BELL SYSTEM PRACTICES
Outside Plant Construction
and Maintenance

SECTION G21.430
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AT&T Co. Standard

# POLE LINES—MAINTENANCE
## STUB REINFORCEMENT

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### 1. GENERAL

1.01 Stub reinforcement is a means of strengthening a pole which has deteriorated at or near the ground line section. It consists of setting a stub in the ground and securing the existing pole to it. A reinforcing stub can also be used to support a pole at the ground where it is raised to obtain greater height.

1.02 There are two general classifications of stub reinforcements, which are designated for convenience as the "cut-off" and the "non-cut-off" types.

1.03 In the "cut-off" type, the deteriorated pole is cut off a few inches above the decayed section, the butt of the old pole is removed, and the reinforcing stub is set in the hole previously occupied by the pole. The pole is then secured to the stub.

1.04 In the "non-cut-off" type, the reinforcing stub is set alongside the deteriorated pole and the pole is secured to it.

1.05 Where the pole is raised to obtain greater clearance the pole is jacked out of the ground and the stub is set in the hole previously occupied by the pole. The pole is then secured to the stub. A pole should be raised only where the butt shows slight, if any, deterioration.

**Reason for Reissue**

1.06 The principal reasons for reissuing this section are to provide information in regard to a new type of band reinforcement and to revise the table of creosoted pine stub sizes in paragraph 5.11. More definite information in regard to the field of use of the cut-off types and other minor changes have been made at various points in the section.

## 2. DESIGNATION OF TYPES OF REINFORCEMENT AND NUMBER OF BANDS REQUIRED

2.01 There are two types of reinforcements designated 1 and 1 A, in which bolts are used for securing the stub to the pole. The former is one of the "non-cut-off" types and the latter is one of the "cut-off" types. The field of use and the details of the construction are described in Part 6.

2.02 The band reinforcements are also of the "non-cut-off" or "cut-off" types and differ only in the arrangement and number of bands used. The field of use of each of these types and the details of construction are also described in Part 6. The following table indicates the number of bands to be used for reinforcing the various sizes of poles.

## NUMBER AND LENGTH OF BANDS RECOMMENDED FOR BAND REINFORCEMENTS

| Length of Band | Class of Pole to be Reinforced | Circ. of Pole Plus Circ. of Stub at Ground | No. of Bands Near Upper End of Stub | No. of Bands Near Lower End of Stub |
|---|---|---|---|---|
| 4′ | Class 7, 8, 9 & 10 | Less than 3′8″ | 1 | 1 |
| 5′8″ | Class 7, 40′ & less in length, Class 8, 9 & 10 | 3′8″ to 6′ | 1 | 1 |
| | **Class 1, 2, 3, 4, 5 & 6, 40′ and less in length | 3′8″ to 6′ | 2 | 1* |
| 7′5″ | **Class 1, 2, 3, 4, 5 & 6, 40′ and less in length | 6′ to 8′ | 2 | 1* |
| 8′3″ | All poles longer than 40 ft. | Less than 8′8″ | 3 or 4 | 2, 3 or 4 |
| 10′ | All poles longer than 40 ft. | 8′8″ to 10′6″ | 3 or 4 | 2, 3 or 4 |

**The number of bands to be used is covered in Paragraph 6.06.**

**NOTES:** *In the cut-off type of reinforcement where the stub must be set in line with the lead, use the same number of bands near the lower end of the stub as is used near the upper end of the stub

**This group represents approx. 97 per cent. of poles reinforced.

2.03 Where a pole is raised to provide clearance, the methods of attaching the pole to the stub are the same as indicated for the "cut-off" type except that when a creosoted pine pole is raised and reinforced with a creosoted pine stub, a creosoted anchor plank is placed under the butt of the pole.

## 3. LIMITATIONS OF USE

3.01 The type of reinforcement to be employed in each case will usually be indicated in the instructions for the work. In general, the "cut-off" types are preferred to the "non-cut-off" under the following conditions:

(a) Where the pole is entirely or nearly rotted off at the ground line.

(b) Where the butt has decayed to such an extent that it would not afford a suitable bearing for a stub placed against it.

(c) Where the pole to be reinforced is set in rock and the excavation of a stub hole alongside the pole would be difficult and more expensive than reusing the old hole with a "cut-off" type.

3.02 The "cut-off" types are not adapted to reinforcing poles of "H" fixtures, on account of having to move the old pole over from its original position.

3.03 Where very heavy loads are to be supported by the "cut-off" type, supplement the stubbing bands with one or two bolts passing through both pole and stub or place a 2 inch creosoted plank under the butt of the pole so that the pole rests on the plank after it is cut off. The plank may be used where the butt of the pole is in sound condition and deep frosts or freezing of the ground with resulting heaving of the soil in the spring are not encountered.

3.04 The "cut-off" band type reinforcement employing 3 to 5 bands will support about 3000 pounds vertical load without through bolts, about 5000 pounds with one bolt and about 7000 pounds with two bolts. The band type employing more than 5 bands will support about 6000 pounds vertical load without through bolts, about 8000 pounds with one bolt and about 10,000 pounds with two bolts.

3.05 The following values are representative vertical loads that the various "cut-off" type reinforcements may be assumed to be capable of supporting. Other combinations of loads roughly equivalent to these may likewise be supported.

| Type of Reinforcement | Kind of Load |
|---|---|
| Band Type (3 to 5 bands) Without Bolts (3,000 lbs. allowable load) | Pole + 2 cables on 16 M. strand (120 ft. spans)<br>Pole + 40 ice-covered conductors (130 ft. spans)<br>Pole + 1 cable on 16,000 pound strand + 20 ice-covered conductors (130 ft. spans)<br>Corner pole supporting one cable on 16 M. strand (130 ft. spans) held by 6 M. pole to stub guy |
| Band Type (3 to 5 bands) With One Bolt (5,000 lbs. allowable load) | Corner pole supporting one cable on 6,000 pound strand (130 ft. spans) and 40 wires (no ice load) held by two 6 M. pole to stub guys<br>Corner pole supporting 20 ice-covered conductors, held by one 6,000 pound anchor guy |
| Band Type (3 to 5 bands) With 2 bolts (7 000 lbs. allowable load) | Corner pole supporting one cable on 16,000 pound strand (130 ft. spans) with a 10,000 pound anchor guy |

3.06 The "non-cut-off" type may be used at corners and other locations without restriction as to vertical load provided that the good wood remaining in the pole at the section of greatest decay measures at least 15 inches in circumference. If this section measures less than 15 inches, the restrictions applying to the "cut-off" types as indicated in Paragraph 3.05 apply.

3.07 Stub reinforcement may be applied to poles at railroad crossings under certain conditions, as described in the instructions covering Railroad Crossings.

## 4. KINDS OF TIMBER FOR STUBS

4.01 The kinds of timber that are considered satisfactory for poles are likewise considered satisfactory for use as stubs.

4.02 Recovered cedar or chestnut poles may be cut into reinforcing stubs, provided that the timber is in good condition, and they cannot be reused as poles or guy stubs. In general, stubs cut from recovered poles should be used only for rural line reinforcements, emergency work or temporary work.

4.03 The use of treated stubs is recommended where the pole is in good condition above the ground line and the pole line will probably be maintained permanently in its existing location.

## 5. SIZES OF STUBS

5.01 The lengths of stubs are given in the following table.

| Length of Pole to be Reinforced (Feet) | Length of Stub (Feet) | |
|---|---|---|
| | When Cut From Old Poles | Treated or Untreated Stock Stubs |
| 20 | 8-1/2 | 10 |
| 25 | 9-1/2 | 10 |
| 30 | 10 | 10 |
| 35 | 10-1/2 | 11 |
| 40 | 11 | 11 |
| 45 | 12 | 13 |
| 50 | 13 | 13 |
| 55 | 14-1/2 | 15-1/2 |
| 60 | 16-1/2 | 19-1/2 |
| 65 | 17-1/2 | 19-1/2 |
| 70 | 18-1/2 | 19-1/2 |
| 75 | 19-1/2 | 19-1/2 |

5.02 The depths to which the stubs should be set depend upon the length of poles to be reinforced and should be the same as are recommended in Section G21.130 for new poles of equivalent length.

5.03 The ground line circumference of a stub should be selected with reference to the size and kind of pole which would be used for replacement at the same location, in accordance with the following table.

| Kind of Stub | Minimum Ground Line Circumference of Stub with Reference to Ground Line Circumference of a | |
|---|---|---|
| | New Untreated Pole | New Treated Pole |
| Treated Pine, Douglas Fir and Treated Cedar | 6 inches less | 2 inches less |
| New Untreated Cedar | 2 inches less | 2 inches more |
| *Cedar or Chestnut Cut from Used Poles | Same as pole | 4 inches more |

*To be used only for rural line reinforcements, emergency jobs or temporary jobs.

5.04 If stubs are to be used for raising an existing pole to obtain increased ground clearance select the minimum ground line circumference of the stub with reference to a new pole of the desired length, that would be used for replacement.

5.05 In general, do not reinforce an undersize pole, that is, a pole of a lower class than would be used for replacement at the same location.

5.06 If there are no replacements specified for a section of line which is typical of that in which the reinforcement is to be applied, obtain from the plant engineer, information in regard to the proper size of pole for reference in the above table.

5.07 In isolated cases, in the absence of information with respect to the size and kind of pole which would be used for a replacement, the indications of the above table may be applied with reference to the size and kind of pole to be reinforced, except that:

(a) Poles which are of a lower class than the average pole in the same wire load section of line, should not be reinforced.

(b) When the pole to be reinforced is appreciably oversized with respect to the average pole in the same wire load section of line, the proper size and kind of stub should be designated by the plant engineer.

5.08 In order to simplify the ordering and stocking of stubs and to reduce to a reasonable minimum the number of sizes to be stocked, certain sizes of Western cedar and creosoted pine stubs have been selected which will satisfactorily meet the requirements in a large proportion of the cases.

5.09 The stock sizes in which Western cedar and pine stubs are available are listed in the following tables. If a larger circumference for a given length of stub is required, select a longer stub with the desired circumference.

5.10 Western cedar stubs, treated or untreated, are available in the following stock sizes: The length and top circumferences are minimum values. The ground line circumference is based on the minimum top, average taper, and average depth of setting.

**DIMENSIONS**

| Length of Stub (Feet) | Class W Circumference (Inches) | | Class X Circumference (Inches) | | Class Y Circumference (Inches) | | Class Z Circumference (Inches) | |
|---|---|---|---|---|---|---|---|---|
| | Top | Ground Line | Top | Ground Line | Top | Ground Line | Top | Ground Line |
| 10 | 16 | 18 | 22 | 24 | 29 | 31 | 37 | 39 |
| 11 | 20 | 22 | 26 | 28 | 33 | 35 | 41 | 43 |
| 13 | 24 | 26-1/2 | 30 | 32-1/2 | 37 | 39-1/2 | 45 | 47-1/2 |
| 15-1/2 | .. | .... | .. | .... | 35 | 38 | 48 | 51 |
| 19-1/2 | .. | .... | .. | .... | 37 | 41 | 50 | 54 |

5.11 Creosoted pine, Lodgepole pine and Douglas fir stubs are available in the following stock sizes: The length and top circumferences are minimum values. The ground line circumference is based on the minimum top, average taper, and average depth of setting.

**DIMENSIONS**

| Length of Stub (Feet) | Class W Circumference (Inches) | | Class X Circumference (Inches) | | Class Y Circumference (Inches) | | Class Z Circumference (Inches) | |
|---|---|---|---|---|---|---|---|---|
| | Top | Ground Line | Top | Ground Line | Top | Ground Line | Top | Ground Line |
| 10 | 15 | 16 | 20 | 21 | 26 | 27 | 33 | 34 |
| 11 | 19 | 20 | 24 | 25 | 30 | 31 | 37 | 38-1/2 |
| 13 | 23 | 24-1/2 | 28 | 29-1/2 | 34 | 35-1/2 | 41 | 42-1/2 |
| 15-1/2 | .. | .... | 30 | 32 | .. | .... | 42 | 44 |
| 19-1/2 | .. | .... | 34 | 36-1/2 | .. | .... | 46 | 48-1/2 |

## 6. METHODS OF STUB REINFORCING

**General**

6.01 In the Nos. 1 and 1-A types, the pole is secured to the stub by means of bolts only. In the other types, galvanized metal bands are used and in some cases, where the poles are cut off, the bands are supplemented by bolts through the pole and stub.

6.02 Locate the stub on the field side of the pole, where practicable. Along infrequently traveled roads the stubs may be set on the road side of the pole. If conditions

make it necessary or preferable, the stub may be set in line with the lead.

6.03 A good contact between the pole and stub must be provided. When necessary, trim untreated poles to obtain a good bearing. In order to prevent separation between the pole and stub by the tightening bolts passing between them, bore a hole for each tightening bolt while the pole and stub are lashed tightly together. After bolts are tightened, cut off excess lengths. If the stub is cut from the gained portion of a pole, place the gains toward the pole. In case a square stub is to be used to reinforce a round pole, or a round stub is to be used to reinforce a square pole, round off the corners of the square section where the bands will be placed, to approximately a 2-inch radius.

6.04 In reinforcing a pole by the "cut-off" methods, proceed as follows:

(1) Support the pole with temporary side guys or with pike poles.

(2) Pull the old pole about one foot out of the ground by means of a jack, pole derrick, or otherwise, to facilitate cutting off the old pole.

(3) Saw off the pole on a slant (see Paragraph 6.06) just above the decayed portion of the butt. The direction of the slant should be such that the low point will be away from the stub.

(4) Set the upper portion of the pole to one side, that is, to the side of the butt that will permit the pole to be placed readily against the stub. It is desirable to set the butt on a stone or plank or other temporary footing, so that it will be at the proper height for attachment to the stub.

(5) Complete the removal of the butt by means of pole jacks, winch line and pole derrick, or by a set of blocks and tackle, using the pole as a gin. See Section G21.505 covering Removal of Poles. Pull the butt out vertically, to avoid tearing out the side of the hole. If necessary, remove the earth around the butt to the depth of a foot or more to facilitate the removal of the butt.

(6) Clean out the hole to the required depth and size.

(7) Set the stub and pole against each other and secure them as described in Paragraph 6.06.

(8) Backfill and tamp as described in Section G21.140.

6.05 In reinforcing a pole by the "non-cut-off" types, proceed as follows:

(1) Dig hole for the stub in the proper location and to the proper depth.

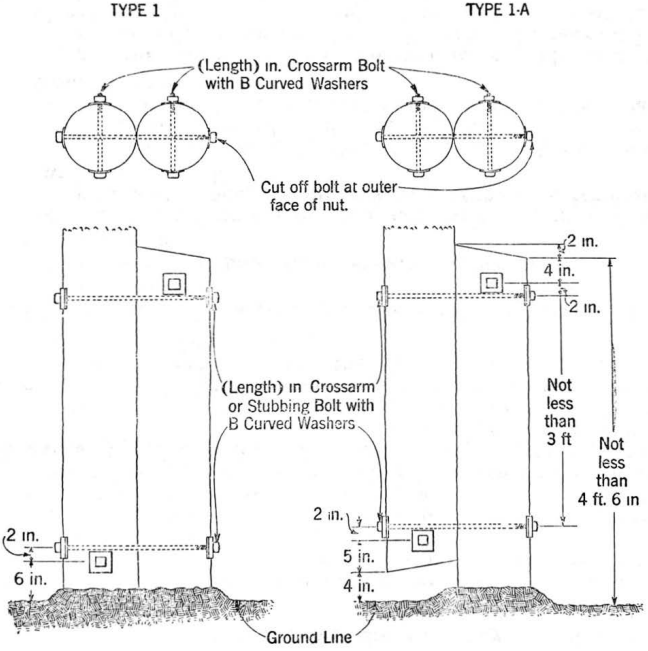
(2) Set the stub against the pole and secure it as described in Paragraph 6.06.

(3) Backfill and tamp as described in Section G21.140.

**Description of Types**

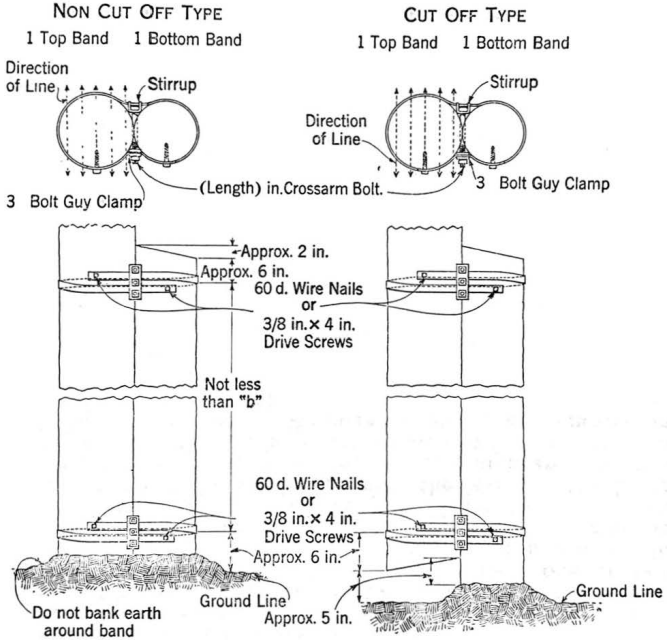
6.06 The conditions under which the various types of reinforcement are to be employed and the details of the various types are described below.

(a) Types 1 and 1-A are suitable for use on light lines (20 or less exchange or rural wires on 30-foot or shorter poles). They may also be used on other lines by the maintenance forces as a temporary measure until the construction forces next go over the line. The bolts in all cases should pass through sound wood.



(b) The band type reinforcement employing a single band at the top and another at the lower part of the reinforcement is also satisfactory for the Class 7 and smaller poles 40 feet and less in length, as indicated in Paragraph 2.02.

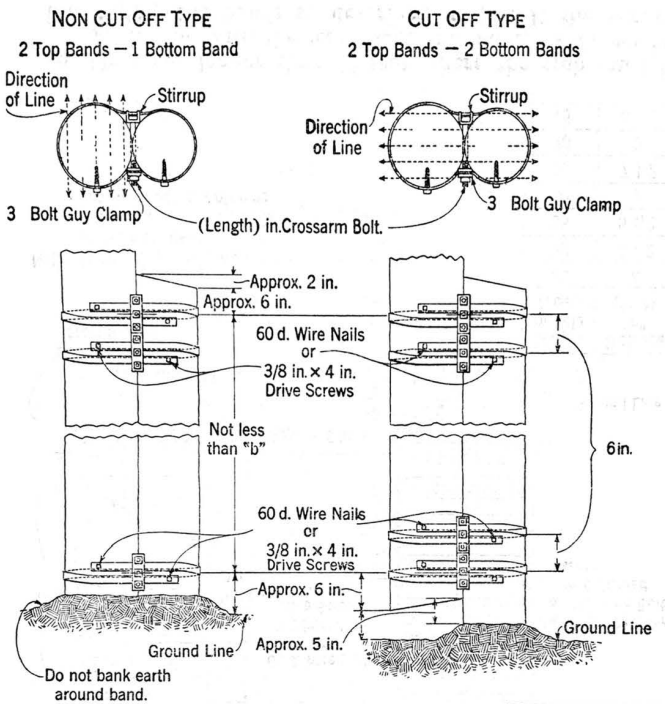
Place the bands as shown below. Place the stub against the pole and bore a clearance hole for the bolt that is placed through the center hole of the 3-bolt guy clamp.




| Length of Pole (Feet) | Distance "b" (Feet) |
|---|---|
| 20 | 3 |
| 25 | 3 |
| 30 | 3 |
| 35 | 3 |
| 40 | 3 1/2 |

Note: In applying the bands, the work will be facilitated if the ends of the bands are secured to the pole or stub by nails or lag screws before tightening the bolt that is placed through the center holes of the 3-bolt clamps. Small holes are provided at the ends of the bands for the purpose.

(c) The band types employing 3 and 4 bands as indicated in Paragraph 2.02 are for use on 40 foot and shorter poles of Classes 1 to 6 poles supporting any number of toll, exchange or rural wires. If the vertical load to be supported is in excess of the load that can properly be supported by bands only (see Part 3), place a 2 inch creosoted plank under the butt of the pole or place one or two through bolts depending on the load to be supported, to supplement the bands. It is preferable to set the stub on the field or road side of the pole. If necessary, however, the stub may be set in line with the lead. In the latter case, if the pole is in a heavy loading area and supports 40 or more wires, it is desirable that two 5/8 inch through bolts with B Curved Washers be placed as indicated in the illustration in (e).

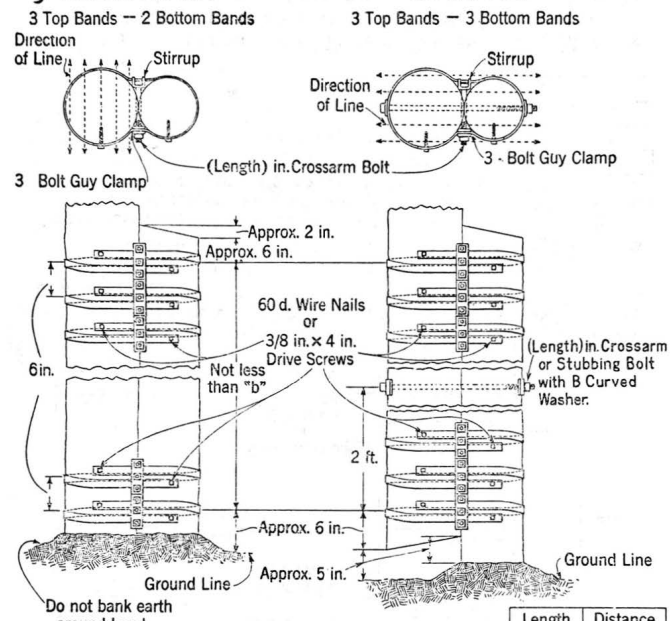



Note - In cut off type where stub is across lead, use same number of bands at lower end as is shown for Non Cut off Type

| Length of Pole (Feet) | Distance "b" (Feet) |
|---|---|
| 20 | 3 |
| 25 | 3 |
| 30 | 3 |
| 35 | 3 |
| 40 | 3 1/2 |

**(d) On poles longer than 40 feet the stub should be set on the field or road side of the pole if practicable. In the cut-off type if it is necessary to place the stub in line with the lead the same number of bands should be placed in the lower position as are used at the upper end of the stub. The bands should be placed as shown in the following. Apply the bands as described in (b). If the vertical load to be supported is in excess of the load that can prop-**

erly be supported by bands only (see Part 3), place a 2 inch creosoted plank or one or two through bolts to supplement the bands as shown below and in (e), depending on the load to be supported.



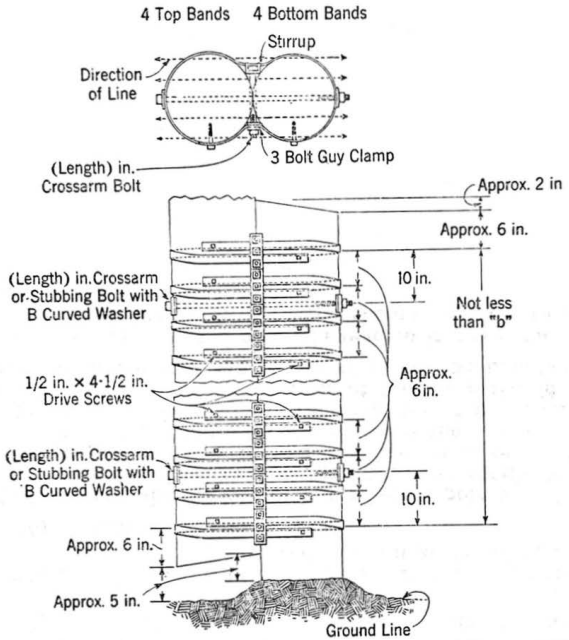

| Length of Pole (Feet) | Distance "b" (Feet) |
|---|---|
| 45 | 4 |
| 50 | 4 1/2 |
| 55 | 5 1/2 |
| 60 | 7 |
| 65 | 7 1/2 |
| 70 | 8 |
| 75 | 8 1/2 |

Note: In cut off type where stub is across lead, use same number of bands at lower end as is shown for non cut off type.

(e) On poles longer than 40 feet where the stub must be set in line with the lead place the bands as shown below. Apply the bands as described in (b). If the vertical

load to be supported is in excess of the load that can properly be supported by bands only (see Part 3), place one bolt as shown above or two through bolts, as shown below, depending on the load to be supported, to supplement the bands.

CUT OFF TYPE




| Length of Pole (Feet) | Distance "b" (Feet) |
|---|---|
| 45 | 4 |
| 50 | 4-1/2 |
| 55 | 5-1/2 |
| 60 | 7 |
| 65 | 7-1/2 |
| 70 | 8 |
| 75 | 8-1/2 |

6.07 Where a pole is to be raised to provide clearance, proceed as follows:

(1) Support the pole with temporary guys arranged so that slack can be given as the pole is raised.

(2) Raise the pole by means of pole jacks or winch line and pole derrick. (See Section G21.505.) As the pole is raised slacken the temporary guys.

(3) Set the pole to the side of the hole it is to occupy with respect to the stub as specified in Paragraph 6.02 and place it on an anchor plank.

(4) Clean out the hole to the required size for the reinforcing stub.

(5) Set the stub against the pole with the pole continuing to rest on the plank, and attach it as described above.

(6) Backfill and tamp.

6.08 In straight sections of line where a pole is to be reinforced by the "cut-off" type the pole should be raked slightly across the line so that the line wires or suspension strand will not introduce a corner pull on the pole as a result of the lower portion of the pole being moved out of its original position. At corners the rake of the poles should be adjusted so that proper sag in the wires will be maintained.

6.09 Where raising a pole will tend to increase the tension in the wires, arrangements should be made to provide proper sags.