UNITED STATES DEPARTMENT OF AGRICULTURE
Rural Utilities Service

BULLETIN 1751F-650

SUBJECT: Aerial Plant Guying and Anchoring

TO: All Telecommunications Borrowers
RUS Telecommunications Staff

EFFECTIVE DATE: Date of Approval

EXPIRATION DATE: Seven years from effective date

OFFICE OF PRIMARY INTEREST: Outside Plant Branch, Telecommunications Standards Division

PREVIOUS INSTRUCTIONS: This bulletin replaces RUS Telecommunications Engineering & Construction Manual (TE&CM) Section 650, Guys and Anchors on Wire and Cable Lines, Issue 4, dated February 1960; Addenda 1 and 2, dated October 1966, and April 1967; respectively.

FILING INSTRUCTIONS: Discard RUS TE&CM Section 650, Guys and Anchors on Wire and Cable Lines, Issue 4, dated February 1960; Addenda 1 and 2, dated October 1966 and April 1967, respectively; and replace them with this bulletin. File with 7 CFR 1751. This bulletin is available to the RUS staff on RUSNET (text only) and can be accessed via Internet at http://www.usda.gov/rus/home/home.htm

PURPOSE: This bulletin provides RUS borrowers, consulting engineers, contractors and other interested parties with information on the guying and anchoring of aerial plant facilities.

Wally Beyer — 7/3/96

Administrator — Date

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ABBREVIATIONS

°C	Degrees Celsius
EHS	Extra High Strength Galvanized Steel
°F	Degrees Fahrenheit
ft	Feet
H	Height
in.	Inches
L	Lead
lbf	Pounds-force
L/H	Lead/Height Ratio
m	Meter
MGN	Multigrounded Neutral
mm	Millimeter
N	Newton
NESC	National Electrical Safety Code
PF	Anchor Assembly Unit
RUS	Rural Utilities Service
TE&CM	Telecommunications Engineering and Construction Manual

DEFINITIONS

6M Guy: A guy strand size having a rated breaking strength of 6,000 pounds-force (lbf) [26,688 Newtons (N)].

10M Guy: A guy strand size having a rated breaking strength of 10,000 lbf (44,480 N).

16M Guy: A guy strand size having a rated breaking strength of 16,000 lbf (71,168 N).

Anchor: A device that serves as a reliable support to hold an object firmly in place. The term anchor is normally associated with cone, plate, screw, or concrete anchors, but the terms snub, deadman and anchor log are usually associated with pole stubs or logs set or buried in the ground to serve as temporary anchors. The latter are often used at pull and tension sites.

Anchor rod: A steel or other metal rod designed for convenient attachment to a buried anchor and also to provide for one or more guy attachments above ground.

Deadend Guy: An installation of line or anchor guys to hold the pole at the end of a line.

<u>Effectively Grounded</u>: Intentionally connected to earth through a ground connection or connections of sufficiently low impedance and having sufficient current-carrying capacity to prevent the buildup of voltages that may result in undue hazards to connected equipment or to persons.

<u>Guy</u>: A tension member having one end secured to a fixed object and the other end attached to a pole or other structural part that it supports.

<u>Guy Strand</u>: A stranded group of wires used as a semiflexible tension support between a pole or structure and the anchor rod, or between structures.

<u>Heavy Loading District</u>: Horizontal wind pressure, at a right angle to the line, of 4 pounds per square foot (190 Pascals) upon the projected area of the cylindrical surfaces of all supported wires (including suspension strand and cables) when coated with a radial thickness of 0.50 inch (in.) [12.5 millimeters (mm)] of ice at a temperature of 0°F (-20°C).

<u>Height</u>: The vertical distance between the attachment of the guy strand to the pole and the surface of the ground at the anchor.

<u>Lashed Aerial Cable</u>: Cable that is attached to the separate suspension strand by lashing wire to support the cable.

<u>Lead</u>: The horizontal distance between the pole and where the guy attaches to the anchor.

<u>Lead/Height Ratio</u>: The ratio of the "lead distance" to the "height distance".

<u>Light Loading District</u>: Horizontal wind pressure, at a right angle to the line, of 9 pounds per square foot (430 Pascals) upon the projected area of the cylindrical surfaces of all supported wires (including suspension strand and cables) at a temperature of 30°F (-1°C).

<u>Medium Loading District</u>: Horizontal wind pressure, at a right angle to the line, of 4 pounds per square foot (190 Pascals) upon the projected area of the cylindrical surfaces of all supported wires (including suspension strand and cables) when coated with a radial thickness of 0.25 in. (6.5 mm) of ice at a temperature of 15°F (-10°C).

<u>PF1-3</u>: An expanding anchor assembly unit which includes all the material and labor costs to install the anchor with rod. The holding power of the anchor is 6,000 lbf (26,688 N).

PF1-5: An expanding anchor assembly unit which includes all the material and labor costs to install the anchor with rod. The holding power of the anchor is 10,000 lbf (44,480 N).
PF1-7: An expanding anchor assembly unit which includes all the material and labor costs to install the anchor with rod. The holding power of the anchor is 16,000 lbf (71,168 N).

PF2-3: An plate anchor assembly unit which includes all the material and labor costs to install the anchor with rod. The holding power of the anchor is 6,000 lbf (26,688 N).

PF2-5: An plate anchor assembly unit which includes all the material and labor costs to install the anchor with rod. The holding power of the anchor is 10,000 lbf (44,480 N).

PF2-7: An plate anchor assembly unit which includes all the material and labor costs to install the anchor with rod. The holding power of the anchor is 16,000 lbf (71,168 N).

PF3-3: A screw anchor assembly unit which includes all the material and labor costs to install the anchor with rod. The holding power of the anchor is 6,000 lbf (26,688 N).

PF3-5: A screw anchor assembly unit which includes all the material and labor costs to install the anchor with rod. The holding power of the anchor is 10,000 lbf (44,480 N).

PF3-7: A screw anchor assembly unit which includes all the material and labor costs to install the anchor with rod. The holding power of the anchor is 16,000 lbf (71,168 N).

PF5-3: A rock anchor assembly unit which includes all the material and labor costs to install the anchor with rod. The diameter of the rod is 3/4 in. (19 mm).

PF5-4: A rock anchor assembly unit which includes all the material and labor costs to install the rod as the anchor. The diameter of the rod is 1 in. (25.4 mm).

PF6-3: A swamp anchor assembly unit which includes all the material and labor costs to install the anchor with rod. The holding power of the anchor is 6,000 lbf (26,688 N).

PF6-4: A swamp anchor assembly unit which includes all the material and labor costs to install the anchor with rod. The holding power of the anchor is 8,000 lbf (35,585 N).

PF6-5: A swamp anchor assembly unit which includes all the material and labor costs to install the anchor with rod. The holding power of the anchor is 10,000 lbf (44,480 N).

Pole: A column of wood supporting overhead cables usually by means of brackets.

Push Brace: A supporting member, usually of timber, placed between a pole or other structural part of a line and the ground or a fixed object.

Resident Engineer: The representative of the Engineer who is delegated full-time "on-site" engineering responsibilities for construction administration.

RUS Accepted (Material and Equipment): Material and equipment which RUS has reviewed and determined that:

a. Final assembly is conducted within the United States, Mexico, or Canada or any of their respective territories and the cost of United States, Mexican, or Canadian, manufactured components, in any combination, is more than 50 percent of the total cost of all components utilized in the material or equipment, and

b. The material or equipment complies with pertinent RUS or industry standards and field experience has demonstrated that the material or equipment is suitable for use on systems of RUS telecommunications borrowers.

RUS Technically Accepted (Material and Equipment): Material and equipment which RUS has reviewed and determined that:

a. Final assembly is not conducted within the United States, Mexico, or Canada, or any of their territories, or the cost of components within the material or equipment which are manufactured within the United States, Mexico, or Canada, or any of their territories, cost 50 percent or less than the total cost of all components utilized in the material or equipment, and

b. The material or equipment complies with pertinent RUS or industry standards and field experience has demonstrated that the material or equipment is suitable for use on systems of RUS telecommunications borrowers.

Self-Supporting Aerial Fiber Optic Cable: A cable consisting of one or more buffered optical fibers factory assembled with a messenger that supports the cable.

Span Length: The horizontal distance between two adjacent supporting points of a cable.

Suspension Strand: A stranded group of wires supported above the ground at intervals by poles or other structures and employed to furnish within these intervals frequent points of support for cables.

1. GENERAL

1.1 This bulletin discusses in particular the guying and anchoring of aerial plant using filled copper and fiber optic cables and filled, self-supporting fiber optic cables. The information and recommendations in this bulletin are advisory.

1.2 Some of the work items associated with guying and anchoring of aerial plant are as follows:

a. Pre-installation inspection of anchors and anchor rods; and

b. Pre-installation inspection of guy strands.

1.3 Additional information for the use in guying and anchoring of aerial plant facilities can be found in following documents:

a. Rural Utilities Service (RUS) Form 515, RUS Telephone System Construction Contract (Labor and Materials);

b. RUS Bulletin 345-153, Specifications and Drawings for Construction of Pole Lines, Aerial Cables and Wires (RUS Form 515f);

c. RUS Bulletin 1751F-626, Staking of Aerial Plant;

d. RUS Bulletin 1751F-630, Design of Aerial Plant;

e. RUS Bulletin 1751F-635, Construction of Aerial Plant;

f. RUS Bulletin 1751F-670, Outside Plant Corrosion Considerations; and

g. Latest edition of the National Electrical Safety Code (NESC).

2. DESIGN CONSIDERATIONS

2.1 The size of the guy for lashed aerial plant facilities using filled copper or filled fiber optic cables should be based on the tension in the suspension strand when the filled copper or filled fiber optic cable and strand are loaded to 60 percent of the rated breaking strength of the suspension strand. The strength of the guy used for lashed aerial plant construction is independent of the span length and the three storm loading districts as defined in the latest edition of the NESC.

2.2 The size of the guy for filled, self-supporting fiber optic cables should be based on the tension in the stranded support messenger when the filled, self-supporting fiber optic cable and integral messenger are loaded to 60 percent of the rated breaking strength of the integral support messenger. The strength of the guy used for filled, self-supporting fiber optic cable construction is independent of the span length and the three storm loading districts as defined in the latest edition of the NESC.

2.3 Guy strands used in aerial plant construction should be RUS accepted or technically accepted. Guy strands normally used in aerial plant construction are given in Tables 1 and 2.

TABLE 1
Guy Strand Sizes
Utilities Grade
7 Wire, Galvanized Steel Strand

Strand Designations	Diameter in. (mm)
6M	5/16 (7.9)
10M	3/8 (9.5)
16M	7/16 (11.1)

TABLE 2
Guy Strand Sizes
Extra High Strength (EHS)
7 Wire, Galvanized Steel Strand

Strand Designations	Diameter in. (mm)
6M	1/4 (6.3)
10M	5/16 (7.9)
16M	7/16 (11.1)

2.4 The strength of guys used in aerial plant construction should be in accordance with the required grade of construction as defined in the latest edition of the NESC.

2.5 The guying of aerial plant facilities crossing railroads should be performed in accordance with Section 24 of the latest edition of the NESC and the “Specification For Communication Lines Crossing the Tracks of Railroads” issued by the Association of American Railroads.

2.6 Figure 1 shows the measurements for determining the “lead” (L) and “height” (H) of guys. L/H ratios for best results of aerial plant construction should be between 1/2 and 1. L/H ratios less than 1/2 and greater than 1 should not be used unless circumstances require otherwise. When L/H ratios less than 1/2 are required, the longest “lead” possible should be obtained and the strength of poles, guys, and anchors should be increased as required for the increased load.

2.7 When sidewalk guy arms are required to be installed, the sidewalk guy arms should be designed using larger strand sizes and stronger poles than would be needed for normal guying applications with the same L/H ratios. Figure 2 depicts a sidewalk guy arm application and gives the procedure for determining the size of the guy strand and class of pole that should be installed.

3. FILLED AERIAL CABLE GUYS

3.1 Guys for poles supporting lashed filled copper or fiber optic cables at various corner angles and deadends for the three commonly used suspension strands installed either singly or in combinations on poles should be selected using the information provided in Table 3. The information given in Table 3 can be used for the selection of guy strands in the heavy, medium, and light loading districts as defined in the latest edition of the NESC.

TABLE 3
Minimum Guy Strand Selection Chart
Filled Copper or Fiber Optic Cables
Corners and Deadends
Heavy, Medium, and Light Loading Districts

Suspension Strand Size	L/H Ratio	Corner Angles (Degrees)											
		5	10	15	20	25	30	35	40	45	50	55	60
6M	1/2	6M	6M	6M	6M	6M	6M	6M	6M	10M	10M	10M	10M
	1	6M	6M	6M	6M	6M	6M	6M	6M	6M	6M	6M	6M
10M	1/2	6M	6M	6M	6M	10M	10M	10M	16M	16M	16M	16M	16M
	1	6M	6M	6M	6M	6M	6M	6M	10M	10M	10M	10M	10M
16M	1/2	6M	6M	10M	10M	10M	16M	16M	20M	20M	20M	26M	26M
	1	6M	6M	6M	6M	10M	10M	10M	6M	16M	16M	16M	16M
20M	1/2	6M	6M	10M	16M	16M	16M	20M	26M	26M	26M	32M	32M
	1	6M	6M	6M	10M	10M	10M	16M	16M	16M	20M	20M	20M

Note 1: For deadends use 60 degree corner angle guy size.
Note 2: For 20M guy size, use 2 10M guys or equivalents.
Note 3: For 26M guy size, use 1 10M guy and 1 16M guy or equivalents.
Note 4: For 32M guy size, use 2 16M guys or equivalents.
Note 5: For 20M strand size, use 2 10M strands or equivalents.

3.2 Guys for poles supporting filled, self-supporting fiber optic cables at various corner angles and deadends using 1/4 in. (6.35 mm) 7 wire, EHS, galvanized steel strand integral supporting messengers should be selected using the information provided in Table 4. The information given in Table 4 can be used for the selection of guy strands in the heavy, medium, and light loading districts as defined in the latest edition of the NESC.

TABLE 4 Guy Strand Selection Chart Filled, Self-Supporting Fiber Optic Cables			
Integral Messenger Size	L/H Ratio	Maximum Corner Angle in Degrees for Size of Guy Strand	
		6M	10M
1/4 in. (6.35 mm)	1/2	35	60
	1	60	--

3.3 Guys placed at corners of 60 degrees or less should be installed so that the guys bisect the corner angles unless strand is double-deadended for other reasons.

3.4 Two head guys should be installed at corners that are greater than 60 degrees but less than 90 degrees. The anchors for each of the two guys should be installed approximately 2 feet (ft) (610 mm) away from the "in-line" position toward the bisectors of corner angles.

3.5 Two head guys should be installed at corners of 90 degrees or greater. The anchors should be placed in line with cable strands they hold. The thimbleye bolts, guy hooks, or other suitable types of hardware should be installed through the poles for each strand and its guy.

4. GUYING OF UNUSUAL CASES

4.1 Guying may be required in certain unusual cases not covered in this bulletin. In such cases the resident engineer or the resident engineer's representative should make a thorough study of the situation and provide adequate guying in accordance with the NESC or other local code, whichever is the more stringent code.

4.2 In some situations, guying may be required at locations where normal placement of anchor guys may be impracticable because conditions do not allow sufficient L/H ratios to be obtained while maintaining the required clearances. In these circumstances sidewalk guys or other acceptable methods should be used but only as last resorts.

5. GUY ATTACHMENTS TO POLES AND PUSH BRACES USED IN PLACE OF GUYS

5.1 Guys with downward pulls should be attached to poles by means of thimbleye angle bolts, guy hooks, or other suitable types of hardware. Guys with horizontal pulls should be attached to poles by means of straight thimbleye bolts, guy hooks, or other suitable types of hardware.

5.2 Push braces should be used for supporting horizontal loads on poles only when it is impracticable to place down guys or overhead guys to stub poles. When push braces are used, the push braces should be of the same pole classes as the poles they brace. Push brace installations recommend the installation of pole keys at pole butts to prevent lifting of poles during storm conditions and plank footings where rock footings are not present at butts of braces.

6. POLE-TO-POLE AND POLE-TO-STUB POLE GUYS

6.1 Pole-to-pole guys should be only installed when it is impracticable to install anchor guys.

6.2 The sizes of down guys at stub poles in pole-to-stub pole guy installations should be selected as though the down guys are to be attached to line corner poles instead of stub poles. The overhead guy sizes should be the same sizes as required for down guys with L/H ratios of 1.

7. ELECTRICAL PROTECTION OF EXPOSED GUYS AND ADDING GUYS TO EXISTING ANCHORS

7.1 Guys classified as exposed guys should be considered electrical hazards to workmen and the public and should be electrically protected.

7.2 Guys are considered to be exposed guys when:

a. Guys pass over, under, or between supply conductors having voltages that exceed 300 volts to ground;

b. Guys are attached to poles carrying supply conductors having voltages exceeding 300 volts to ground;

c. The minimum horizontal distance between the guy and the nearest supply conductor having voltages that exceed 300 volts is less than 10 ft [3 meters (m)]; and

d. Guys that are connected to continuous cable suspension strands which are not systematically and effectively grounded.

7.3 Electrical protection of exposed guys should be accomplished by grounding the guys. The grounding of the guys should be accomplished by:

a. Bonding guys to vertical pole ground wires which are connected to multiground neutrals (MGN); or

b. Bonding guys to effectively grounded cable suspension strands.

7.4 Guys on the same throughbolts with effectively grounded cable suspension strands are considered to be electrically bonded to the suspension strands thus eliminating the need for separate bonding conductors.

7.5 Auxiliary eye bolts should be use for attaching second guys to existing anchor rods having eyes for only one guy strand. When attachment of guys to existing anchors of foreign companies is contemplated, the foreign companies should be notified. Permission from the foreign companies should be obtained before attaching the guys to the anchor rods. In any event the attachment of second guys to existing anchors should only be performed if it is known that the existing anchors have sufficient holding power for the load of the two guys.

8. GUY SELECTION EXAMPLES

8.1 For the selection of a guy associated with filled copper cables, assume the following conditions:

a. A pole supporting a filled copper cable lashed to 6M suspension strand;

b. A corner angle of 45 degrees; and

c. A L/H = 1/2.

The information given in items “a” through “c” above indicate that Table 3 should be used for selecting the guy size. Table 3 shows that for a L/H = 1/2 at a 45 degree corner, a 10M guy should be used to provide satisfactory holding power at the pole.

8.2 For selection of a guy associated with filled fiber optic cables, assume the following conditions:

a. A pole supporting a filled fiber optic cable lashed to a 6M suspension strand;

b. A corner angle of 30 degrees; and

c. A L/H = 1.

The information given in items “a” through “c” above indicate that Table 3 should be used for selecting the guy size. Table 3 shows that for a L/H = 1 at a 30 degree corner, a 6M guy should be used to provide satisfactory holding power at the pole.

8.3 For the selection of a guy associated with filled, self-supporting fiber optic cables, assume the following conditions:

a. Messenger of the self-supporting, filled fiber optic cable is a 1/4 in. (6.35 mm) 7 wire, EHS, galvanized steel strand;

b. A corner angle of 45 degrees; and

c. A L/H = 1/2.

The information given in items “a” through “c” above indicate that Table 4 should be used for selecting the guy size. Table 4 shows that for a L/H = 1/2 at a 45 degree corner, a 10M guy should be used to provide satisfactory holding power at the pole.

8.4 For selection of a sidewalk guy arm, assume the following conditions:

a. A 30 ft (9 m) pole carrying a filled copper cable lashed to a 6M suspension strand;

b. A minimum pole setting depth of 5.5 ft (1.7 m) for the 30 ft (9 m) pole;

c. A guy attachment distance of 1.0 ft (0.3 m) from the top of the pole;

d. A corner angle of 45 degrees; and

e. A pipe having an outside diameter of 2 in. (50.8 mm) and a length of 8 ft (2.4 m) which is attached to the pole at a height of 8 ft (2.4 m) above the ground.

8.4.1 The information given in items “a” through “e” above indicates that Figure 2 and Table 3 should be used in determining the appropriate the sidewalk guy arm.

8.4.2 The solution for selecting the sidewalk guy arm should be performed using the following steps:

a. Compute AE from Figure 2 which indicates that AE = (pole length minus pole setting depth minus guy attachment distance from top of pole). Therefore, AE = 30 ft - 5.5 ft - 1.0 ft = 23.5 ft using the English Units listed in items “a” through “c” of Paragraph 8.4 of this bulletin. AE = 9 m - 1.7 m - 0.3 m = 7 m using the Metric Units listed in Paragraph 8.4 of this bulletin;

b. Compute L/H from Figure 2 which indicates that L/H = BC/AC = BC/(AE - CE). Therefore, L/H = 8 ft/(23.5 ft - 8 ft) = 8 ft/15.5 ft = 1/1.9 using the English Units listed in item "e" of Paragraph 8.4 and item "a" of Paragraph 8.4.2 of this bulletin. Using the Metric Units listed in item "e" of Paragraph 8.4 and item "a" of Paragraph 8.4.2 L/H = 2.4 m/(7 m - 2.4 m) = 2.4 m/4.6 m = 1/1.9. Since the calculated L/H ratio of 1/1.9 is close to a L/H ratio of 1/2, a L/H ratio of 1/2 is used for the remaining calculations to determine the appropriate sidewalk guy arm;

c. Using Table 3, we see that for a 6M suspension strand with a L/H = 1/2 and a corner angle of 45 degrees, the guy strand selected for the application should be a 10M;

d. Figure 2 indicates that for a 10M guy, the strand size for the sidewalk guy should be 16M since AE, the height of the guy attachment to the pole, which is 23.5 ft (7 m), is between 20 ft (6.1 m) and 26 ft (7.9 m) as indicated in Figure 2; and

e. Finally Figure 2 indicates that a Class 3 pole should be used in the sidewalk guy arm installation because the L/H = 1/2.

9. ANCHOR SELECTION

9.1 Anchors should be selected based on the soil type at the anchor location and the size of the guy selected from either Table 3 or Table 4 of this bulletin.

9.2 The various soil types that may be encountered during anchor installations are classified as follows:

a. Class 1 - Hard rock (solid);

b. Class 2 - All soil except hard rock, sand, and swamp;

c. Class 3 - Sand; and

d. Class 4 - Swamp.

9.3 After the guy size has been selected from either Table 3 or Table 4 the anchor assembly unit for the appropriate guy size should be selected from Table 5 based on the soil type where the anchor is to be installed. Anchor assembly units given in Table 5 are defined in RUS Bulletin 345-153, Specifications and Drawings for Construction of Pole Lines, Aerial Cables and Wires(RUS Form 515f) and this bulletin. Where Table 5 provides for more than one anchor assembly unit, a choice as to which anchor assembly unit to be installed should be made by the resident engineer based on sound engineering judgment. In certain situations the use of 2 anchors and guys may be required to be installed to provide satisfactory holding power of the aerial cable line.

TABLE 5
Minimum Anchor Selection Chart

Guy Size	Anchor Assembly Unit Soil Class Class 1	Class 2	Class 3	Class 4
6M	PF5-3 or PF-5-4 (Note 6)	PF1-3, PF2-3, or PF3-3	PF1-3, PF2-3, or PF3-3	PF6-3
10M	PF5-3 or PF5-4 (Note 6)	PF1-5, PF2-5, or PF3-5	PF1-5, PF2-5, or PF3-5	PF6-4
16M	PF5-3 or PF5-4 (Note 6)	PF1-7, PF2-7, or PF3-7	PF1-7, PF2-7, or PF3-7	PF6-5
20M (use 2 10M Guys)	2 PF5-3 or 2 PF5-4 (Note 6)	2 PF1-5, 2 PF2-5, or 2 PF3-5	2 PF1-5, 2 PF2-5, or 2 PF3-5	2 PF6-4
26M (use 1 10M Guy and 1 16M guy)	2 PF5-3 or 2 PF5-4 (Note 6)	1 PF1-5 and 1 PF1-7; 1 PF2-5 and 1 PF2-7; or 1 PF3-5 and 1 PF3-7	1 PF1-5 and 1 PF1-7; 1 PF2-5 and 1 PF2-7; or 1 PF3-5 and 1 PF3-7	1 PF6-4 and 1 PF6-5
32M (use 2 16M Guys)	2 PF5-3 or 2 PF5-4 (Note 6)	2PF1-7, 2 PF2-7, or 2 PF3-7	2 PF1-7, 2 PF2-7, or 2 PF3-7	2 PF6-5

Note 6: The PF5-3 and PF5-4 anchor assembly units are not interchangeable.

9.4 PF5-3 anchor assembly units should be installed either in accordance with the guide drawing listed in RUS Bulletin 345-153 (RUS Form 515f) or Figure 3 of this bulletin.

9.5 PF5-4 anchor assembly units should be installed in accordance with the guide drawing listed in RUS Bulletin 345-153 (RUS Form 515f).

9.6 Swamp anchors are screw type anchors. Swamp anchors use galvanized steel sections of pipe as “rods”, which allow the lengths of anchor rods to be as long as necessary by coupling the pipe sections together. This allows anchors to be installed in firm soil under swamps. The rods should be of sufficient length that should result in penetration into the firm soil under the swamps of at least 5 ft (1.5 m).

10. ANCHOR INSTALLATION PRECAUTIONS

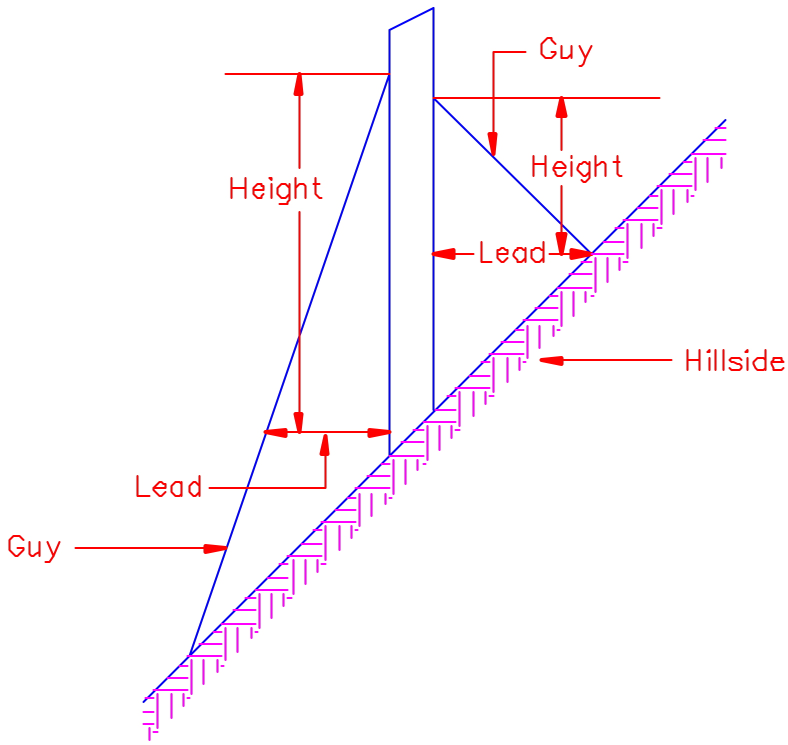
10.1 Holes dug for anchors should be no larger than necessary to permit entry of anchors into the holes.

10.2 Care should be exercised in placing certain types of expanding anchors to prevent earth or sand falling into the holes and lodging between the plates which could prevent full expansion of the plates and which could result in a reduction of the anchor’s holding power.

10.3 Anchor holes should be dug to such depths that no more than about 6 in. (152 mm) of anchor rods should be above ground after strain is applied by guys. Anchor holes should be dug so that anchor rods will be in line with guys. Anchor rods should not be bent. Thimbleyes of anchor rods should never be covered with earth.

FIGURE 1
GUY LEAD AND HEIGHT MEASUREMENTS

Hillside Measurements



Level Ground Measurements

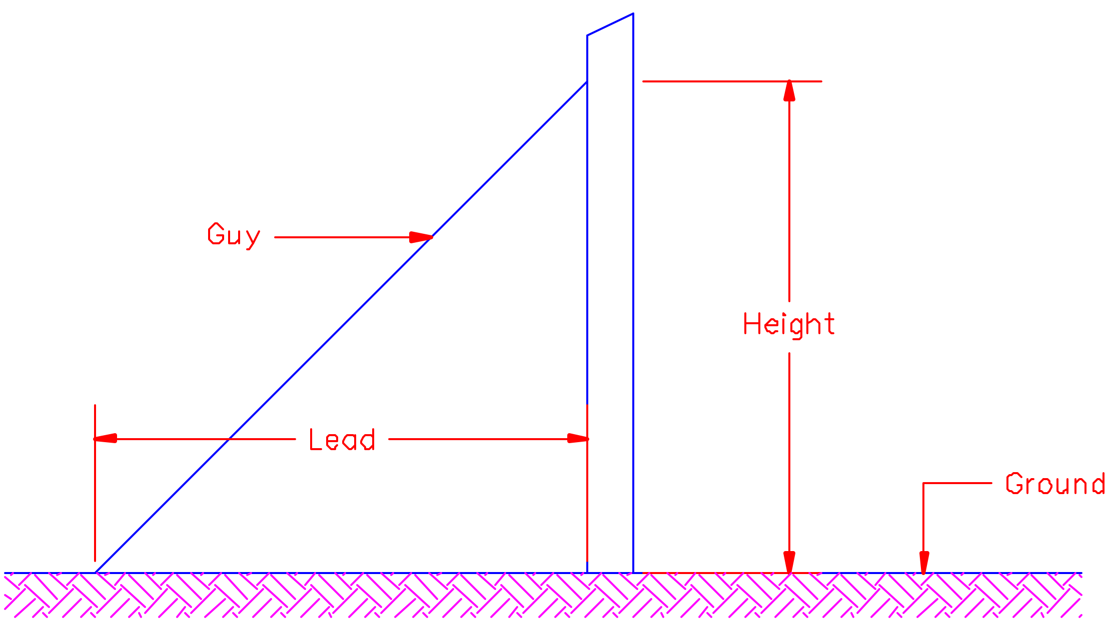
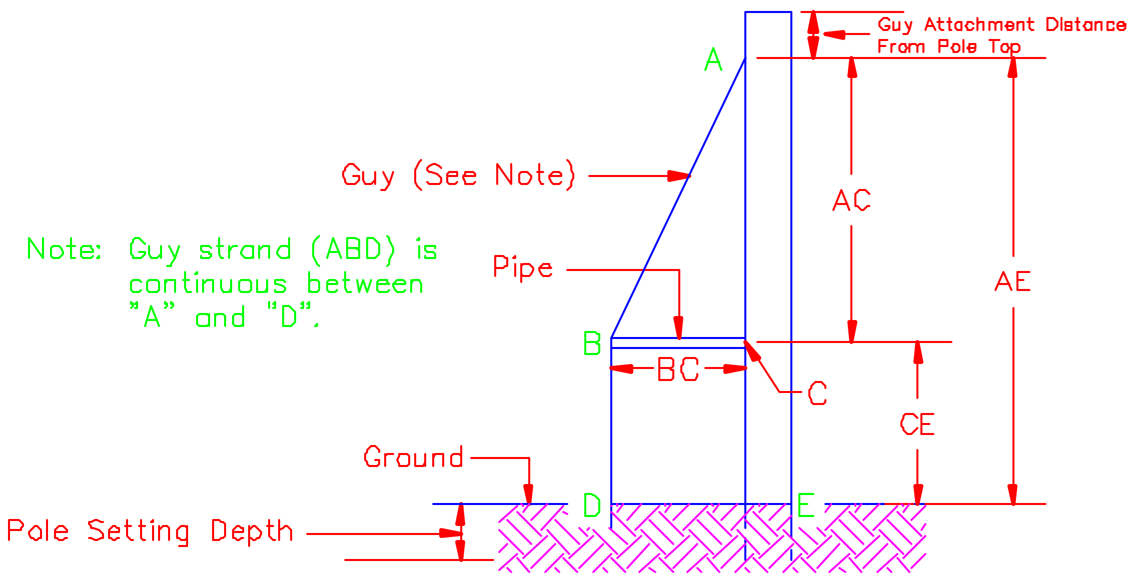


FIGURE 2

SIDEWALK GUY DETERMINATION



Procedure For Determining Guy Size And Pole Class For Sidewalk Guy

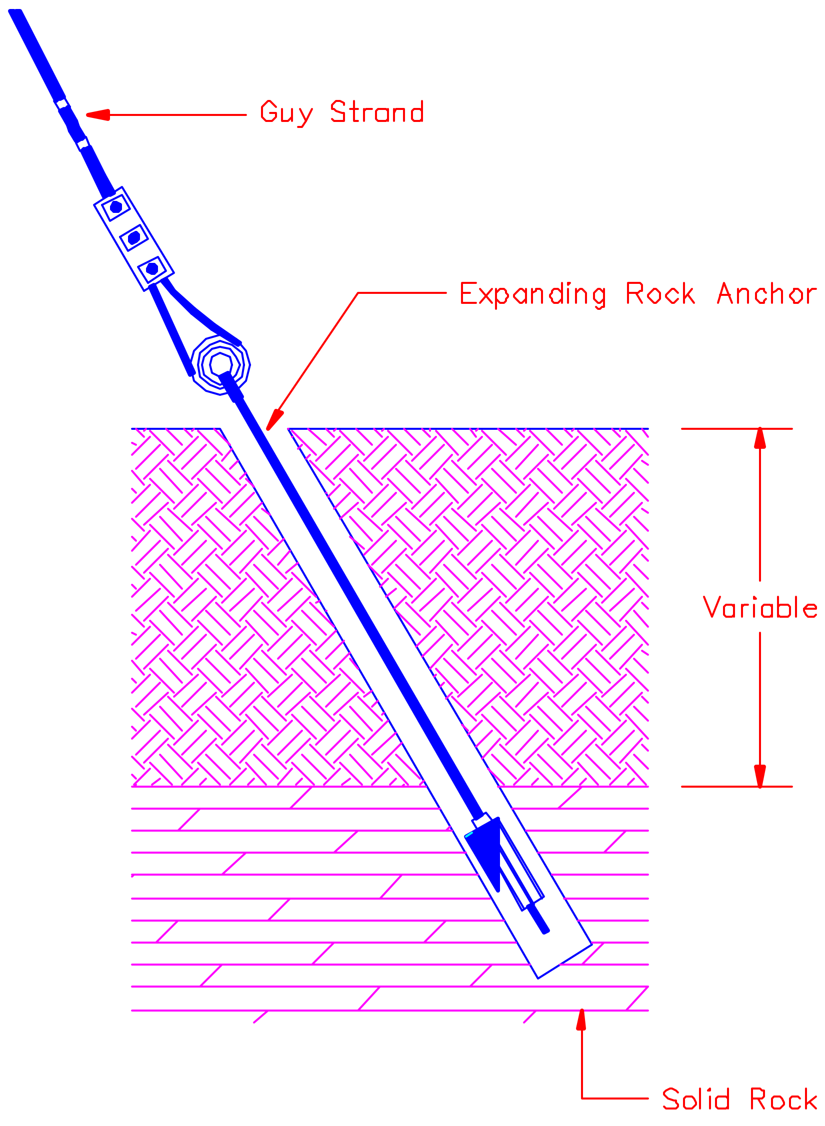
Step 1: Let AE = (Pole Length – Pole Setting Depth – Guy Attachment Distance From Pole Top).
Step 2: Let CE = The distance between the ground and where the pipe is attached to the pole.
Step 3: Let "Lead" (L) = BC which is the length of the horizontal pipe.
Step 4: Let "Height" (H) = AC which is the distance between the points of attachment of the pipe and the guy strand to the pole.
Step 5: Let L/H Ratio = BC/AC = BC/(AE – CE).
Step 6: Compute the theoretical guy strength requirements for "AB" as in a normal guying application where "BC" is considered the ground line based on the L/H ratio, corner angle, and suspension strand size.
Step 7: Select the standard guy size necessary to meet the requirements computed from step 6 above from either Table 3 or Table 4.
Step 8: Use the standard guy size selected from step 7 to determine the comparative and final guy strand and pole size requirements for the sidewalk guy from the table listed below:

Guy Size Necessary For (AB)	6M		10M		16M	
Size of Sidewalk Guy (ABD) Required When: (AE) is between 20 ft and 26 ft	10M		16M		1 – 10M 1 – 16M	
Size of Sidewalk Guy (ABD) Required When: (AE) is 20 ft or less	10M		2 – 10M		---	
When L/H Ratio (BC/AC) is	1/2	1	1/2	1	1/2	1
Class of 30 ft Pole required is	4	3	3	1	1	1
Maximum Length of 2 in. Outside Diameter Pipe in ft	11		8		7	
If poles of other heights are used, the poles should be of equivalent breaking load						

Note Where two strands would be required, thimbleye nuts, pipe end fittings, and anchor rods designed to accommodate two strands should be used.

FIGURE 3

PF5-3 ANCHOR ASSEMBLY UNIT
ALTERNATIVE INSTALLATION METHOD



Note: The anchor should be installed in line with the guy strand.