

POLE LINES

INSPECTION OF POLES

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1. GENERAL

1.01 At each inspection, observe all poles, guy stubs, and pole braces for visible defects above ground and test them for hollow heart by sounding.

1.02 In connection with the pole inspection work, note any hazardous conditions resulting from faulty or non-standard construction. In some cases, it may be advantageous to combine with the pole inspection work, a thorough inspection of the attachments on the line. Detailed instructions covering the inspection of the various types of plant will be furnished the inspector if a complete inspection is to be made. (See Part 5.)

1.03 When a jointly used line is to be inspected, the arrangements for the inspection should be discussed with the power company or other company concerned before the work is undertaken.

1.04 In addition to the visual inspection mentioned in paragraph 1.01, make measurements of the remaining good wood at the section of maximum decay wherever necessary. Such measurements will ordinarily be required for all poles except those in which the defects are obviously such as to require prompt attention, and those poles which will not exceed, within the ensuing inspection period, the age established for the first inspection. This age depends chiefly upon the preservative treatment of the pole, if any, and the scheduling of the pole replacement work, and should be obtained from the plant engineer before the inspection is started.

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1.05 The measured circumferences of sound wood obtained at inspection, and corrected for hollow heart or pockets by making deductions as indicated in Part 4 below, should ordinarily exceed the minimum circumferences given in the inspection tables by a margin sufficient to allow for probable decay before the next inspection. This margin may be based upon past experience with similar poles in the same general locality. Where such information is not available, and the poles show appreciable decay, the rate may be assumed as 1/2 inch of circumference per year.

1.06 Poles which are found to be infested with ants or termites can be expected to deteriorate more rapidly than poles not so infested, and extra allowance, based on local experience, should be made for the more rapid rate of deterioration.

1.07 Storm side guyed poles, guyed corner poles and poles of H fixtures, may be permitted to deteriorate 10 per cent. under the replacement circumferences given in the tables on account of the greater stability of these poles.

1.08 In connection with the inspection of short poles in rural lines it may be desirable to omit the detailed inspections and measurements of the section of maximum decay, and apply instead the push pike test. The push pike test, which is outlined in the instructions covering "Rural Lines," consists of applying at the center of the wire load a certain push at an angle of 45 degrees and noting the effect on the pole.

2. PREPARATION FOR MEASUREMENT

2.01 Dig out the earth from around the pole butt sufficiently to permit the inspection of the butt at the section of maximum decay. The depth at which maximum decay occurs varies. Usually it is at a depth of 6 to 12 inches below the ground line. In some cases, however, particularly in porous soil, it may be at a considerably greater depth.

2.02 Remove all completely decayed wood, but exercise care to avoid damage to the treated portions of poles and unnecessary removal of sound wood. A Pole Inspection Chisel and Hatchet are available for removing decayed wood and sounding the poles. When the wood shows only discoloration or partial decay beyond the area of complete rot, do not remove any more wood. By "partial decay" is meant a change in the composition of the wood which reduces somewhat the strength of fibres but still provides a substantial proportion of the original strength. Do not chop away good wood in order to expose a decay pocket. Explore the extent of the pocket by boring. (See Paragraphs 3.04, 3.06 and 4.03.)

3. MEASUREMENT AT DECAYED SECTION

3.01 After the decayed wood has been removed, measure the minimum circumference of the pole and make deductions, where necessary, to allow for hollow heart, pockets, etc. The amounts of these deductions are given in Part 4. A Steel Pole Tape is available for measuring the pole circumference.

3.02 Sound each pole at several places around the pole from below the ground line to four or five feet above ground, to determine whether or not there may be hollow heart or enclosed pockets.

3.03 Where there is hollow heart, locate by careful sounding the place where the shell is thinnest and determine the thickness at this point. This thickness may be determined by a test boring, using a 3/8-inch bit, and inserting a Shell Thickness Tool in the hole and noting the distance to the inner surface.

3.04 Where enclosed pockets are found on one side of the pole, determine their extent by boring and measuring the depth of the pocket.

3.05 When a pole is entirely surrounded by concrete or pavement which cannot be removed readily, and when visual inspection and sounding seem to indicate a doubtful condition, make a boring test. For this purpose, bore a 3/8-inch hole near the ground line and at an angle that will intersect the probable decay at as low a point as possible. Careful examination of the chips brought out during the process of boring will indicate the condition. The extent of decay close to the ground line can be approximated by exploring the section with a Pole Prod.

3.06 Whenever a hole is bored in a pole and replacement of the pole is not recommended or suggested, carefully plug the hole by means of creosoted dowels provided for the purpose.

4. ALLOWANCES FOR SPECIFIC DEFECTS

4.01 The circumference measurements of poles having certain defects at or near the ground line, such as hollow heart or enclosed or exposed pockets, do not provide an accurate measure of the amount of sound wood. Allowances must be made for the defects before referring to the inspection tables. Such allowances are tabulated below in terms of deductions to be made from the measured circumferences.

Hollow Hearts

4.02 Measurements of poles having hollow hearts may be corrected by deducting the amounts given in the following table, which shows, for example, that a hollow pole

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having an outer circumference (after the rot has been removed) of 30 inches, and a minimum thickness of shell of 2-1/2 inches, is equivalent in strength to a solid pole measuring 1 inch less. The pole should then be compared with the dimensions given in the inspection tables as if it were a solid pole measuring 29 inches at the ground line.

POLES WITH HOLLOW HEARTS

Deductions to be made from measured circumferences in inches to obtain circumferences of equivalent solid poles.

Measured Circumference of Sound Wood of Hollow Pole in Inches	Minimum Thickness of Shell in Inches*						
	2.0	2.5	3.0	3.5	4.0	4.5	5.0
20	1	—	—	—	—	—	—
21	1	—	—	—	—	—	—
22	1	1	—	—	—	—	—
23	1	1	—	—	—	—	—
24	1	1	—	—	—	—	—
25	1	1	—	—	—	—	—
26	1	1	—	—	—	—	—
27	1	1	1	—	—	—	—
28	1	1	1	—	—	—	—
29	1	1	1	—	—	—	—
30	2	1	1	1	—	—	—
31	2	1	1	1	—	—	—
32	2	1	1	1	—	—	—
33	2	1	1	1	—	—	—
34	2	1	1	1	1	—	—
35	3	2	1	1	1	—	—
36	3	2	1	1	1	—	—
37	3	2	1	1	1	—	—
38	3	2	1	1	1	1	—
39	3	2	1	1	1	1	—
40	4	2	2	1	1	1	—
41	4	3	2	1	1	1	—
42	4	3	2	1	1	1	1
43	4	3	2	1	1	1	1
44	5	3	2	1	1	1	1
45	5	3	2	2	1	1	1

46	5	4	2	2	1	1	1
47	6	4	3	2	1	1	1
48	6	4	3	2	1	1	1
49	6	4	3	2	1	1	1
50	6	4	3	2	2	1	1
51	7	5	3	2	2	1	1
52	7	5	4	2	2	1	1
53	7	5	4	3	2	1	1
54	8	6	4	3	2	1	1
55	8	6	4	3	2	2	1
56	8	6	4	3	2	2	1
57	9	6	5	3	2	2	1
58	9	6	5	3	2	2	1
59	9	7	5	4	3	2	1
60	10	7	5	4	3	2	1

*Poles with hollow heart which have a minimum shell thickness of less than three inches in the case of chestnut poles, or two inches in the case of poles other than chestnut, should be lowered or replaced.

Enclosed Pockets

4.03 Measurements of poles having enclosed pockets on one side, at or near the ground line, may be corrected by deducting the amounts given in the following table, in which depth refers to the maximum depth or radial dimension of the pocket. This table shows, for example, that a pole having a 30-inch measured circumference, a minimum thickness of shell of two inches, and a pocket five inches deep is equivalent in strength to a solid pole having a circumference of one inch less, or 29 inches.

POLES WITH ENCLOSED POCKETS

Deductions to be made from measured circumferences in inches to obtain circumferences of equivalent solid poles.

Measured Circumference of Sound Wood in Inches	Thickness of Shell on Thin Side in Inches	Maximum Depth of Pocket in Inches		
		3.0	4.0	5.0
22-30	1.0	2	2	3
22-30	2.0	—	1	1
22-30	3.0	—	—	—
31-38	1.0	2	3	3
31-38	2.0	1	1	2
31-38	3.0	1	1	1
39-50	1.0	2	3	4
39-50	2.0	1	2	2
39-50	3.0	1	1	1

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Exposed Pockets

4.04 Measurements of poles having exposed pockets of varying shapes and dimensions, at or near the ground line, may be corrected by deducting the amounts given in the following table, in which width refers, in general, to the horizontal width at the outside of the pole, and depth is the average distance obtained by measuring at right angles from a straight-edge (such as the prod carried by the inspector for other purposes) placed across the pocket. This table shows, for example, that a pole having a measured circumference of 30 inches and an exposed pocket 4 inches wide and 3 inches deep will be equivalent in strength to a solid pole having a circumference of 5 inches less than 30, or 25 inches.

POLES WITH EXPOSED POCKETS

Deductions to be made from measured circumferences in inches to obtain circumferences of equivalent solid poles.

Depth of Pocket in Inches	Width of Pocket in Inches							
	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0
1.0	1	1	2	2	3	3	4	5
2.0	1	2	3	4	5	6	7	8
3.0	1	2	4	5	6	8	9	11
4.0	2	3	4	5	7	9	10	13
5.0	2	3	4	6	7	9	11	—

5. INSPECTION ABOVE GROUND

5.01 An inspection from the ground should be made covering the condition of the pole above ground, so as to determine damage from woodpecker holes, splits, checks and other defects which may affect the strength of the pole.

5.02 An inspection from the ground should also be made covering such maintenance conditions as need of replacement of guys, anchors, crossarms, etc., need of straightening poles, necessary pruning for bad tree conditions, and any other work which may require attention under the estimate or work order covering the general reconstruction of the lines.

6. RESTORATION AFTER INSPECTION

6.01 When the inspection is completed, replace the earth and make a mound around the butt of the pole. If the earth replaced is insufficient to form a mound which will afford drainage away from the pole, obtain additional earth and use it for this purpose. Stones removed during the excavation for inspection should be replaced against the pole surface when backfilling.

7. RECOMMENDATIONS

7.01 The recommendations made by the inspector should be based on observation, measurement and comparison with the tables, and should represent his best judgment in the light of experience in the locality concerned. The Pole Inspection Form, the use of which is described in detail in Section G21.320, provides space for entering recommendations as well as measurements and other data.

7.02 Poles which are found so infested with ants or termites or so badly decayed as to be obviously dangerous, and poles having such defects as large woodpecker holes, seriously decayed knots or scars, badly weakened conditions due to burning, cracking, splintering or checking, and which in the judgment of the inspector ought not to remain in service, should be reported immediately. Conditions such as these, even though not immediately dangerous, often involve the likelihood of such rapid decrease in strength that it is best not to rely upon the regular replacement work as a means of safeguarding the line.

7.03 Poles which are broken off or have been so reduced in strength that they might be broken off while climbing, or which might constitute an immediate hazard to the public or employees, should be plainly marked to indicate that they are unsafe. The marking preferably should be applied directly below the pole number, or if the pole is not numbered, the marking should be applied at a height of approximately 4 feet above ground on the road side of the pole. Suitable markings that have been used for this purpose are a red "X" or a blaze chopped in the pole.

7.04 Where the ground line circumferences, as measured and corrected for specific defects, are less than the minimum given in the tables, or where for any other reason it is not desirable to continue the use of poles in their existing condition, the inspector should recommend (a) lowering, (b) reinforcing, or (c) replacing. Other recommendations, calling for changes such as straightening or moving individual poles, or calling for rearrangements involving a whole section of pole line, are sometimes necessary under particular conditions.

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7.05 Lowering involves cutting off at the ground line and resetting, and is the cheapest method for prolonging the service life. Poles may be lowered provided:

- (a) The section above the ground is free from defects which would seriously affect the strength of the pole.
- (b) The lowered pole will be long enough to maintain the proper clearances for existing attachments, or for any additional attachments which it is known will be required within an economical period as determined by the plant engineer previous to the inspection.
- (c) The lowering of the pole will not cause a change of grade between adjacent poles exceeding the limits set in the instructions for pole line construction. In some cases an excessive change in grade at a lowered pole can be avoided by lowering the attachments on the adjacent poles.

7.06 Reinforcing is often a desirable method of prolonging the life of poles in service, and may be used provided:

- (a) The section above the ground is free from defects which would seriously affect the strength of the pole. Poles with hollow heart having a shell thickness of 3 inches or more may be stub reinforced.
- (b) The pole is long enough to provide for any additional attachments which will be placed within the life of the reinforcement.
- (c) The cost of reinforcing will be materially less than the cost of replacing. The greatest economy in reinforcing as against replacing will be realized when the pole carries a large number of attachments and the cost of transferring the attachments to the new pole would consequently be heavy.
- (d) Conditions at the location are such that there will be no objection to reinforcing from an appearance standpoint.

7.07 Replacing of defective poles becomes necessary where lowering or reinforcing is impracticable. The proper class and spacing to be recommended for new poles, considering any additional attachments which will be required within an economical period, should be determined by the plant engineer.

7.08 Rearrangements of sections of pole line should be recommended in some cases, as where the inspection indicates the necessity for the replacement of a number of poles, and where a change in the location of these and possibly adjoining poles will improve or shorten the route. In some cases it may also be advisable to recommend for consideration joint use where it is not already in effect.