BELL SYSTEM PRACTICES
Outside Plant Construction and Maintenance

SECTION G21.150
Issue 1, April, 1933
Standard

PLACING POLES
POLE BRACES

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1. GENERAL

1.01 The use of pole braces as substitutes for anchor guys is not recommended. Under certain conditions, however, particularly where anchor guys cannot be placed or where it would otherwise be necessary to set a higher pole and a stub in order to place a stub guy across a highway, the use of pole braces may offer advantages.

1.02 In constructing pole braces, it is desirable to so place them that they will not interfere with the wires. Shifting of the pins will thereby be reduced to a minimum.

1.03 The preferred $\frac{\text{Lead}}{\text{Height}}$ for the brace, from the standpoint of least wire interference, is different for the various spacings of wires on the crossarms which the brace passes. The preferred values for $\frac{\text{Lead}}{\text{Height}}$ are as follows:

Type of Crossarm	$\frac{\text{Lead}}{\text{Height}}$
A	1/2 or 1
B	2/5 or 5/6 (approx.)
8 pin S or W	2/3
10 pin CS or CW	1

1.04 Under certain conditions, it will be impracticable to provide a $\frac{\text{Lead}}{\text{Height}}$ of the above values. In such cases use may be made of a guy to stub or other type of construction.

1.05 Standard braces are available in a number of different lengths. The upper end is framed to bear flush against the pole when the $\frac{\text{Lead}}{\text{Height}} = 1/2$. These braces may be used satisfactorily for other values of $\frac{\text{Lead}}{\text{Height}}$ provided that the brace is framed slightly on the job. Treated pine braces shall not be cut off to obtain a desired length. The framing at the upper end may be changed where necessary to provide a better fit against the pole, provided that no untreated wood is exposed. Braces are classified according to size and, unless otherwise specified, they should be of the same class as the pole with which they are used. The standard lengths of braces, measured from the butt to the top of the framing, are as follows:

14, 16, 18, 20, 23, 28, 33 and 38 feet.

1.06 The lengths of push braces shown in the table will be found satisfactory under the following conditions:

(a) Ground lines of pole and brace are at same level.

(b) $\frac{\text{Lead}}{\text{Height}} = 1/2$.

(c) The push brace is placed against the pole three feet from the top or directly below the second gain.

(d) The pole is set to the specified depth for poles in earth.

Length of Pole (Feet)	Distance from Pole to Brace at Ground Line (Center to Center)	Distance along Brace from Brace Attachment to 2 Feet below Ground Line	Length of Brace Recommended
20	7 ft.	17 ft.	18 ft.
22	8 "	19 "	20 "
25	9 "	22 "	23 "
30	11 " 3 in.	26 "	28 "
35	13 " 6 "	32 "	33 "
40	16 "	37-1/2 "	38 "
45	18 " 3 "	43 "	43 "
50	20 " 6 "	48 "	48 "

1.07 In cases where due to the $\frac{\text{Lead}}{\text{Height}}$ being other than 1/2, or for other reasons, the above table cannot be used,

the required length of brace can be determined as explained and illustrated below, using a scale diagram to represent conditions.

(1) Draw a vertical line of a proper length to represent the length of the pole. A scale of 1/8 in. = 1 foot will usually be convenient.

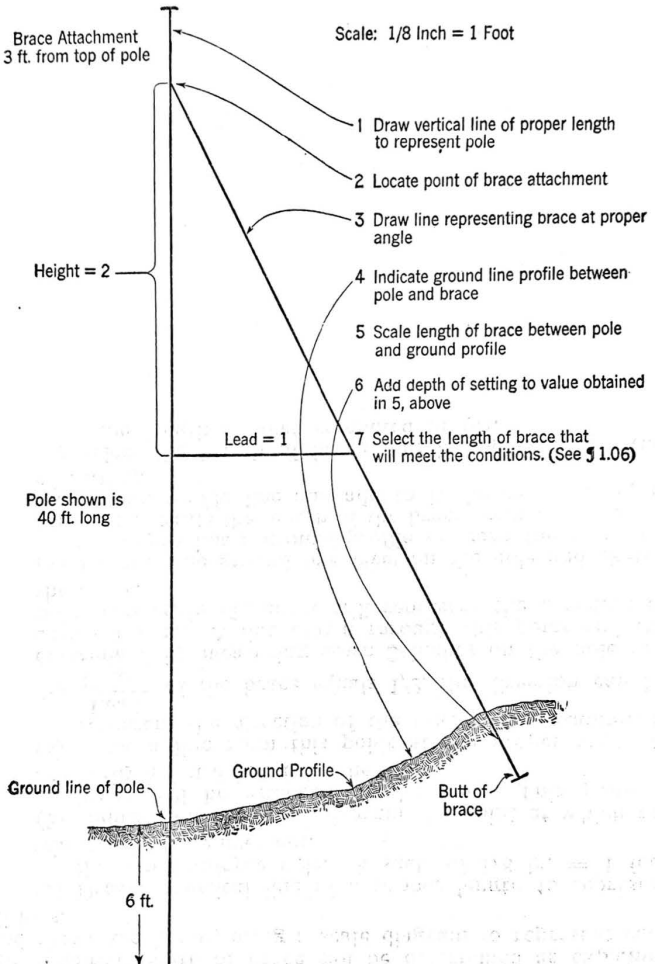
(2) Indicate on the scale diagram the point at which the brace will be attached to the pole. This point is ordinarily about 3 feet from the top.

(3) Draw a line from this point at the proper angle to represent the direction of the brace. For example, if the $\frac{\text{Lead}}{\text{Height}}$ of the brace equals 1/2, the direction can be determined by measuring down 2 inches on the pole and across 1 inch. A line drawn through this point and the point located in (2) above will represent the direction of the brace.

(4) Indicate the ground line level on the pole and sketch the approximate ground profile between the pole and the brace. Scale the length of the brace from Point (2) to the ground profile line and add to it the required depth of setting.

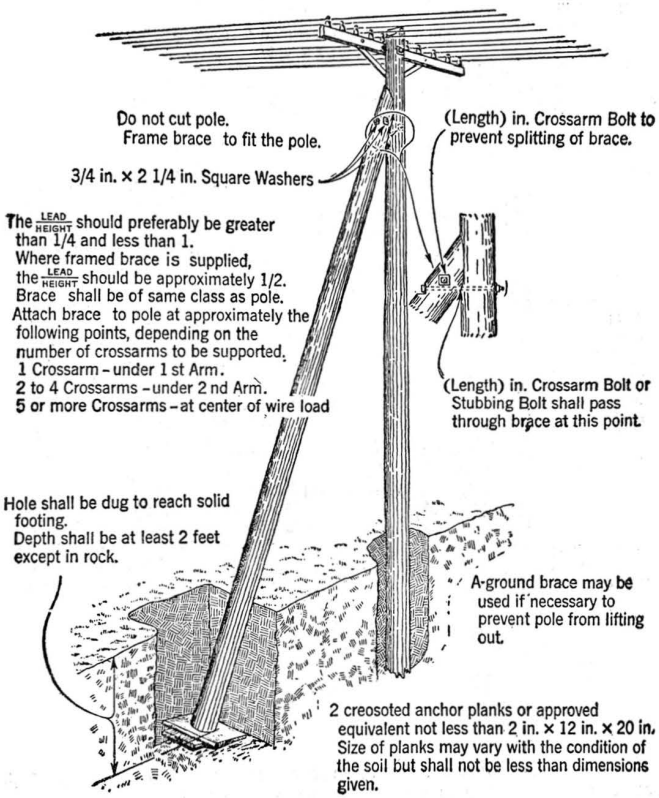
(5) Select the length of brace that is approximately the same length as that computed in (4).

1.08 The following example illustrates the method described in paragraph 1.06.



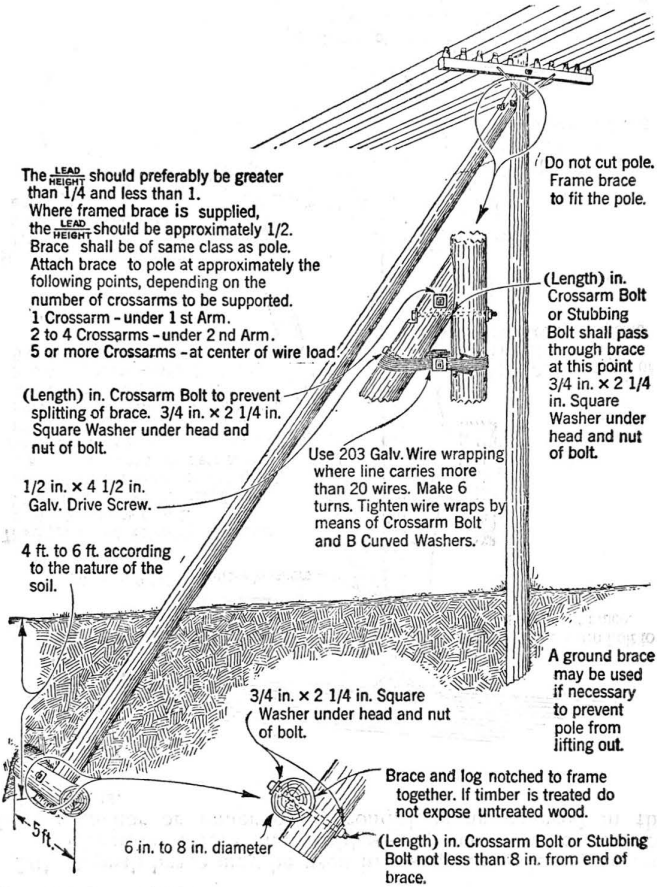
2. PUSH BRACE

2.01 A push brace may be used in place of a side guy in one direction where the right-of-way cannot be secured for an anchor or under other conditions as covered in the detail plans.



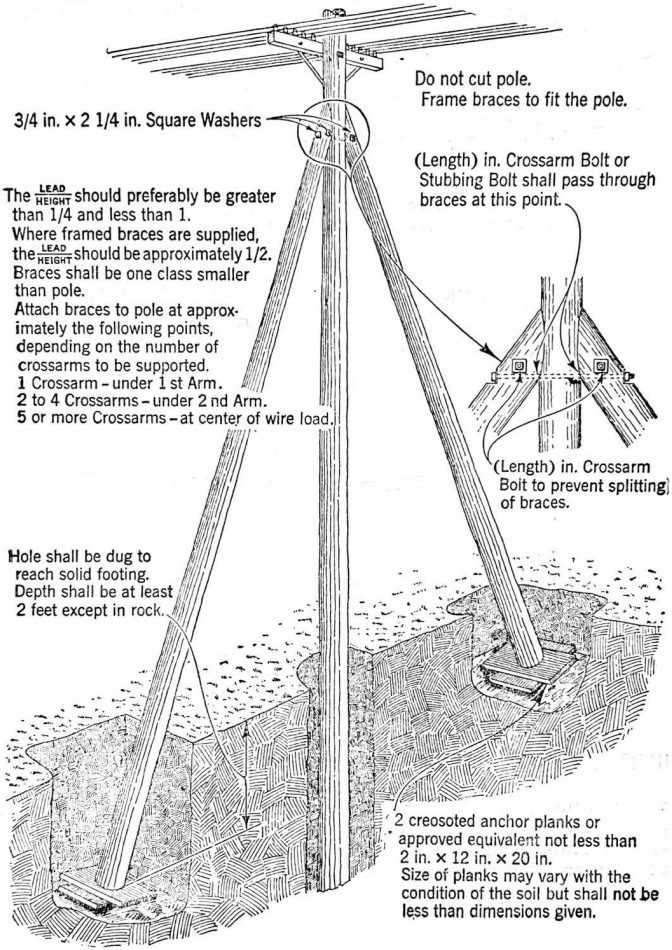
3. PUSH AND PULL BRACE

3.01 A push and pull brace may be used in place of side guys in both directions in marshy ground or where the right-of-way cannot be secured for a stub or anchor.



4. DOUBLE POLE BRACE

4.01 A double pole brace may be used to reinforce an existing pole line in marshy ground. This construction should be used only where it is not convenient to install swamp or other type of anchors or to install a push and pull brace.

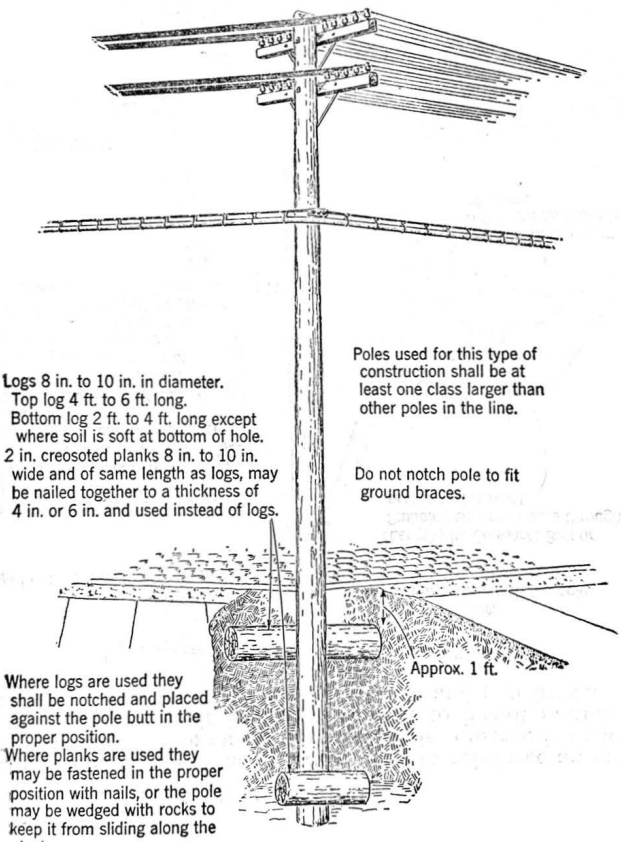


5. GROUND BRACING

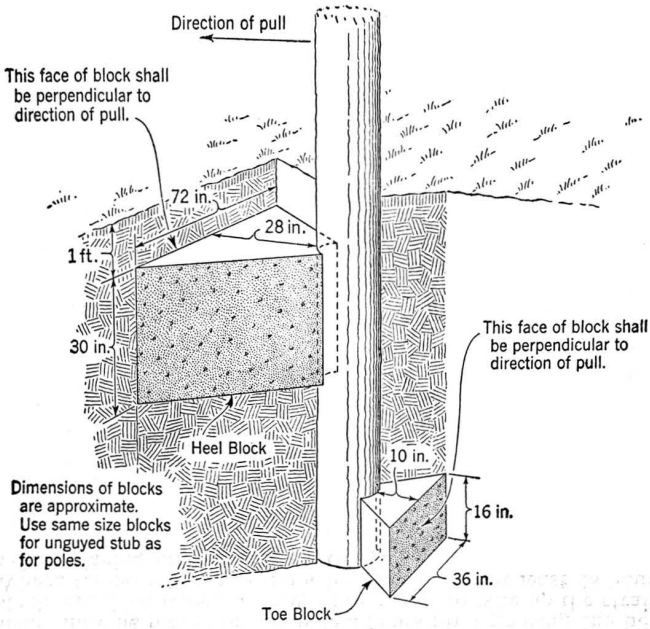
5.01 Where right-of-way for guy or pole brace cannot be obtained, poles may be ground braced, if your supervisor approves. Ground braces shall ordinarily be of creosoted plank or creosoted logs, concrete being employed only where wooden ground braces are impracticable.

5.02 Wooden ground braces at corners and dead-ends shall be placed as shown below:

GROUND BRACE



5.03 Concrete ground braces at corners and dead-ends shall consist of concrete poured into place at the heel and toe of the pole butt to form blocks approximately triangular in shape as shown below. Note that heel blocks are larger than toe blocks.



MATERIAL FOR CONCRETE		
Material	Number of Parts	Approximate Amount Required
Portland Cement	1	4 bags
Sharp Sand	3	11½ cu. ft. (1275 Lbs.)
Crushed Stone or Gravel	6	23 cu. ft. (2750 Lbs.)

5.04 Install concrete braces as follows. Dig pole hole to depth required in Section G21.130. On side of pole hole opposite direction of pull, dig hole of depth equal to pole hole and of dimensions equal to or slightly larger than those of

toe block. On opposite side of pole hole, dig a hole one foot deeper than thickness of heel block, and in other dimensions equal to or slightly larger than heel block. Set pole with proper rake.

5.05 If the earth holds in place and the holes have been dug to approximately the correct shape of the blocks, no forms are necessary. If not, rough board forms may be used to confine the concrete. Pour concrete (previously mixed in proportions of 1-3-6) into hole or form for toe block. Do not permit concrete to encircle pole. Fill hole with dirt up to bottom of heel block excavation. Pour heel block. Do not permit concrete to encircle pole. Fill hole, tamping the earth well. Attachments may be placed on the pole 2 hours after pouring the heel block, provided temporary guys are placed to take up the strain. Where temporary guys cannot be placed, wait at least 48 hours before placing attachments on the pole.