol-petroleum solution* 6.0, 9.0 and 13.5 lb/ft,^{3} (96, 144 and 216 kg/m^3) *pentachlorophenol* 0.33, 0.50 and 0.75 lb/ft,^{3} (5.3, 8.0 and 12 kg/m^3) Fluor chrome arsenate phenol (FCAP) 0.33, 0.50 and 0.75 lb/ft.^{3} (5.3, 8.0 and 12 kg/m^3).

6.6 *Concentration of Treating Solutions for Type FC Tests*—Make up the treatment solutions for Type FC tests in appropriate gradient concentrations with a view to leaving in the posts at treatment a range of retentions running from below to above the

[4] "Brands Used on Forest Products," American Wood-Preservers' Association Manual of Recommended Practice M 6, latest edition.

anticipated minimum effective retention. All preservatives shall be in such a state of solution before use that the active ingredients will be uniformly distributed throughout the treated wood. The number of concentrations to be made up for any given preservative depends on whether it is possible to anticipate a protective retention and how close it is necessary to determine it.

NOTE 5—Adjust the concentrations of solid preservative chemicals or combinations of chemicals in oil or water vehicles so that the wood will absorb the required amount of the "dry" solid.

6.7 *Full-Cell Treatment*—For Type FC tests, which are designed as comparative tests of the relative order of effectiveness of preservatives (Note 6) impregnate the specimens by a full-cell process, using an initial vacuum, suitable temperature, and appropriate pressure period but omitting final vacuum. Promote the best possible distribution of the preservative in the wood (Note 7).

NOTE 6—The spread in retentions in the individual test posts has been shown by experience to be considerably wider in the case of empty-cell treatments than for full-cell treatments. The magnitude of the range in retention distribution shall be determined by trial. It is desirable to select the treated posts with a view to holding the range of retention as low as possible for each of the graded retentions chosen.

NOTE 7—Values in Type FC tests are based on approximately even distribution of the preservative in the wood. Evacuate the air from the wood as far as practicable before the pressure cycle is employed in order to leave the cell cavities free to be filled with the preservative solution. The amount of air spaces available to hold liquids has been determined for woods of different density and moisture content.[5] Therefore, the approximate maximum absorption to be expected can be computed from the percentage of air space in the wood and the specific gravity of the treating solution. The greater the volume of air space (the lower the density), the greater the absorption that should be obtained if all air cavities are filled. With water-soluble preservatives, absorptions are higher than for oil-type preservatives because water not only fills the airspaces but is also absorbed in the cell walls of wood.

6.8 *Empty-Cell Treatment*—For Type EC tests which are designed to compare the relative preformance of wood treated by methods usually used commercially, impregnate the posts by an empty-cell process in imitation of the usual accepted commercial practice, adapted to the available treating equipment. Apply creosote or related material or oil-borne preservative solution undiluted. Adjust the treating process so as to leave in the wood suitable average amounts of preservative to conform to the plan for graded retentions prescribed in 6.5.

6.9 *Preservative Retention-Gain in Weight Basis*—For posts in which the preservative retention is measured by a gain in weight, measure and record the untreated weights immediately before treatment. To determine the amount of preservative absorbed, remove each post individually from the treating chamber, wipe lightly, if necessary, to remove excess surface preservative or preservative solution, and weigh promptly to the nearest 0.10 lb (45 g). Calculate the retention of preservative or preservative solution as follows:

$$\text{Retention, lb/ft}^3\ (\text{kg/m}^3) = A/B$$

where:

A = gain in weight, lb, (kg) and
B = volume, ft^3 (m^3).

6.10 *Preservative Retention-Assay of Treated Wood*—Retention based on gain in weight is considered accurate when posts are air-seasoned to 20 % moisture or less. However, when green or partially seasoned posts are conditioned prior to treatment either by steam conditioning or boultonizing, gain in weight does not yield accurate over-all retention results due to the interchange of water between the timber under treatment and the treating solution. This occurs with both oil-type and water-type preservative solutions. In such cases, reliance should be placed on the assay of increment cores, but such retention figures are applicable only to the section or zone sampled. Assay data obtained from analyzing two or more zones are of value when preservative distribution is under study. This applies to air-seasoned posts also. The increment cores should be taken from the midpoint after the posts have cooled to ambient temperature. For Type L southern pine and ponderosa pine posts, utilize borings from 20 posts in a charge from the zone 0.5 to 2.0 in. (13 to 51 mm) when a single zone assay is being made. When individual posts are being assayed, use the composited zone samples from not less than four increment cores. Use ASTM methods for retention analyses. Otherwise, employ methods of the American Wood-Preservers' Association.

7. After-Treatment Handling of Posts

7.1 *Posts Treated with Water Solutions*—Dry posts treated with water-borne preservatives after treatment by air seasoning, kiln drying, or a combination of both (Note 8). Thus, upon final weighing after treatment, the posts may be stacked so that air can circulate freely between them until their moisture content is less than 30 %. If stored outdoors, stacks shall be completely protected from the weather during drying. Alternatively, posts may be dried in an oven or kiln at a temperature not to exceed 140°F (60°C) until their moisture content is less than 30 %, as evidenced by change in weight of the charge. Adequate air seasoning after treatment is necessary with many water-borne preservatives of the fixing type, to bring to completion certain chemical reactions.

NOTE 8—If a preservative requires special or other types of conditioning than that specified, report the method of after-treatment handling fully.

NOTE 9—It is believed that these reactions cannot take place well in the below ground area of a post, especially if the moisture content of the soil is high.

[5] MacLean, J. D. "Effects of Moisture Changes on the Shrinking, Swelling, Specific Gravity, Air or Void Space Weight and Similar Properties of Wood." Mimeographed report No. 1448, U.S. Department of Agriculture, 1958.

7.2 *Posts Treated with Undiluted Preservatives*—Posts treated with undiluted preservatives, for example creosote or pentachlorophenol-petroleum solution, should be close-piled immediately after treatment. The stacks shall be stored in a cool location and the posts shall be completely protected from the weather until they are sent to the test site for installation.

7.3 *Weighing Before Installation*—With the exception of posts treated with a water solution of preservative, weigh the posts to the nearest ounce or 0.10 lb (0.04 kg) within 24 h before they are shipped to the test plot for installation. If bleeding of preservative is indicated between the time of treatment and the time of installation, such posts must be reweighed or reassayed to correct for preservative losses.

8. Installation of Posts

8.1 *Time Lapse Between Treatment and Installation*—Install the posts in the test plot as soon as possible after treatment, consistent with the requirements outlined in Section 6. The lapse of time between treatment and installation shall not exceed 6 months.

8.2 *Spacing of Posts in Test Plot*—Space the posts not less than 2 ft (0.6 m) between specimens and not less than 3 ft (0.9 m) between rows.

8.3 *Depth of Installation*—Install the posts to a depth of 24 in. (0.6 m) for small posts and 36 in. (0.9 m) for large posts. Compact the soil against the posts.

8.4 *Location of Posts*—Randomize the posts in the test plot.

8.5 *Plot Map*—A plot map is essential to eliminate the danger of having unidentifiable posts.

9. Inspection of Specimens

9.1 *Frequency of Inspection*—One advantage of having untreated posts in the test plot is that guidance is obtained as to when the first inspection shall be made. The time between subsequent inspections will depend upon whether a new preservative is being tested or whether one is trying only to establish service limits.

9.2 *Inspection*—Fall is the preferable time of inspection. New posts should be installed at inspection time. Examination shall be made without prior reference to records of previous years.

9.3 *Procedure*—Three alternative procedures may be used to inspect post specimens, but employ only one of these procedures throughout a test plot.

9.3.1 Posts can be withdrawn from the ground by jacks, etc.

9.3.2 The below-ground portion of the post can be exposed by removing the soil to the required depth. For both methods, use an instrument with a blunt point to determine the condition of the posts below the groundline. Excessive picking of the softer springwood in the specimens should be avoided. Special care should be taken in examinations when the posts are very wet, because softening due to high moisture content can be mistaken for decay. Also, the specimen can be damaged easily by indiscriminate probing when wet (Note 9), and

9.3.3 Posts can be left undisturbed below ground but be subjected to several firm and uniform alternate pushes from opposite directions. The push test is not enough if one wishes to get information on early decay or termite attack. In these cases, lifting is necessary.

NOTE 10—Prior experience in inspecting posts will assist correct diagnosis of post condition. To the extent possible, the same individual should carry out the periodic inspections.

In all three procedures, visually observe the upper portion of posts and note bleeding of the preservative and its extent. After any of the methods of examination or after resetting of the posts to their original depth, the soil shall be compacted against the posts.

9.4 *Grading Systems* (*for Below-Ground Condition*)—The grading system for reporting results shall be as listed in Tables 1 and 2. Two rating scales are shown for termite ratings. This is done to prevent confusion when recording data. When analysing the ratings, the numerical ones can be substituted. If desired, the numerical ratings may be used throughout.

9.5 *Index of Condition*—For comparison of the treatments either immediately or at the termination of the test, the index of condition as determined from the grades assigned to the posts shall be computed in terms of (*1*) decay grades only, (*2*) termite grades only, and (*3*) decay and termite grades combined, that is, the lowest grade from either cause. Compute the index of condition for each of the above categories by listing the grades and multiplying each grade by the number of individual posts in the retention group that received it as the lowest grade. The sum of the products, divided by the total number of posts rated in the retention group, gives the average index of condition of the retention group at the time that the ratings are made.

TABLE 1 Decay Grades

Description of Condition	Grade No.
Sound	10
Trace of decay	9
Moderate decay	7
Heavy decay	4
Failure due to decay	0

TABLE 2 Termite Grades

Description of Condition	Numerical Rating	Recording Grade
Sound	10	A
Trace of attack	9	B
Moderate attack	7	C
Heavy attack	4	D
Failure by termite attack	0	E

9.6 *After-Test Analysis*—It is recommended that the above and below ground-line portions of the posts which are removed due to failure should be saved for use in identifying species of organism causing failure and determining quantity of preservative remaining.

10. Evaluation of Results

10.1 *Termination of Test*—The general pattern of preservative performance may be established within 5 to 10 years of post installation, but the test of a given preservative shall not be terminated until the average life has been attained and one should not try to estimate life expectancy until at least 10 % but not less than two specimens of a retention group have failed from either decay or termite attack. Average life is usually attained when 60 % of the specimens have failed.

10.2 *Lost Posts*—The number of posts lost or destroyed by other causes than decay or termite attack shall be deducted from the original number in their retention groups for any computations and such posts shall be adequately noted in the report.

10.3 *General Analysis*—The average life of different retention groups is used as an indication of the performance of a preservative in the posts in the test plot. If the range of retention (6.2 and Note 2) for a given nominal retention set of posts does not exceed 10 % of the average retention in a full-cell treatment of 15 % in an empty-cell treatment, the service life of individual posts in each set shall be averaged. When the range is greater than the above values, the service life shall be presented individually for each post in a set and arranged according to increasing retention. If the cause of failure due to decay or to termite attack can be determined separately for each post, or the percentage of failure due to each cause in a group of posts can be estimated, this information should be given. In the case of unusual results, particularly in failure of preservative due to decay, an isolation and identification of the causal fungus is desirable. In post tests, attention shall also be paid to chemical analyses during the lifetime of the posts. Posts can give information on the depletion of the preservative above ground, or at the ground line, at various times in their life. If the rate of depletion of preservative during the lifetime of the post is not required, then an analysis of the ground-line portion at the time of failure will supply information on the amount of preservative remaining in the region subject to attack. Appropriate assays can, therefore, be made to obtain this information. The average life and estimated standard deviation of retention shall be reported for each charge (nominal retention) of posts.

11. Report

11.1 A suggested test report is shown in Fig. 1. The report shall include concise information and data on the following essential phases of the test:

11.1.1 Location of plot,

11.1.2 Character of soil, including values for pH and moisture-holding capacity (See Method D 1413) of upper 6 in. (150 mm) of mineral soil (See 4.3),

11.1.3 Time in test (see 10.1) (years to termination) for test posts and treated reference posts.

11.1.4 Climatological data including (*a*) average rainfall and average temperature per month, (*b*) average minimum and maximum temperature per month, (*c*) number of days having more than 0.01 in. (0.25 mm) of rain, and (*d*) total annual rainfall,

11.1.5 Species of wood, dimensions of post, and average sapwood depth,

11.1.6 Preservative: name and chemical description of preservative and carrier sufficient to identify both fully,

11.1.7 Average retention per charge.

11.1.8 Average life and standard deviation per charge (retention group) of test posts at time test is terminated, and

11.1.9 Deviations, if any, from standard procedure.

12. Precision and Bias

12.1 This test method is dependent upon the physiological action of living organisms. Therefore, the results may not be repeatable or reproducible. While the relative efficacy between experimental levels within each individual test group is obtainable, repeatability and reproducibility cannot be applied to make any inference of relative performance between different test groups.

13. Keywords

123.1 evaluation; field; pesticide; preservative

Test Plot
Location _____
Soil type _____ pH _____
Moisture-holding capacity (top 6 in.) (ASTM D 1413) _____

Time of Test
From _____ to _____

Weather Data
Average monthly rainfall _____ in.
Average monthly temperature _____ F
Number of days per year having more than 0.01 in. of rain _____
Average minimum monthly temperature _____ F
Average maximum monthly temperature _____ F
Total annual rainfall _____ in.

Specimens
Species of wood _____
Size of posts: Length _____ ft, Average diameter _____ in.
Thickness _____ (in.) or percentage _____ of Sapwood

Preservative
Name _____
Chemical description of preservative and carrier _____

Results
The following tabular form may be used when the range of retentions permits averaging the test data for each charge of test posts; otherwise, results must be listed individually for each post.

Charge No.	Retention		Time in test, years	Life data for each retention group	
	Average lb/ft^3	Range		Average life	Percent failure

Remarks

FIG. 1 Typical Report Form