# GUYING 11

## TABLE OF CONTENTS

1. GENERAL

Guys are used to sustain unbalanced forces imposed on a structure at corners, angles, deadends, large differences in span lengths, and changes of grade of construction. Guys shall be considered as taking the entire load in the direction in which they act, with the pole or structure acting as a strut only, resisting the vertical component of all forces.

The strength requirements of guy and anchor systems are governed by the National Electric Safety Code which specifies criteria for calculating conductor tensions and imposes overload factors to be used under different circumstances.

Guying is preferable to oversized self sustained poles. Where adequate guying cannot be obtained due to right−of−way or other difficulties, self sustained poles, within their limitations, may be used. Loadings and other details for self sustained poles are covered in Dist. Stds. 02 00 04 02 thru 02 00 04 05.

2. GUY WIRE & FITTINGS

Three sizes and grades of galvanized steel guy wire are stocked for normal use. The maximum tension and associated fittings for each guy wire is given below in Table 1. The maximum tensions shown are 90 percent of the rated breaking strength, in accordance with the NESC. In Illinois, 1/4" guy wire is not used.

TABLE 1

| GUY WIRE | | | PREFORMED GRIP | AUTOMATIC DEADEND |
|---|---|---|---|---|
| Stock No. | Size & Grade | Max. Tension (lbs) | Stock No. | Stock No. |
| 27 59 016 | 1/4" Galv. E.H.S | 5,985 | 23 68 241 | 23 68 300 |
| 27 59 020 | 3/8" Galv. E.H.S. | 13,860 | 23 68 237 | 23 68 299 |
| 27 59 022 | 7/16" Galv. E.H.S. | 18,720 | 23 68 238 | 23 68 301 |

In general, all guy strand shall be secured to the pole fitting or to guy insulators with preformed guy grips. Automatic Deadends may only be used with galvanized guy wire at the anchor or guy pole. Due to increased cost, there is no need for more than one automatic installed per guy lead.

3. ANCHORS & ANCHOR RODS

Three types of anchors are available for use in the distribution system; power installed screw anchors, expanding anchors and rock anchors.

3.1 Power installed screw anchors are the preferred anchors for use in all soils other than solid rock. Access with a power digger equipped with wrench assembly is required for installation. Two strengths of these anchors are stocked; a 6,000 ft−lb series for use in sandy to hard pan soils, and a 10,000 ft−lb series for use in rockier soils in which the 6,000 ft−lb anchors cannot be installed. Only square shaft anchors shall be used in Illinois for down guys on Sub−Transmission (34.5kV and 69kV).

3.2 Expanding anchors can be installed in most any soil in which an 8" to 12" diameter hole, depending on anchor size, can be augered. Because of the time needed to install these anchors, usage is generally limited to locations not accessible to power equipment.

3.3 Rock anchors are an expanding type anchor which must be installed in at least 12” of solid rock. A 2” or 2−1/4” diameter hole is needed for installation. Rod lengths from 30” to 96” are available to meet site requirements.

Standard sizes, holding strengths and methods of installation for each type of anchor are shown in Dist. Std. 11 00 60 ** thru 11 00 63 **.

4. USE OF GUY INSULATORS

Guy strain insulators are used to: (1) protect pedestrians and line workers if a guy accidentally contacts supply conductors, (2) minimize the possibility of plant damage which may result in unsafe conditions, and (3) increase the structure BIL and reduce lightning caused outages.

All guys attached to poles supporting energized conductors or equipment shall have a minimum of one guy strain insulator inserted in each guy. EXCEPTION: Stub−pole to anchor guys generally do not require an insulator unless the exposure between the energized pole and the stub−pole cannot be isolated. One insulator typically cannot be located to satisfy all of the following requirements. Additional insulators shall be used as required.

Where multiple guys are required, **the insulators in each guy shall be located so that in case any guy sags down upon another, the insulators will not become ineffective (NESC Rule 215C2).**

DCS 11 00 02 01 demonstrates the general concepts of proper guy strain insulator placement described in this DCS. DCS 11 00 02 02 gives more detailed guidance for guy strain insulator placement for many of Ameren’s typical structure configurations.

If necessary, a fiberglass (FG) guy strain insulator may be used to allow a guy to be located in closer proximity to a conductor than would otherwise be allowed. **In no instance, however, shall any conductive portion of the guy or the insulator be located in closer proximity to a conductor than is specified in DCS 11 00 02 03.** To achieve the requirements from the NESC as described in this DCS, it will often be necessary to link two or more FG guy strain insulators together.

4.1 Distribution

In Missouri, FG or porcelain guy strain insulators may be used in guys associated with circuits 15 kV and below. In Illinois, only FG guy strain insulators shall be used. Insulators shall be installed to meet all of the following placement criteria that apply:

a) A FG guy strain insulator shall be used at the pole attachment of all anchor or span guys. EXCEPTION: Stub−pole to anchor guys do not require insulators if the span guys are effectively isolated and there are no energized conductors or communication attachments on the stub−pole.
b) On non−joint use poles, an insulator (or at least 12” of a FG insulator) must be located between primary voltage and secondary voltage (including neutral) supply circuits. This insulator must be located so that:
    i. It prevents the possibility of voltage transfer between the primary and secondary circuits during normal operation of the guy, and
    ii. If the guy wire breaks below the insulator, it will fall below all primary voltage supply conductors and above any secondary conductors (including the neutral) as it rests against the pole.
c) On non−joint use poles, an insulator (or at least 12” of a FG insulator) must be located between the lowest supply conductor (primary, secondary, or neutral) and ground. The insulator must be located so that:
    i. It prevents the possibility of voltage transfer between the lowest supply conductor and ground during normal operation of the guy, and
    ii. If the guy wire breaks below the insulator, the insulator falls below the lowest supply conductor and the bottom of the insulator must fall a minimum of 8 ft. above the ground as it rests against the pole.
d) On joint use poles, in addition to a) and b) above an insulator (or at least 12” of a FG insulator) must be located between the lowest supply conductor (primary, secondary, or neutral) and the highest communication cable. This insulator must be located so that:

i. Any guy passing within twelve inches (12”) of a supply conductor and also passing within twelve inches (12”) of a communication cable shall have an insulator located below the lowest supply conductor and above the highest communication cable (NESC Table 235 – 6, Note (1)).
ii. It prevents the possibility of voltage transfer between the supply circuits and communication cable during normal operation of the guy, and

iii. If the guy wire breaks below the insulator, it will fall below all supply conductors and above any communication cables as it rests against the pole.

e) On joint use poles, an insulator (or at least 12” of a FG insulator) must be located between the lowest communication cable and ground. The insulator must be located so that:
   i. It prevents the possibility of voltage transfer between the lowest communication cable and ground during normal operation of the guy, and
   ii. If the guy wire breaks below the insulator, the insulator falls below the lowest communication cable and the bottom of the insulator must fall a minimum of 8 ft. above the ground as it rests against the pole.

   EXCEPTION: This insulator is not required if the communication cables are self−supported fiber−optic (with no metallic messenger).

4.2 Sub Transmission

Guys associated with 34.5kV or 69kV circuits require a FG guy strain insulator be used in place of a porcelain insulator. In addition to the protective role, FG guy strain insulators serve to increase the BIL level of ungrounded structures associated with these circuits. FG guy strain insulators shall be installed to meet all of the following placement criteria that apply in addition to the criteria in section 4.1 of this DCS:

a) A FG guy strain insulator shall be used at the pole attachment of all anchor or span guys. EXCEPTION: Stub−pole to anchor guys do not require insulators if the span guys are effectively isolated and there are no energized conductors on the stub−pole.
b) If no underbuilt circuits are present, at least 24” of a FG insulator must be located between the lowest 34.5kV or 69 kV conductor and ground. The insulator must be located so that:
   i. It prevents the possibility of voltage transfer between the lowest supply conductor and ground during normal operation of the guy, and
   ii. If the guy wire breaks below the insulator, the insulator falls below the lowest supply conductor and the bottom of the insulator must fall a minimum of 8 ft. above the ground as it rests against the pole.
c) If an underbuilt circuit is present, at least 24” of a FG insulator shall be located to effectively isolate the lowest 34.5kV or 69kV conductor and the highest distribution underbuilt conductor.

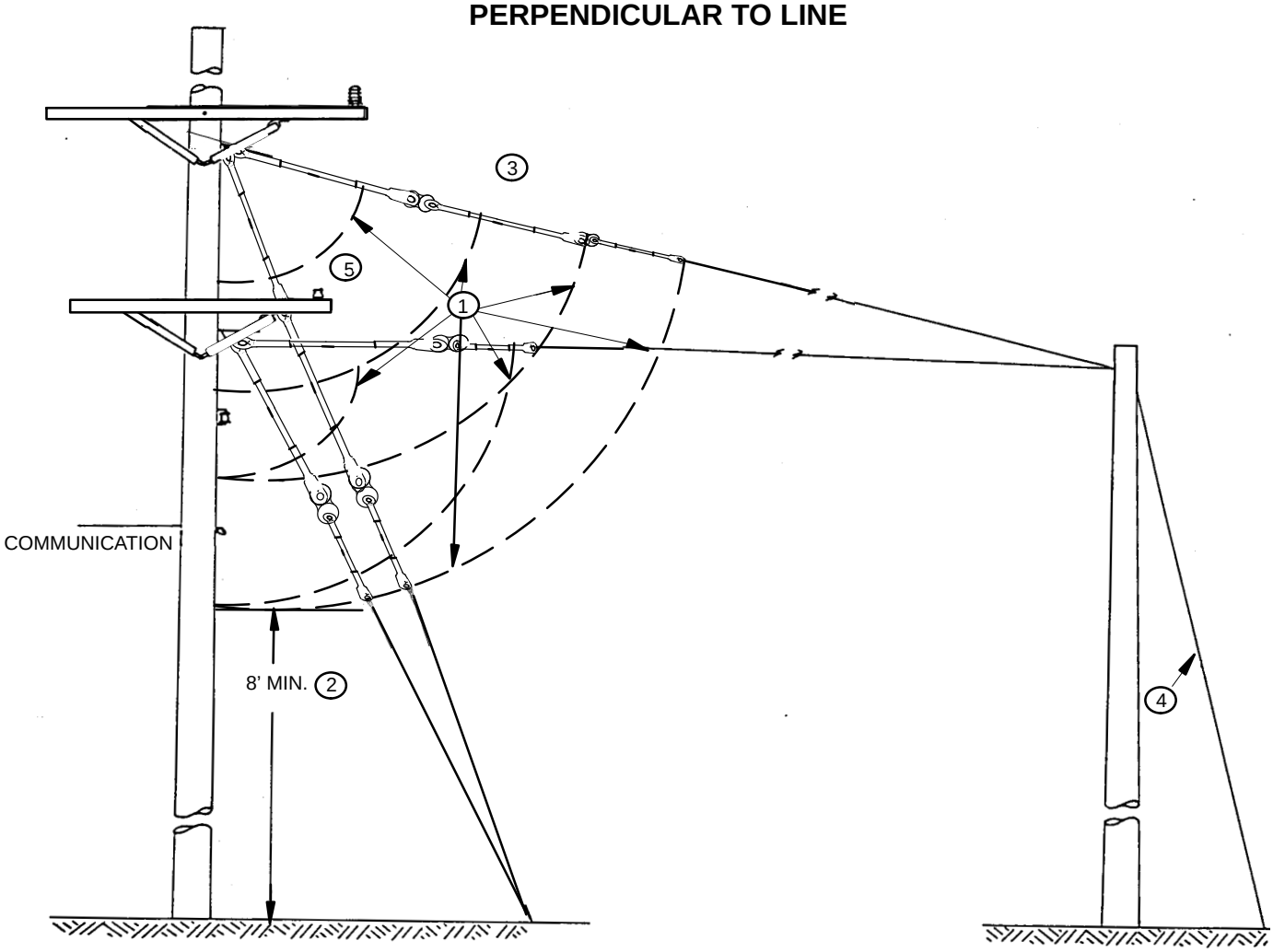
4.3 Span Guys

All of the requirements of sections 4.1 and 4.2 of this DCS also apply to span guys.

5. GUY MARKERS

Guy MARKERS shall be installed on the ground end of all anchor guys. Where two or more guys are attached to the same anchor, only one MARKER is required and shall be installed on the highest guy wire.

## PERPENDICULAR TO LINE

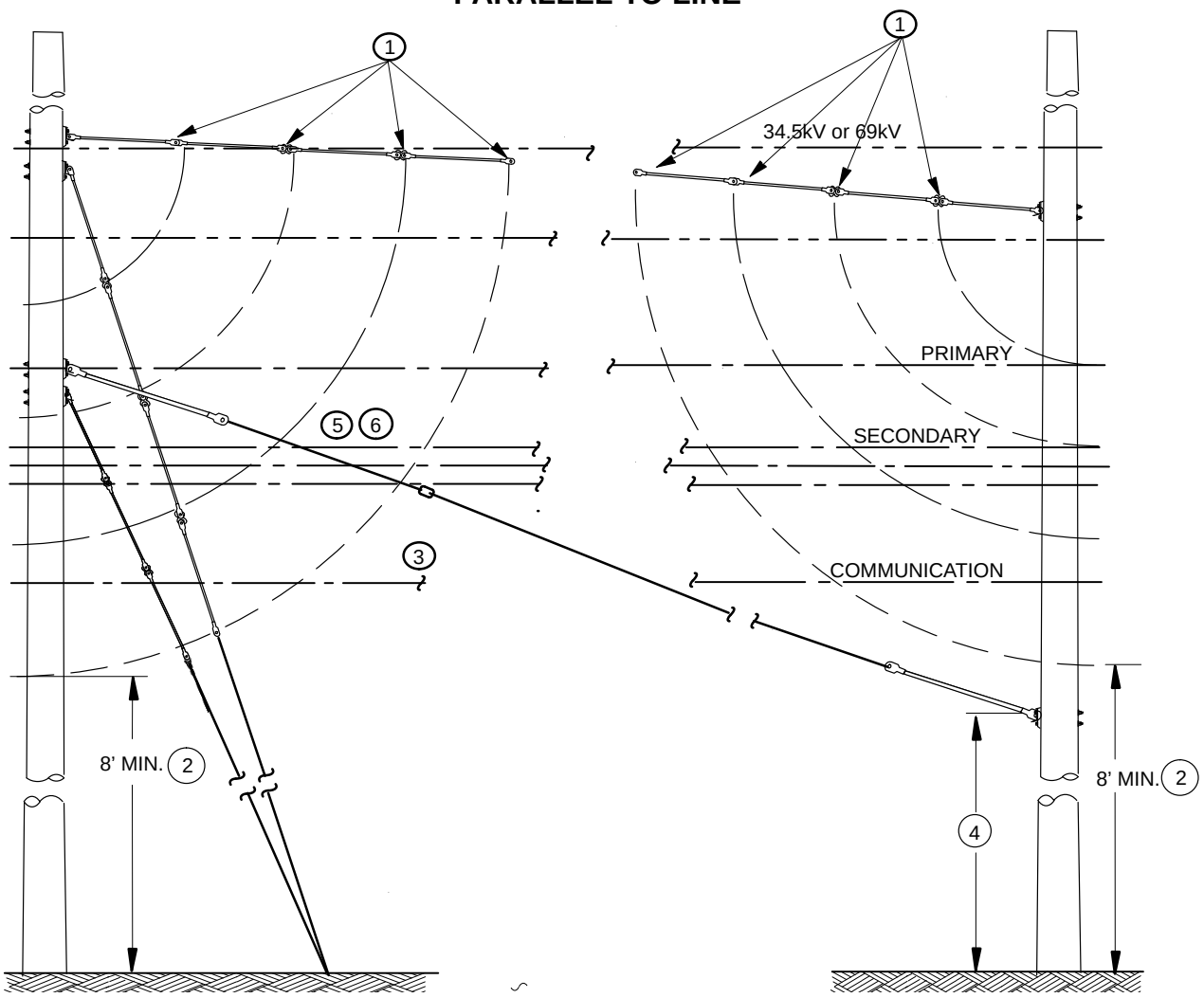



NOTES:

Reference: NESC, 2017 Edition, Rule 215C2

1. Guys must be insulated such that if they break and fall into the pole, insulation will be provided between subtrans mission and primary distribution circuits, between primary and secondary distribution circuits, between secondary distribution and communication circuits, and below the communication circuits. (Note: Guy insulators must fall between all circuits.)
2. The bottom of the lowest insulator must fall a minimum of eight (8) feet above ground level.
3. In Illinois, only fiberglass guy strain insulators shall be used. In Missouri, porcelain guy strain insulators may be used for guys associated with circuits 15kv and below. In both Illinois and Missouri, fiberglass guy strain insulators must be used in all guys associated with 34.5kV and 69kV circuits.
4. Stub pole to anchor guys require no insulator if the span guys attached to the stub pole have been effectively isolated with insulators and there are no other energized conductors on the stub pole.
5. See Dist. Std. 11 00 02 03 for minimum clearances of guys to conductors.

**PARALLEL TO LINE**



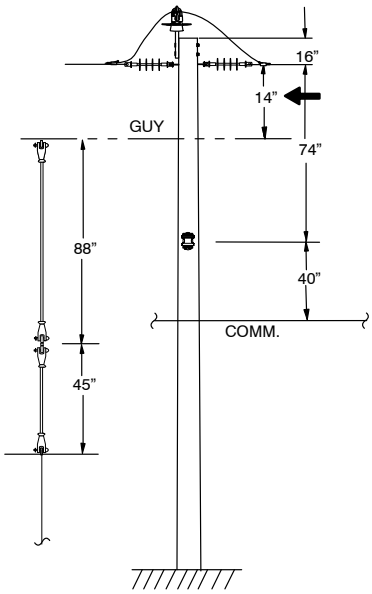

NOTES:

Reference: NESC, 2017 Edition, Rule 215C2

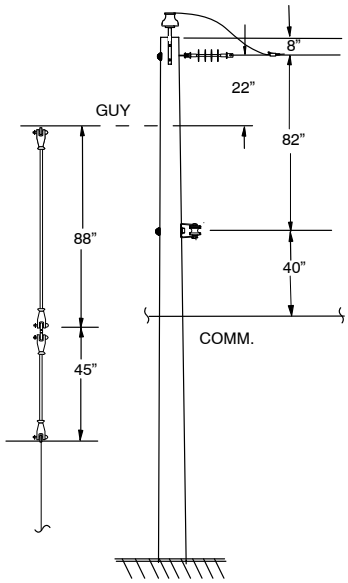
1. Guys must be insulated such that if they break and fall into the pole, insulation will be provided between subtrans mission and primary distribution circuits, between primary and secondary distribution circuits, between secondary distribution and communication circuits, and below the communication circuits. (Note: Guy insulators must fall between all circuits.)
2. The bottom of the lowest insulator must fall a minimum of eight (8) feet above ground level.
3. In Illinois, only fiberglass guy strain insulators shall be used. In Missouri, porcelain guy strain insulators may be used for guys associated with circuits 15kv and below. In both Illinois and Missouri, fiberglass guy strain insulators must be used in all guys associated with 34.5kV and 69kV circuits.
4. Guys shall be attached a minimum of twelve (12) feet above ground on a pole, or higher as needed to satisfy mid −span clearance requirements. (This assumes a 45" FG guy insulator to meet the 8' MIN ground level rule.)
5. See Dist. Std. 11 00 02 03 for minimum clearances of guys to conductors.
6. If a span guy passes over or through supply conductors, two (2) insulators shall be used, each satisfying the above requirements.

**PURPOSE** – The purpose of this standard is to show combinations of FG guy strain insulators that will provide proper guy insulation on many of Ameren's standard structures. Although only the neutral and one communication attachment is shown these FG guy strain insulator combinations are based on the structure having a single–phase secondary rack and two communication attachments. Note: The guy attachment dimensions in this DCS are presented in inches (instead of feet–inches) for easy comparison to the inches nomenclature used for the FG guy strain insulators.

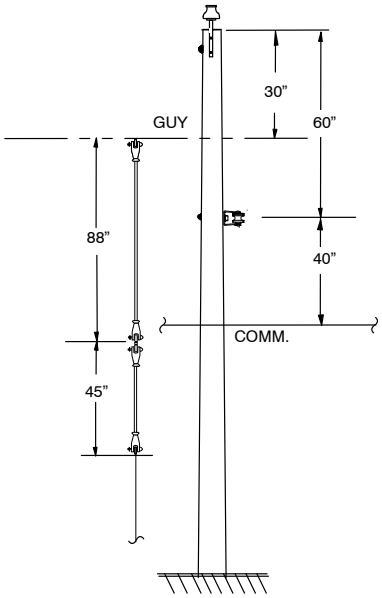
## Single Phase – 4 to 15kV



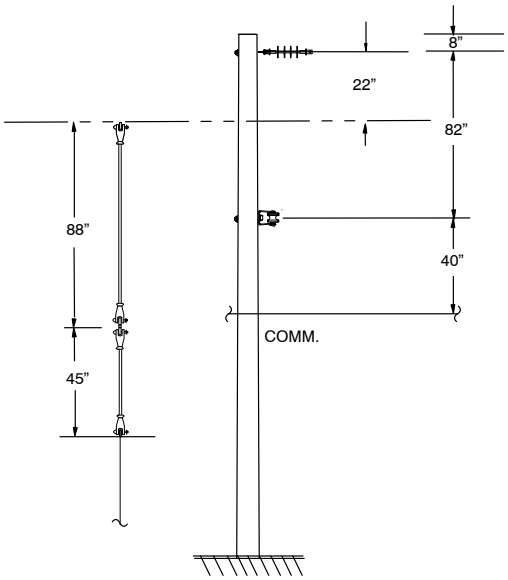

**03 12 01 07**
**03 12 01 13**
**Loopover**




**03 12 01 08**
**03 12 01 14**
**Tap**

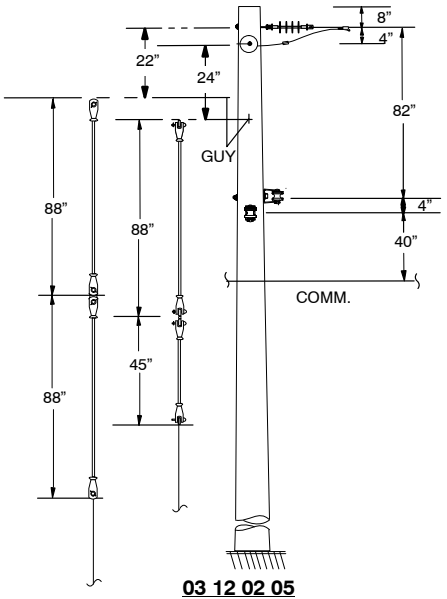



**03 12 01 02**
**03 12 01 22**
**Pole Top Pin**

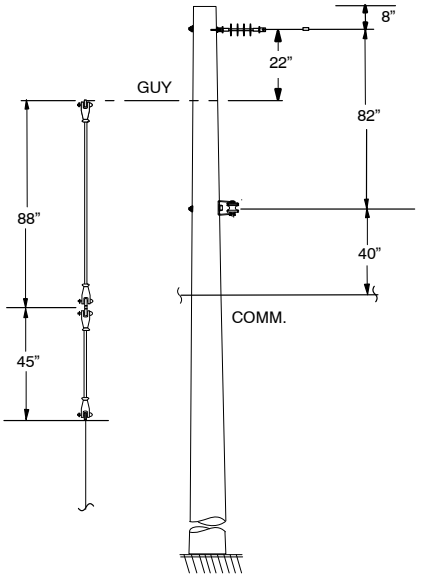



**03 12 01 04**
**03 12 02 24**
**Floating Angle**

## Single Phase – 4 to 15kV

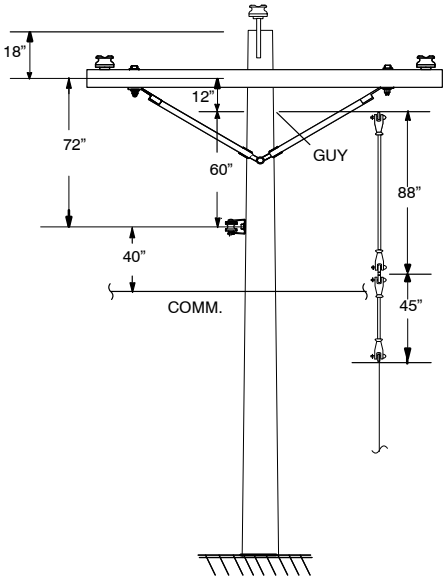



**03 12 02 05**
**03 12 01 12**
**90º Angle**



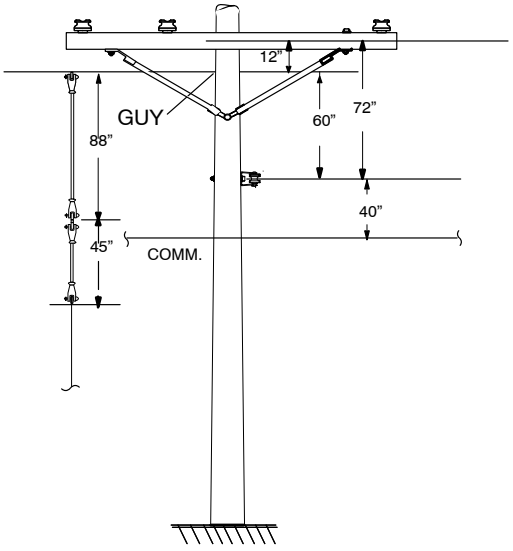

**03 12 01 06**
**03 12 01 11**
**Deadend**

## One, Two or Three Phase
## Angle on Wood Crossarm 4 to 15kV




**TANGENT**

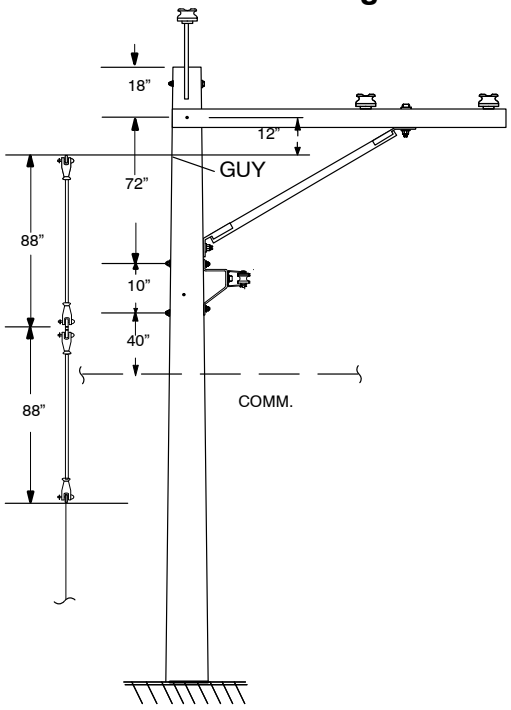
| | | 3Ø | 2Ø |
|---|---|---|---|
| **Preferred Avian** | **Angle 10' Sgle. Arm** | **03 12 05 05** | **03 12 05 11** |
| | **Angle 8' Sgle. Arm** | **03 12 05 02** | **03 12 05 08** |




**UNDERBUILD**

| | 3Ø | 2Ø | 1Ø |
|---|---|---|---|
| **Angle 8' Sgle. Arm** | | | **03 12 02 02** |
| **Angle 8' Dble. Arm** | | | **03 12 02 03** |
| **Angle 10' Sgle. Arm** | **03 12 05 52** | **03 12 05 61** | **03 12 02 12** |
| **Angle 10' Dble. Arm** | | | **03 12 02 13** |

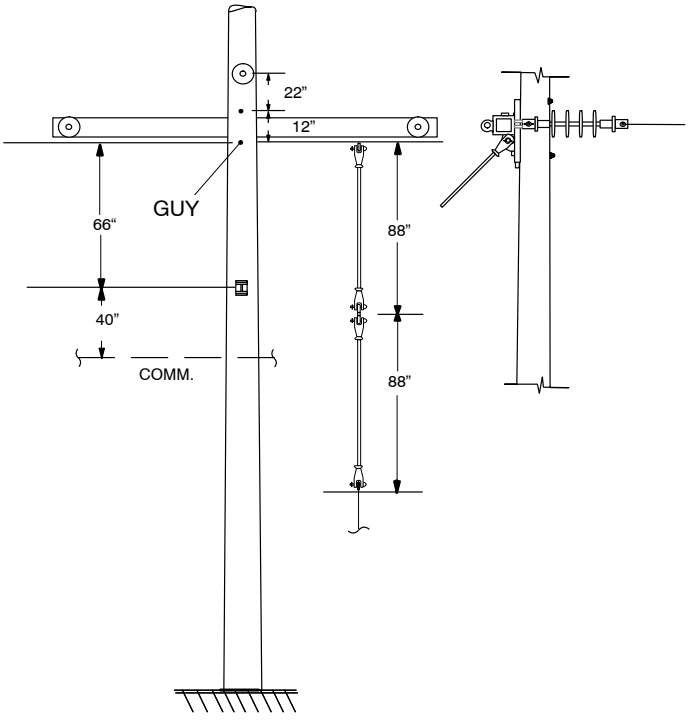
## One, Two or Three Phase
## Angle on Wood Crossarm 4 to 15kV




SIDEARM

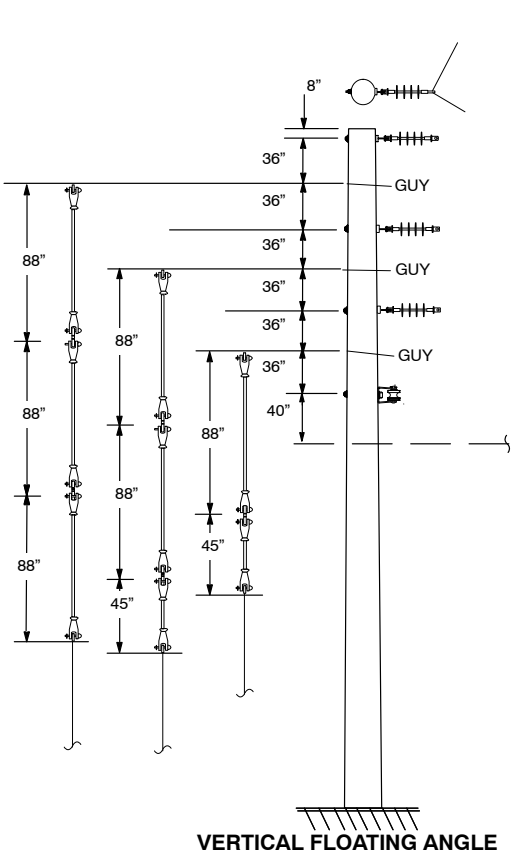
| | 3Ø | 2Ø |
|---|---|---|
| **Tangent 8' Sgle. Arm** | **03 12 05 54** | **03 12 05 63** |
| **Angle 8' Sgle. Arm** | **03 12 05 55** | **03 12 05 64** |
| **Angle 8' Dble. Arm** | **03 12 05 56** | **03 12 05 65** |

## Deadend Arm–Pole Top or Underbuild

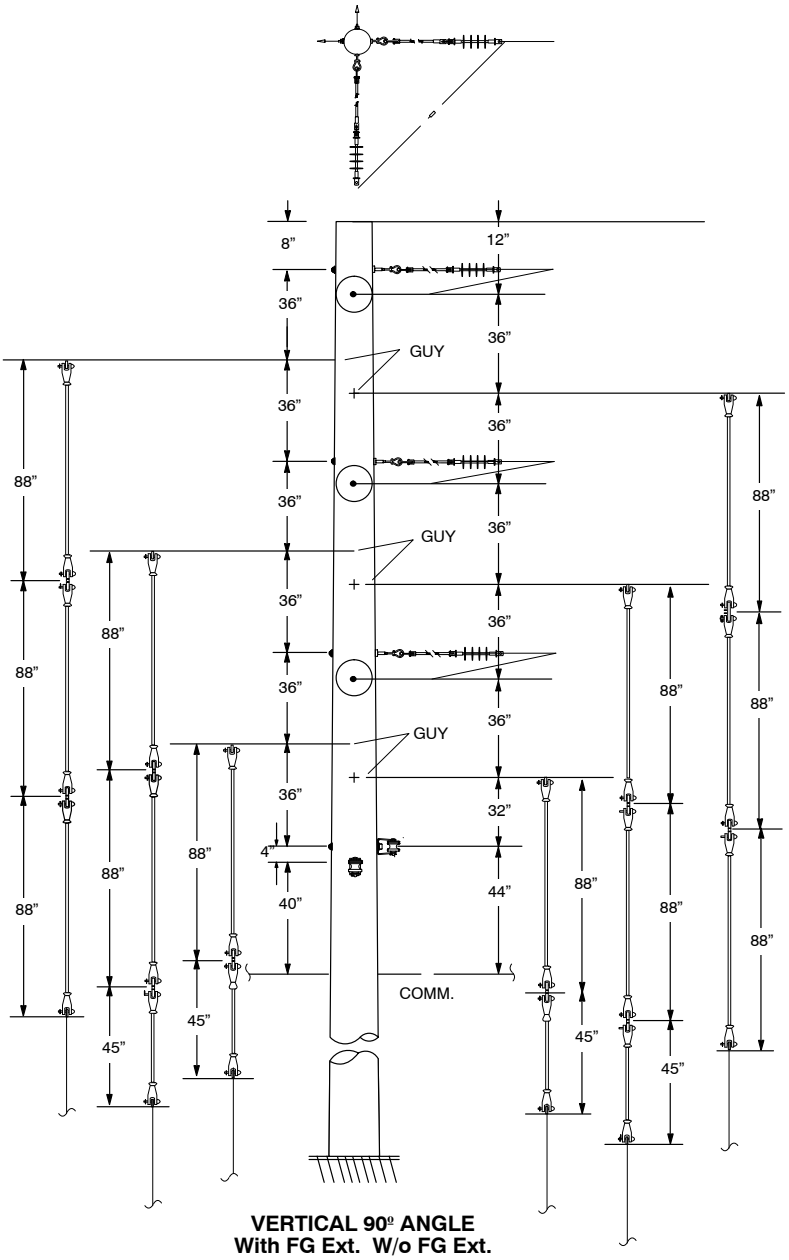



| | 3Ø | 2Ø | 1Ø |
|---|---|---|---|
| **DE Assy 8' Arm** | **03 12 11 01** | **03 12 11 31** | **03 12 02 06** |
| **DE Assy 10' Arm** | **03 12 11 52** | **03 12 11 54** | **03 12 02 16** |

## Two or Three Phase Floating and 90ºAngle
## 4 to 15kV

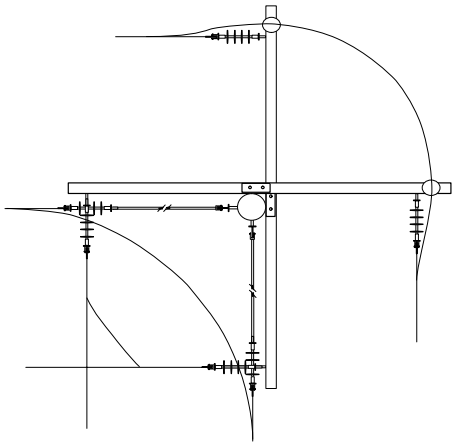


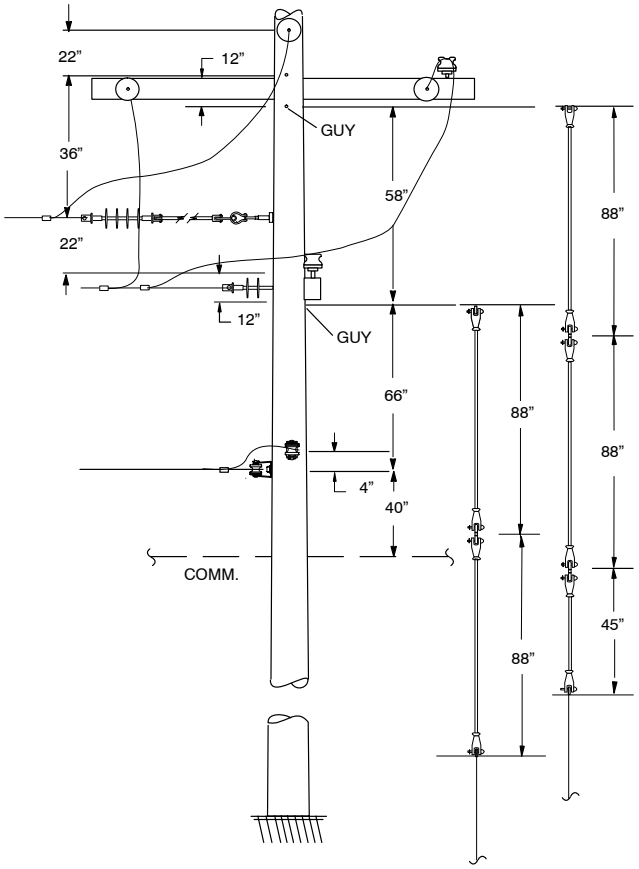

**VERTICAL FLOATING ANGLE**
**3Ø 03 12 07 02**
**2Ø 03 12 07 06**




**VERTICAL 90º ANGLE**
**With FG Ext. W/o FG Ext.**
**3Ø 03 12 07 04 03 12 07 03**
**2Ø 03 12 07 08 03 12 07 07**

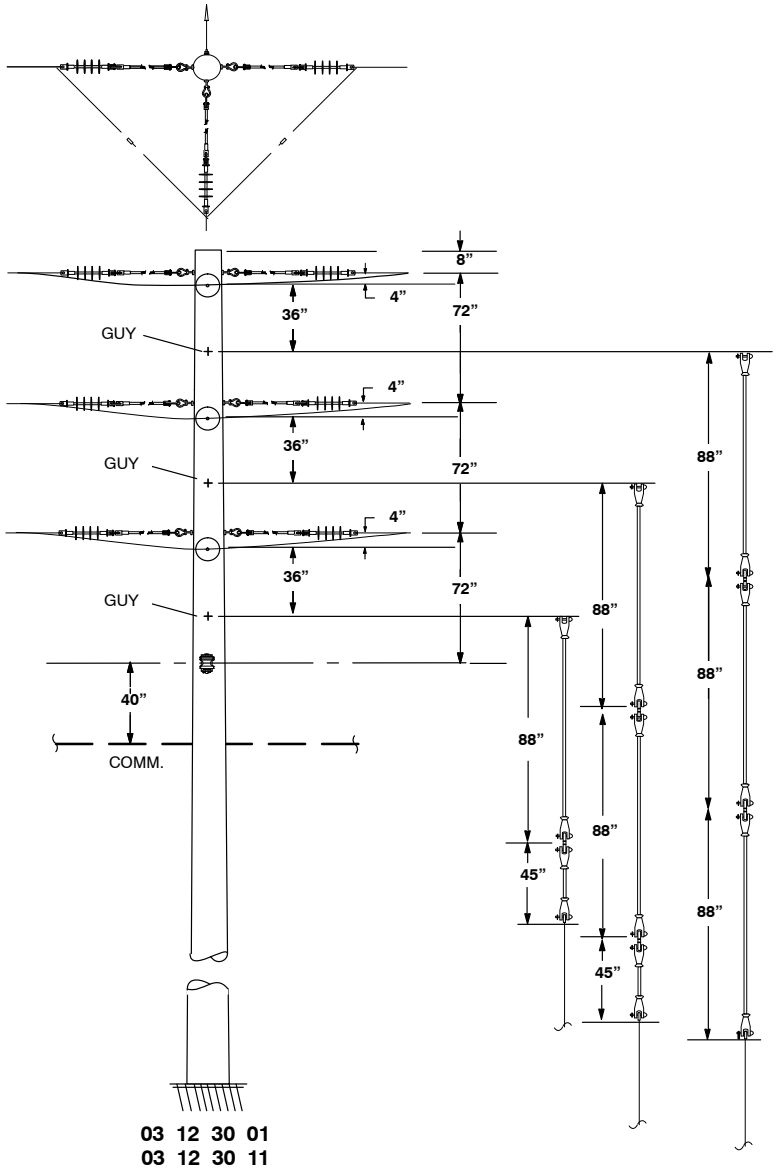
## Two or Three Phase Buck Arm – 90º Angle
## 4 to 15kV





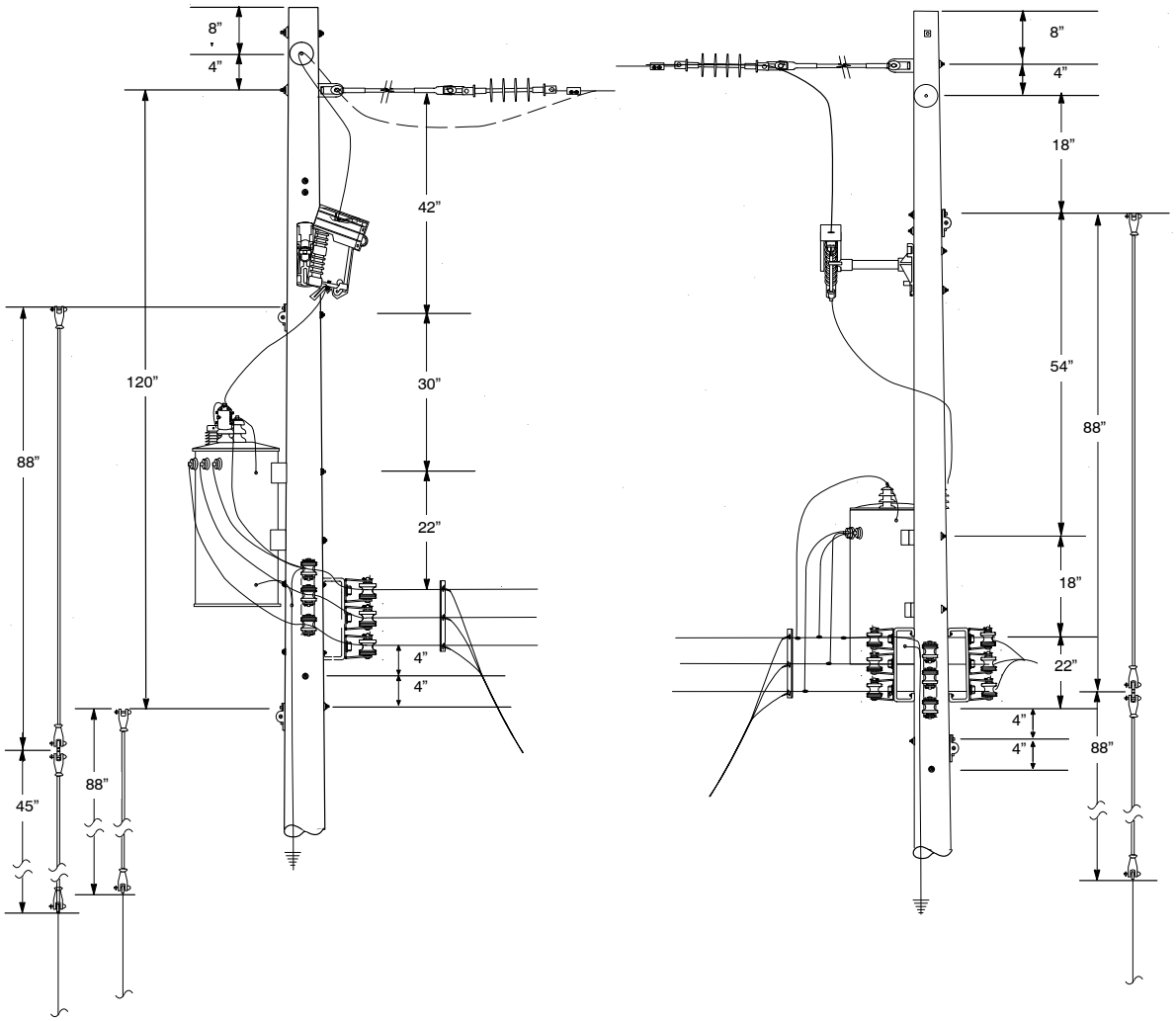

| | 3Ø W/Ext. | | | | 3Ø W/o Ext. | | | | 2Ø (NOT SHOWN) | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 8'F.G. ARMS | 03 | 12 | 09 | 03 | 03 | 12 | 09 | 01 | 03 | 12 | 09 | 04 |
| 10'F.G. ARMS | 03 | 12 | 09 | 02 | 03 | 12 | 09 | 05 | 03 | 12 | 09 | 08 |

## Two or Three Phase – Vertical Tap
## 4 to 12 kV




**03 12 30 01**
**03 12 30 11**

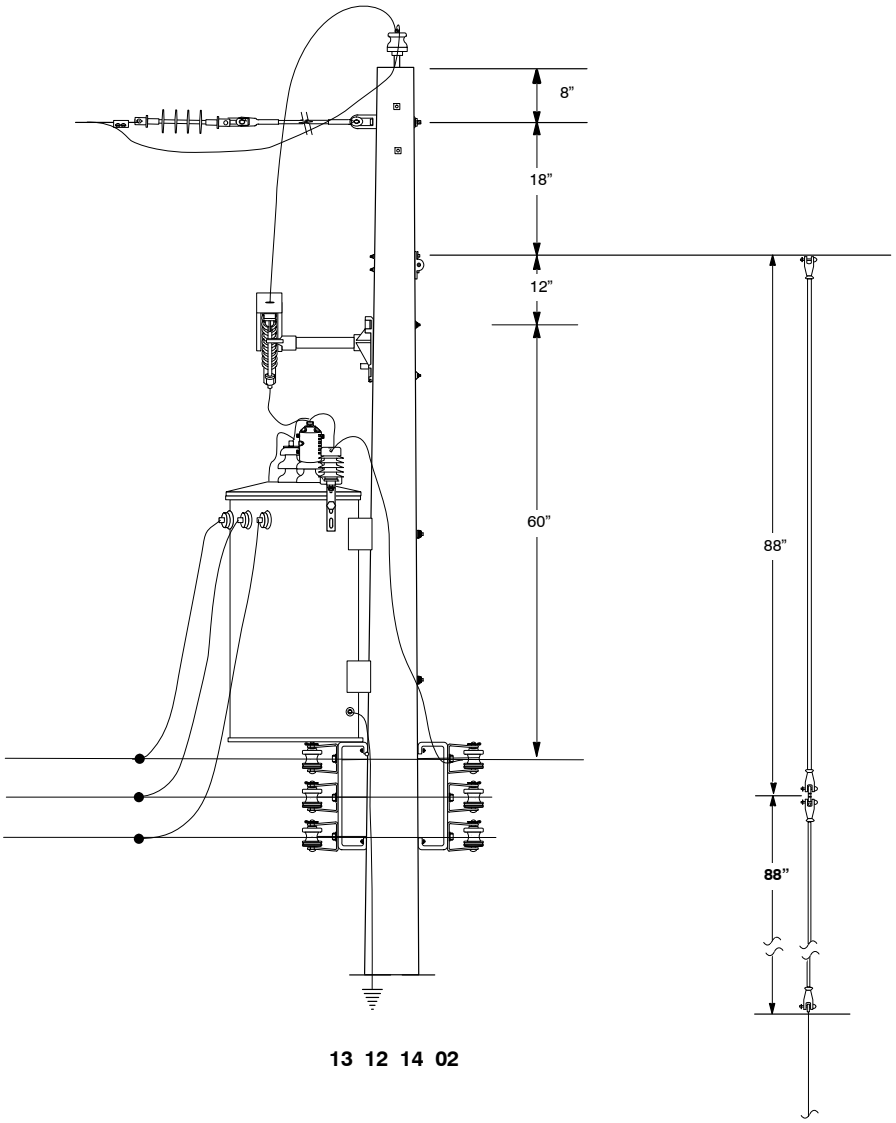
## 3 to 100kVA Deadend or "L" Corner



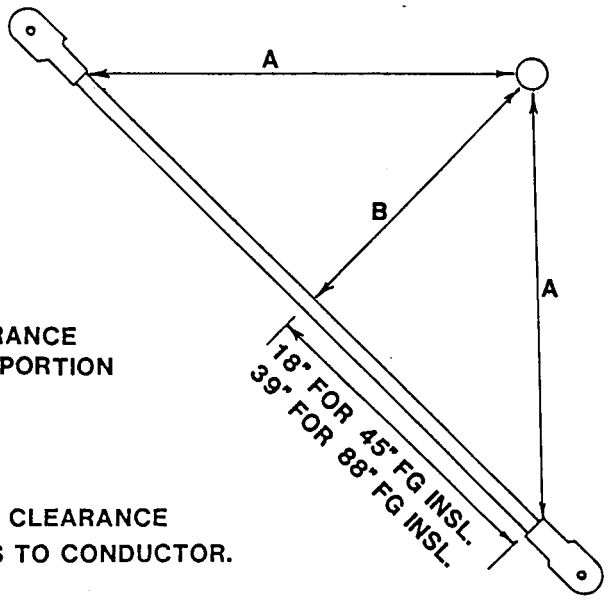

On "L" corners, where a guy can only be installed below the transformer, a Class 4 or heavier pole shall be used. A class 4 pole will provide adequate strength for deadending 1–1/0 bare AAAC at 1,360 lbs. Max. Tension (non–standard intermediate span urban construction). For conductor tension greater than this, contact Distribution Standards for determination of pole class.

**DEADEND – 13 12 10 01**
**"L" CORNER – 13 12 10 02**

## Transformer, 1PH, T Corner




**13 12 14 02**




'A' IS THE MINIMUM CLEARANCE FROM ANY CONDUCTIVE PORTION OF GUY TO CONDUCTOR.

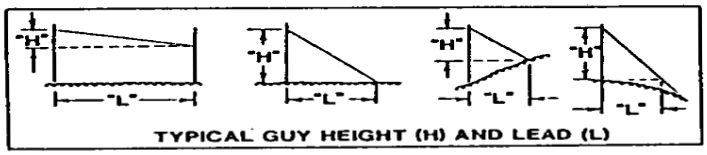
'B' IS THE MINIMUM CLEARANCE FROM FIBERGLASS TO CONDUCTOR.

| Phase To Phase | Span Guy Parallel To Conductor[1] | | | All Other[1] | | |
|---|---|---|---|---|---|---|
| | A | B[2] | | A | B[2] | |
| | | 45"FG | 88"FG[7] | | 45"FG | 88"FG[7] |
| 0−4 kV | 12"[3,6] | 9" | 9" | 6"[3] | 5" | 5" |
| 12.47−14.4 kV | 15" | 12" | 12" | 9"[3] | 7" | 7" |
| 34.5 kV | 30"[4] | 24"[5] | 18" | 30"[4] | 24"[5] | 13" |
| 69 kV | 38" | 34"[5] | 29" | 32" | 27"[5] | 24" |

Reference: NESC, 2017 Edition, Rule 235E

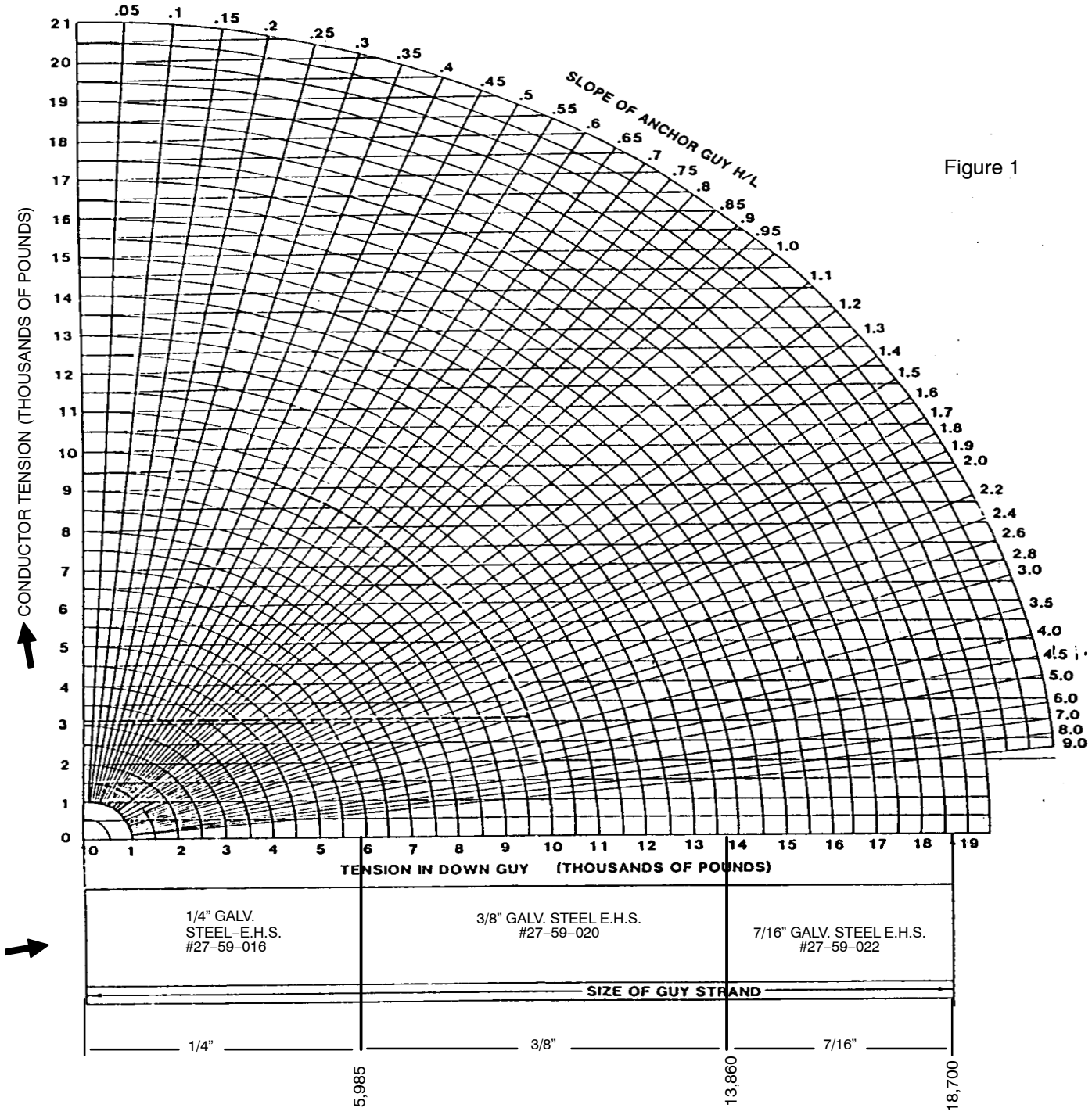
NOTES:

1. "Parallel" means in same general direction as line conductors. "All Other" includes down guys and span guys that cross over or under line conductors.
2. "B" is the minimum clearance required to the insulator or insulated section of guy wire between two insulators provided that the "A" minimum clearance to the uninsulated end fitting or guy wire is maintained.
3. On joint use poles, guys which pass within twelve inches (12") of supply conductors and also pass within twelve inches (12") of communication cables require a strain insulator to be located at a point below the lowest supply conductor and above the highest communication cable (NESC Table 235−6, Note 1: 2017 Edition).
4. 30" is based on Ameren's use of 200 kV BIL .
5. This clearance required to maintain the air gap clearance to conductive parts. No reduction in clearance is allowed.
6. For neutral conductors, dimension "A" can be reduced to 6".
7. Longer FG insulators or daisy chained insulators will not allow further reduction of clearance to guy insulators.




TYPICAL GUY HEIGHT (H) AND LEAD (L)

Figure 1



TO SIMPLIFY THE WORK OF SELECTING THE CORRECT GUY AND ANCHOR FOR A GIVEN LOAD, DIST. STD. 11 00 03 01 HAS BEEN PREPARED. NOTE THAT THE TOTAL LOAD IS THE SUMMATION OF THE CONDUCTOR TENSIONS INVOLVED SINCE SAFETY AND OTHER REQUIRED FACTORS HAVE BEEN INCORPORATED IN THE CONDUCTOR TENSIONS SHOWN IN DIST. STD. **11 00 04 02** BY CHOOSING A GRADE.

INSTRUCTION FOR USE OF GUY CHART

EXAMPLE: To determine the size guy strand for 3–1/0 AAAC & 1/0 Neutral – Urban Grade "C", 150' short span construction 15º line angle, joint use pole. Guy height (H) = 32', guy lead(L) = 10', use pole configuration in accord with Dist. Std. **03 12 05 **** Sht. 1 40' pole.

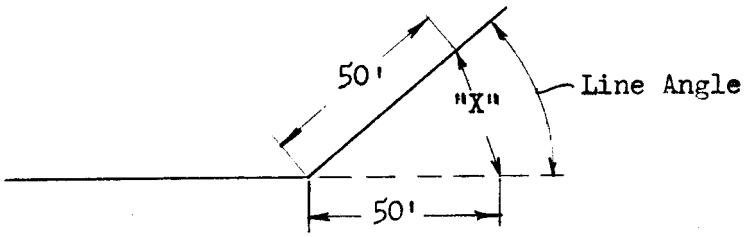
1. Determine the height over lead ratio. H/L = 32/10=3.2 (Radial Line).
2. From Sheet 1 Dist. Std. **11 00 04 02**, the conductor tension is 482 lbs. for 1/0. Total for 3 phases and neutral is 482 x 4 = 1928 lbs.
3. Locate this value on vertical scale of chart on Figure 1 and project this value horizontally to the right to the intersection with radial line 3.2.
4. Follow this point on the arc of the circle to the lower scale. Read the tension in the anchor guy, (6500#) and size guy wire, (3/8" Galv. Steel EHS).

TO DETERMINE THE VERTICAL LOADING ON THE POLE DUE TO GUYING

5. Determine the inverse of the height over lead ratio 1/H/L = 1/3.2 = .312 (Radial Line).
6. Locate the value of guy tension (Step 4) on horizontal scale and follow this point on the arc of the circle to the intersection with radial line .312.
7. Project this value horizontally to vertical scale and read the vertical thrust (V.T. = 6200).
8. Divide the value obtained from the vertical scale by the correction factor for the grade of construction used (V.T.=6200 ÷ 1.14 = 5438). This is the true vertical thrust on the pole due to the guy. Correction factors for the grade of construction are N=1.0 C = 1.14, and B = 1.5.

GENERAL NOTE: To extend the limits of this chart or to create an intersection of the horizontal load and slope lines, divide the horizontal load to be guyed by 2, 3, or 4, and multiply the actual tension by the same number.

METHOD OF DETERMINING LINE ANGLES




| Line Angle Degrees | Distance "X" | Line Angle Degrees | Distance "X" | Line Angle Degrees | Distance "X" |
|---|---|---|---|---|---|
| 1 | 0'–10" | 21 | 18'–3" | 41 | 35'–2" |
| 2 | 1'–9" | 22 | 19'–2" | 42 | 36'–0" |
| 3 | 2'–8" | 23 | 20'–0" | 43 | 36'–10" |
| 4 | 3'–6" | 24 | 20'–8" | 44 | 37'–5" |
| 5 | 4'–4" | 25 | 21'–7" | 45 | 38'–6" |
| 6 | 5'–3" | 26 | 22'–6" | 46 | 39'–5" |
| 7 | 6'–1" | 27 | 23'–4" | 47 | 40'–0" |
| 8 | 7'–0" | 28 | 24'–3" | 48 | 40'–10" |
| 9 | 7'–10" | 29 | 25'–1" | 49 | 41'–7" |
| 10 | 8'–8" | 30 | 26'–0" | 50 | 42'–5" |
| 11 | 9'–6" | 31 | 26'–9" | 51 | 43'–0" |
| 12 | 10'–5" | 32 | 27'–7" | 52 | 43–10" |
| 13 | 11'–3" | 33 | 28'–5" | 53 | 44'–7" |
| 14 | 12'–1" | 34 | 29'–4" | 54 | 45'–5" |
| 15 | 13'–0" | 35 | 30'–2" | 55 | 46'–1" |
| 16 | 13'–9" | 36 | 30'–0" | 56 | 46'–11" |
| 17 | 14'–8" | 37 | 31'–10" | 57 | 47'–7" |
| 18 | 15'–6" | 38 | 32'–8" | 58 | 48'–6" |
| 19 | 16'–4" | 39 | 33'–5" | 59 | 49'–3" |
| 20 | 17'–4" | 40 | 34'–2" | 60 | 50'–0" |

NOTE:

A close approximation of the line angle may be obtained by measuring 50 feet out along either the line or line extended. From this point measure the distance "X". This distance in feet will approximate the line angle in degrees.

For more accruate results use the method sketched above and the table.

SHORT SPAN (150' RULING SPAN)

| Line Angle Deg. | 4/0 AA Poly | | | 1/0 AAAC 7 STR 1/0 AAAC 7 STR POLY | | | 556.5 AAC 19 STR | | | 954 45/7 ACSR | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N |
| 1 | 231 | 198 | 98 | 209 | 177 | 91 | 318 | 262 | 145 | 357 | 296 | 161 |
| 2 | 258 | 216 | 115 | 244 | 200 | 112 | 405 | 319 | 198 | 443 | 353 | 213 |
| 3 | 285 | 234 | 131 | 278 | 223 | 133 | 491 | 377 | 250 | 530 | 411 | 265 |
| 4 | 313 | 252 | 147 | 313 | 246 | 154 | 577 | 434 | 302 | 616 | 468 | 318 |
| 5 | 340 | 270 | 164 | 347 | 269 | 175 | 664 | 492 | 354 | 702 | 526 | 370 |
| 6 | 367 | 288 | 180 | 382 | 292 | 195 | 750 | 549 | 407 | 788 | 583 | 422 |
| 7 | 394 | 306 | 197 | 416 | 315 | 216 | 836 | 607 | 459 | 875 | 641 | 474 |
| 8 | 421 | 324 | 213 | 451 | 338 | 237 | 922 | 664 | 511 | 961 | 698 | 527 |
| 9 | 448 | 342 | 229 | 485 | 360 | 258 | 1008 | 721 | 563 | 1047 | 755 | 579 |
| 10 | 475 | 360 | 246 | 519 | 383 | 279 | 1094 | 779 | 615 | 1132 | 812 | 631 |
| 15 | 609 | 449 | 327 | 690 | 497 | 383 | 1522 | 1064 | 875 | 1561 | 1098 | 890 |
| 20 | 742 | 537 | 408 | 860 | 610 | 486 | 1948 | 1347 | 1133 | 1986 | 1381 | 1148 |
| 25 | 873 | 625 | 488 | 1028 | 722 | 588 | 2369 | 1628 | 1389 | 2407 | 1661 | 1404 |
| 30 | 1003 | 711 | 567 | 1194 | 832 | 689 | 2786 | 1905 | 1643 | 2824 | 1938 | 1657 |
| 35 | 1131 | 796 | 646 | 1357 | 941 | 788 | 3198 | 2179 | 1893 | 3235 | 2212 | 1907 |
| 40 | 1257 | 879 | 722 | 1519 | 1047 | 887 | 3604 | 2449 | 2139 | 3640 | 2481 | 2154 |
| 45 | 1381 | 961 | 798 | 1677 | 1152 | 983 | 4003 | 2714 | 2382 | 4039 | 2746 | 2396 |
| 50 | 1501 | 1040 | 872 | 1832 | 1255 | 1078 | 4394 | 2974 | 2620 | 4429 | 3005 | 2634 |
| 55 | 1619 | 1118 | 944 | 1984 | 1355 | 1170 | 4777 | 3229 | 2853 | 4811 | 3259 | 2867 |
| 60 | 1734 | 1194 | 1014 | 2131 | 1453 | 1261 | 5151 | 3477 | 3080 | 5184 | 3506 | 3094 |
| DE | 1558 | 1038 | 944 | 1980 | 1320 | 1200 | 4950 | 3300 | 3000 | 4950 | 3300 | 3000 |

**NOTE: Grade N represents tensions with no overload capacity factors.**

SHORT SPAN (150' RULING SPAN)

| Line Angle Deg. | 110.8 12/7 ACSR | | | T2 4/0 6/1 ACSR | | | T2 556 AAC 19 STR | | | T2 954 45/7 ACSR | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N |
| 1 | 220 | 186 | 95 | 284 | 240 | 122 | 415 | 341 | 190 | 536 | 435 | 250 |
| 2 | 254 | 209 | 116 | 327 | 269 | 148 | 530 | 418 | 260 | 709 | 550 | 355 |
| 3 | 289 | 232 | 137 | 370 | 298 | 175 | 646 | 494 | 329 | 882 | 665 | 459 |
| 4 | 323 | 255 | 158 | 413 | 327 | 201 | 761 | 571 | 399 | 1054 | 780 | 564 |
| 5 | 358 | 278 | 179 | 456 | 355 | 227 | 876 | 648 | 469 | 1227 | 895 | 669 |
| 6 | 392 | 301 | 200 | 499 | 384 | 253 | 991 | 724 | 539 | 1399 | 1010 | 773 |
| 7 | 427 | 324 | 220 | 542 | 413 | 279 | 1105 | 801 | 608 | 1571 | 1125 | 878 |
| 8 | 461 | 347 | 241 | 585 | 441 | 305 | 1220 | 877 | 678 | 1744 | 1240 | 982 |
| 9 | 495 | 370 | 262 | 628 | 470 | 331 | 1335 | 954 | 747 | 1916 | 1354 | 1086 |
| 10 | 530 | 392 | 283 | 671 | 498 | 357 | 1449 | 1030 | 817 | 2088 | 1469 | 1191 |
| 15 | 700 | 506 | 387 | 884 | 640 | 487 | 2020 | 1410 | 1163 | 2945 | 2040 | 1710 |
| 20 | 870 | 619 | 490 | 1096 | 781 | 616 | 2588 | 1788 | 1507 | 3796 | 2607 | 2227 |
| 25 | 1038 | 730 | 592 | 1306 | 921 | 743 | 3150 | 2163 | 1849 | 4640 | 3169 | 2739 |
| 30 | 1204 | 841 | 693 | 1513 | 1058 | 869 | 3706 | 2533 | 2187 | 5476 | 3725 | 3246 |
| 35 | 1367 | 949 | 792 | 1718 | 1194 | 994 | 4256 | 2898 | 2520 | 6301 | 4274 | 3747 |
| 40 | 1528 | 1056 | 890 | 1919 | 1327 | 1116 | 4797 | 3258 | 2849 | 7113 | 4815 | 4241 |
| 45 | 1686 | 1161 | 987 | 2116 | 1458 | 1237 | 5329 | 3612 | 3172 | 7913 | 5347 | 4726 |
| 50 | 1841 | 1263 | 1081 | 2310 | 1586 | 1355 | 5851 | 3958 | 3490 | 8697 | 5868 | 5203 |
| 55 | 1993 | 1364 | 1174 | 2499 | 1711 | 1471 | 6361 | 4298 | 3800 | 9465 | 6379 | 5670 |
| 60 | 2140 | 1461 | 1264 | 2683 | 1833 | 1583 | 6860 | 4629 | 4104 | 10215 | 6877 | 6126 |
| DE | 1980 | 1320 | 1200 | 2475 | 1650 | 1500 | 6600 | 4400 | 4000 | 9900 | 6600 | 6000 |

MEDIUM SPAN (200' RULING SPAN)

| Line Angle Deg. | 1/0 AAAC 7 STR | | | 556.6 AA 19 STR | | | 954 45/7 ACSR | | | 110.8 12/7 ACSR | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N |
| 1 | 273 | 232 | 118 | 416 | 343 | 188 | 476 | 394 | 214 | 290 | 246 | 125 |
| 2 | 314 | 259 | 142 | 522 | 414 | 253 | 591 | 471 | 284 | 333 | 275 | 151 |
| 3 | 354 | 286 | 166 | 629 | 485 | 317 | 706 | 548 | 354 | 376 | 304 | 177 |
| 4 | 394 | 312 | 191 | 735 | 556 | 382 | 821 | 624 | 423 | 419 | 332 | 203 |
| 5 | 434 | 339 | 215 | 842 | 627 | 446 | 936 | 701 | 493 | 463 | 361 | 230 |
| 6 | 474 | 366 | 240 | 948 | 698 | 511 | 1051 | 778 | 563 | 506 | 390 | 256 |
| 7 | 515 | 393 | 264 | 1054 | 769 | 575 | 1166 | 854 | 632 | 549 | 418 | 282 |
| 8 | 555 | 419 | 288 | 1160 | 839 | 640 | 1281 | 931 | 702 | 592 | 447 | 308 |
| 9 | 595 | 446 | 313 | 1267 | 910 | 704 | 1395 | 1007 | 772 | 634 | 475 | 334 |
| 10 | 635 | 473 | 337 | 1372 | 981 | 768 | 1510 | 1083 | 841 | 677 | 504 | 360 |
| 15 | 834 | 605 | 458 | 1900 | 1332 | 1089 | 2081 | 1463 | 1187 | 891 | 646 | 489 |
| 20 | 1032 | 737 | 578 | 2425 | 1682 | 1407 | 2648 | 1841 | 1531 | 1103 | 787 | 618 |
| 25 | 1227 | 867 | 697 | 2945 | 2028 | 1722 | 3209 | 2215 | 1872 | 1312 | 926 | 746 |
| 30 | 1421 | 995 | 815 | 3459 | 2370 | 2035 | 3765 | 2584 | 2210 | 1520 | 1064 | 872 |
| 35 | 1611 | 1122 | 931 | 3967 | 2707 | 2343 | 4313 | 2949 | 2543 | 1724 | 1200 | 996 |
| 40 | 1799 | 1246 | 1045 | 4467 | 3040 | 2647 | 4854 | 3308 | 2872 | 1925 | 1333 | 1119 |
| 45 | 1983 | 1368 | 1158 | 4958 | 3367 | 2946 | 5385 | 3661 | 3195 | 2122 | 1464 | 1239 |
| 50 | 2164 | 1487 | 1268 | 5441 | 3687 | 3240 | 5906 | 4007 | 3512 | 2316 | 1592 | 1357 |
| 55 | 2340 | 1604 | 1376 | 5912 | 4000 | 3527 | 6415 | 4345 | 3822 | 2505 | 1716 | 1473 |
| 60 | 2512 | 1718 | 1481 | 6373 | 4306 | 3807 | 6913 | 4675 | 4125 | 2689 | 1838 | 1586 |
| DE | 2310 | 1540 | 1400 | 6105 | 4070 | 3700 | 6600 | 4400 | 4000 | 2475 | 1650 | 1500 |

**NOTE: Grade N represents tensions with <u>no</u> overload capacity factors.**

MEDIUM SPAN (200' RULING SPAN)

| Line Angle Deg. | T2 4/0 6/1 ACSR | | | T2 556 AAC | | | T2 954 45/7 ACSR | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N |
| 1 | 377 | 319 | 162 | 537 | 443 | 243 | 700 | 570 | 325 |
| 2 | 433 | 357 | 196 | 674 | 534 | 326 | 916 | 714 | 456 |
| 3 | 489 | 394 | 230 | 810 | 626 | 409 | 1132 | 858 | 586 |
| 4 | 545 | 432 | 264 | 947 | 717 | 492 | 1348 | 1002 | 717 |
| 5 | 601 | 469 | 298 | 1084 | 808 | 574 | 1564 | 1146 | 848 |
| 6 | 657 | 506 | 332 | 1220 | 899 | 657 | 1779 | 1289 | 979 |
| 7 | 713 | 543 | 366 | 1356 | 989 | 740 | 1995 | 1433 | 1109 |
| 8 | 769 | 581 | 400 | 1493 | 1080 | 822 | 2210 | 1576 | 1240 |
| 9 | 824 | 618 | 434 | 1629 | 1171 | 905 | 2425 | 1720 | 1370 |
| 10 | 880 | 655 | 468 | 1765 | 1262 | 987 | 2640 | 1863 | 1500 |
| 15 | 1158 | 840 | 636 | 2443 | 1713 | 1399 | 3711 | 2576 | 2150 |
| 20 | 1433 | 1023 | 803 | 3116 | 2161 | 1807 | 4775 | 3285 | 2796 |
| 25 | 1706 | 1204 | 969 | 3783 | 2606 | 2212 | 5830 | 3988 | 3436 |
| 30 | 1975 | 1383 | 1133 | 4444 | 3045 | 2613 | 6874 | 4682 | 4069 |
| 35 | 2241 | 1559 | 1295 | 5095 | 3478 | 3009 | 7905 | 5368 | 4695 |
| 40 | 2502 | 1732 | 1454 | 5737 | 3905 | 3400 | 8920 | 6044 | 5312 |
| 45 | 2759 | 1902 | 1611 | 6368 | 4324 | 3783 | 9919 | 6708 | 5919 |
| 50 | 3010 | 2069 | 1764 | 6987 | 4736 | 4160 | 10899 | 7360 | 6515 |
| 55 | 3256 | 2231 | 1915 | 7593 | 5138 | 4529 | 11858 | 7997 | 7098 |
| 60 | 3495 | 2389 | 2061 | 8184 | 5530 | 4889 | 12795 | 8619 | 7668 |
| DE | 3218 | 2145 | 1950 | 7838 | 5225 | 4750 | 12375 | 8250 | 7500 |

**NOTE: Grade N represents tensions with <u>no</u> overload capacity factors.**

LONG SPAN (250' RULING SPAN)

| Line Angle Deg. | 1/0 AAAC 7 STR | | | 556.5 AA 19 STR | | | 954 45/7 ACSR | | | 110.8 12/7 ACSR | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N |
| 1 | 339 | 288 | 145 | 508 | 421 | 228 | 595 | 493 | 268 | 360 | 306 | 155 |
| 2 | 386 | 320 | 174 | 629 | 501 | 301 | 739 | 589 | 355 | 412 | 341 | 186 |
| 3 | 434 | 351 | 203 | 749 | 582 | 375 | 883 | 685 | 442 | 464 | 375 | 218 |
| 4 | 481 | 383 | 232 | 870 | 663 | 448 | 1027 | 781 | 529 | 516 | 410 | 249 |
| 5 | 528 | 414 | 260 | 991 | 743 | 521 | 1170 | 876 | 616 | 567 | 444 | 280 |
| 6 | 576 | 446 | 289 | 1112 | 823 | 594 | 1314 | 972 | 704 | 619 | 478 | 312 |
| 7 | 623 | 477 | 318 | 1232 | 904 | 667 | 1458 | 1068 | 791 | 671 | 513 | 343 |
| 8 | 670 | 509 | 346 | 1353 | 984 | 740 | 1601 | 1163 | 878 | 722 | 547 | 374 |
| 9 | 718 | 540 | 375 | 1473 | 1064 | 813 | 1744 | 1259 | 964 | 774 | 581 | 405 |
| 10 | 765 | 572 | 404 | 1593 | 1144 | 886 | 1887 | 1354 | 1051 | 825 | 616 | 437 |
| 15 | 999 | 728 | 546 | 2192 | 1543 | 1250 | 2601 | 1829 | 1484 | 1081 | 786 | 592 |
| 20 | 1232 | 883 | 688 | 2788 | 1940 | 1611 | 3309 | 2301 | 1914 | 1335 | 955 | 747 |
| 25 | 1463 | 1036 | 828 | 3377 | 2332 | 1969 | 4012 | 2768 | 2341 | 1587 | 1122 | 900 |
| 30 | 1691 | 1187 | 967 | 3961 | 2720 | 2323 | 4706 | 3230 | 2762 | 1835 | 1287 | 1051 |
| 35 | 1915 | 1336 | 1103 | 4537 | 3103 | 2673 | 5392 | 3686 | 3179 | 2080 | 1450 | 1200 |
| 40 | 2136 | 1482 | 1238 | 5104 | 3480 | 3018 | 6067 | 4135 | 3590 | 2322 | 1610 | 1347 |
| 45 | 2353 | 1626 | 1370 | 5661 | 3850 | 3357 | 6731 | 4576 | 3994 | 2558 | 1766 | 1492 |
| 50 | 2565 | 1766 | 1500 | 6208 | 4213 | 3690 | 7382 | 5009 | 4390 | 2790 | 1920 | 1633 |
| 55 | 2773 | 1903 | 1627 | 6743 | 4568 | 4016 | 8019 | 5431 | 4778 | 3016 | 2069 | 1772 |
| 60 | 2975 | 2037 | 1751 | 7265 | 4915 | 4334 | 8641 | 5844 | 5156 | 3237 | 2215 | 1907 |
| DE | 2723 | 1815 | 1650 | 6930 | 4620 | 4200 | 8250 | 5500 | 5000 | 2970 | 1981 | 1800 |

**NOTE: Grade N represents tensions with <u>no</u> overload capacity factors.**

LONG SPAN (250' RULING SPAN)

| Line Angle Deg. | T2 4/0 6/1 ACSR | | | T2 556 AAC | | | T2 954 45/7 ACSR | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grade | | | Grade | | | Grade | | |
| | B | C | N | B | C | N | B | C | N |
| 1 | 468 | 398 | 201 | 644 | 536 | 287 | 865 | 706 | 399 |
| 2 | 536 | 443 | 242 | 788 | 632 | 375 | 1124 | 878 | 556 |
| 3 | 603 | 488 | 283 | 932 | 728 | 462 | 1383 | 1051 | 713 |
| 4 | 671 | 533 | 324 | 1076 | 824 | 549 | 1642 | 1224 | 870 |
| 5 | 739 | 578 | 365 | 1219 | 920 | 636 | 1901 | 1396 | 1027 |
| 6 | 806 | 623 | 406 | 1363 | 1015 | 723 | 2159 | 1568 | 1184 |
| 7 | 873 | 668 | 447 | 1507 | 1111 | 810 | 2418 | 1741 | 1341 |
| 8 | 941 | 712 | 488 | 1650 | 1206 | 897 | 2676 | 1913 | 1497 |
| 9 | 1008 | 757 | 529 | 1793 | 1302 | 984 | 2934 | 2085 | 1654 |
| 10 | 1075 | 802 | 569 | 1936 | 1397 | 1071 | 3192 | 2257 | 1810 |
| 15 | 1409 | 1024 | 772 | 2650 | 1872 | 1504 | 4477 | 3113 | 2590 |
| 20 | 1741 | 1245 | 974 | 3358 | 2344 | 1934 | 5754 | 3963 | 3364 |
| 25 | 2070 | 1463 | 1174 | 4060 | 2811 | 2360 | 7020 | 4806 | 4132 |
| 30 | 2394 | 1679 | 1371 | 4754 | 3272 | 2781 | 8272 | 5639 | 4893 |
| 35 | 2714 | 1891 | 1566 | 5439 | 3728 | 3198 | 9509 | 6462 | 5644 |
| 40 | 3029 | 2100 | 1758 | 6113 | 4176 | 3608 | 10727 | 7273 | 6384 |
| 45 | 3338 | 2304 | 1947 | 6776 | 4616 | 4012 | 11925 | 8070 | 7112 |
| 50 | 3640 | 2504 | 2132 | 7427 | 5048 | 4408 | 13101 | 8851 | 7827 |
| 55 | 3936 | 2700 | 2312 | 8063 | 5470 | 4795 | 14251 | 9615 | 8526 |
| 60 | 4224 | 2890 | 2489 | 8683 | 5881 | 5173 | 15374 | 10362 | 9210 |
| DE | 3878 | 2585 | 2350 | 8250 | 5500 | 5000 | 14850 | 9900 | 9000 |

**NOTE: Grade N represents tensions with no overload capacity factors.**

EXTRA LONG SPAN (300' RULING SPAN)

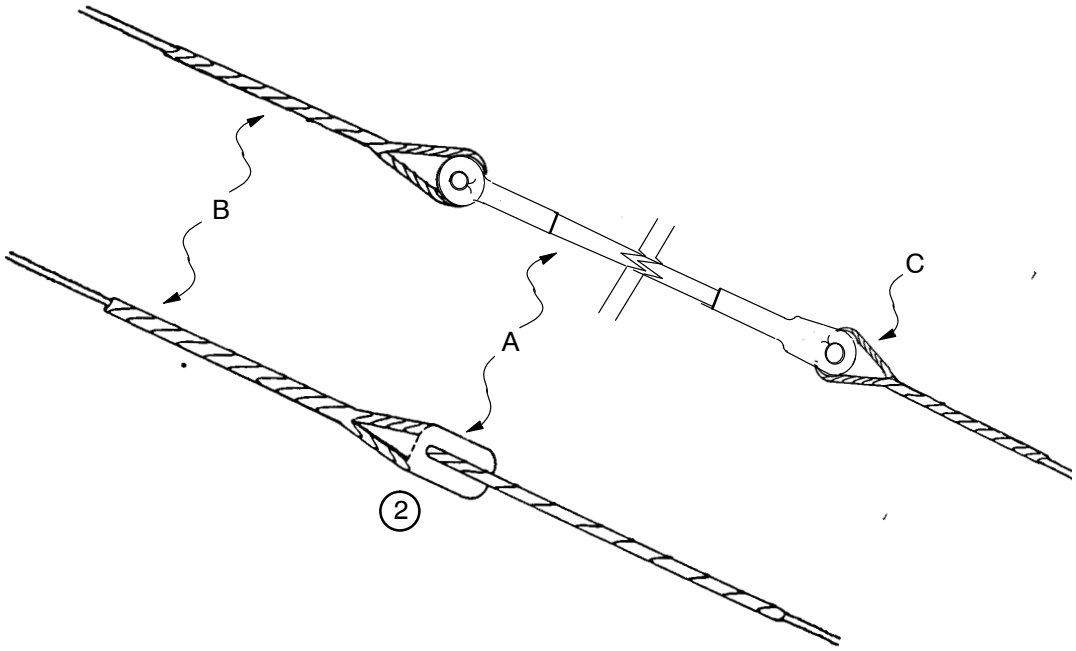
| Line Angle Deg. | 1/0 AAAC 7 STR | | | 556.5 AAC 19 STR | | | 954 45/7 ACSR | | | 110.8 12/7 ACSR | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N | Grade B | Grade C | Grade N |
| 1 | 403 | 343 | 172 | 594 | 495 | 264 | 685 | 572 | 304 | 431 | 366 | 185 |
| 2 | 456 | 379 | 204 | 723 | 581 | 343 | 829 | 668 | 391 | 491 | 406 | 221 |
| 3 | 509 | 414 | 237 | 853 | 667 | 421 | 973 | 764 | 478 | 552 | 447 | 258 |
| 4 | 562 | 449 | 269 | 982 | 754 | 500 | 1117 | 860 | 565 | 612 | 487 | 295 |
| 5 | 615 | 485 | 301 | 1111 | 840 | 578 | 1260 | 956 | 652 | 672 | 527 | 331 |
| 6 | 669 | 520 | 333 | 1241 | 926 | 656 | 1404 | 1051 | 740 | 732 | 567 | 368 |
| 7 | 722 | 555 | 365 | 1370 | 1012 | 735 | 1548 | 1147 | 827 | 793 | 607 | 404 |
| 8 | 775 | 591 | 398 | 1499 | 1098 | 813 | 1691 | 1242 | 914 | 853 | 647 | 441 |
| 9 | 827 | 626 | 430 | 1628 | 1184 | 891 | 1834 | 1338 | 1000 | 913 | 687 | 477 |
| 10 | 880 | 661 | 462 | 1757 | 1270 | 969 | 1977 | 1433 | 1087 | 973 | 727 | 514 |
| 15 | 1143 | 836 | 622 | 2398 | 1697 | 1359 | 2690 | 1908 | 1520 | 1272 | 926 | 695 |
| 20 | 1404 | 1010 | 780 | 3036 | 2121 | 1746 | 3398 | 2379 | 1950 | 1568 | 1123 | 875 |
| 25 | 1663 | 1181 | 937 | 3667 | 2541 | 2129 | 4100 | 2846 | 2376 | 1861 | 1318 | 1054 |
| 30 | 1918 | 1350 | 1093 | 4292 | 2957 | 2509 | 4793 | 3307 | 2797 | 2151 | 1510 | 1230 |
| 35 | 2169 | 1517 | 1246 | 4908 | 3366 | 2883 | 5478 | 3762 | 3214 | 2437 | 1700 | 1404 |
| 40 | 2416 | 1681 | 1397 | 5515 | 3770 | 3253 | 6152 | 4209 | 3624 | 2718 | 1886 | 1576 |
| 45 | 2659 | 1842 | 1545 | 6112 | 4166 | 3616 | 6814 | 4650 | 4027 | 2994 | 2069 | 1744 |
| 50 | 2897 | 1999 | 1690 | 6696 | 4554 | 3972 | 7464 | 5080 | 4422 | 3264 | 2247 | 1909 |
| 55 | 3129 | 2152 | 1832 | 7269 | 4934 | 4320 | 8099 | 5502 | 4810 | 3528 | 2422 | 2071 |
| 60 | 3355 | 2301 | 1971 | 7827 | 5304 | 4661 | 8719 | 5828 | 5188 | 3786 | 2592 | 2228 |
| DE | 3053 | 2035 | 1850 | 7425 | 4950 | 4500 | 8250 | 5500 | 5000 | 3465 | 2310 | 2100 |

**NOTE: Grade N represents tensions with no overload capacity factors.**

EXTRA LONG SPAN (300' RULING SPAN)

| Line Angle Deg. | T2 4/0 6/1 ACSR | | | T2 556 AAC 19 STR | | | T2 954 45/7 ACSR | | |
|---|---|---|---|---|---|---|---|---|---|
| | Grade | | | Grade | | | Grade | | |
| | B | C | N | B | C | N | B | C | N |
| 1 | 560 | 476 | 240 | 744 | 624 | 327 | 986 | 812 | 448 |
| 2 | 639 | 529 | 288 | 888 | 720 | 415 | 1245 | 985 | 605 |
| 3 | 718 | 581 | 336 | 1032 | 816 | 502 | 1504 | 1157 | 762 |
| 4 | 797 | 634 | 384 | 1176 | 912 | 589 | 1763 | 1330 | 919 |
| 5 | 876 | 687 | 432 | 1319 | 1008 | 676 | 2022 | 1503 | 1076 |
| 6 | 955 | 739 | 480 | 1463 | 1103 | 763 | 2280 | 1675 | 1232 |
| 7 | 1034 | 792 | 528 | 1606 | 1199 | 850 | 2539 | 1847 | 1389 |
| 8 | 1113 | 844 | 575 | 1750 | 1294 | 937 | 2797 | 2019 | 1546 |
| 9 | 1191 | 896 | 623 | 1893 | 1390 | 1024 | 3055 | 2191 | 1702 |
| 10 | 1270 | 949 | 671 | 2036 | 1485 | 1111 | 3313 | 2363 | 1858 |
| 15 | 1661 | 1209 | 909 | 2749 | 1959 | 1543 | 4597 | 3218 | 2638 |
| 20 | 2049 | 1467 | 1144 | 3456 | 2430 | 1973 | 5873 | 4068 | 3412 |
| 25 | 2434 | 1722 | 1378 | 4157 | 2897 | 2399 | 7138 | 4910 | 4180 |
| 30 | 2813 | 1974 | 1609 | 4850 | 3357 | 2820 | 8389 | 5742 | 4940 |
| 35 | 3187 | 2223 | 1837 | 5534 | 3812 | 3236 | 9624 | 6564 | 5690 |
| 40 | 3556 | 2467 | 2062 | 6207 | 4259 | 3646 | 10841 | 7373 | 6430 |
| 45 | 3917 | 2706 | 2282 | 6869 | 4698 | 4049 | 12037 | 8168 | 7157 |
| 50 | 4271 | 2940 | 2499 | 7517 | 5128 | 4444 | 13210 | 8947 | 7871 |
| 55 | 4617 | 3169 | 2710 | 8151 | 5548 | 4830 | 14358 | 9710 | 8569 |
| 60 | 4954 | 3391 | 2917 | 8770 | 5957 | 5208 | 15479 | 10454 | 9252 |
| DE | 4538 | 3025 | 2750 | 8250 | 5500 | 5000 | 14850 | 9900 | 9000 |

**NOTE: Grade N represents tensions with <u>no</u> overload capacity factors.**

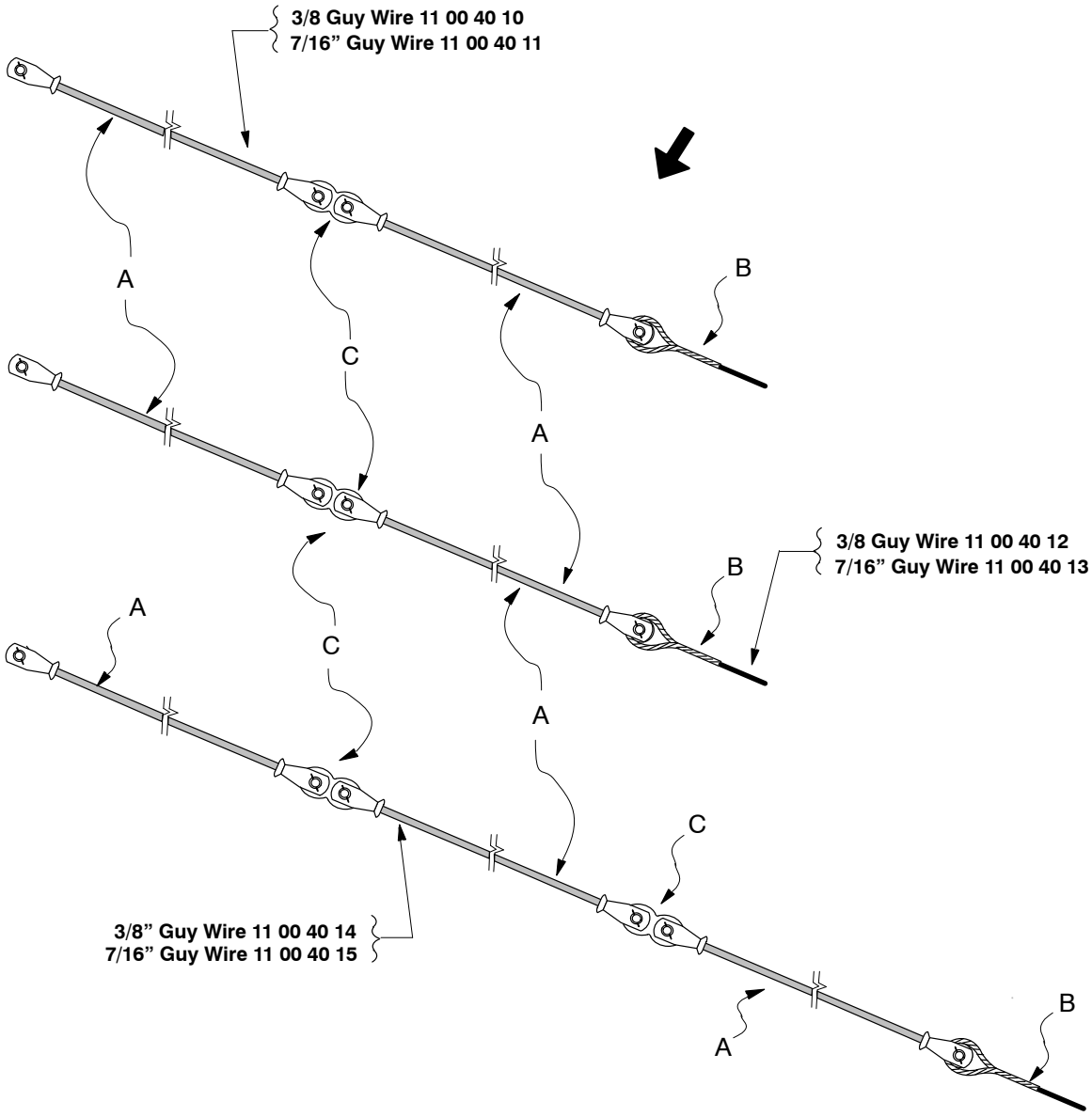



| | Porcelain Strain Ins. | 45" Fiberglass Ins. | 88" Fiberglass Ins. |
|---|---|---|---|
| 1/4" Guy Wire | 11 00 40 01 | 11 00 40 04 | 11 00 40 07 |
| 3/8" Guy Wire | 11 00 40 02 | 11 00 40 05 | 11 00 40 08 |
| 7/16" Guy Wire | 11 00 40 03 | 11 00 40 06 | 11 00 40 09 |

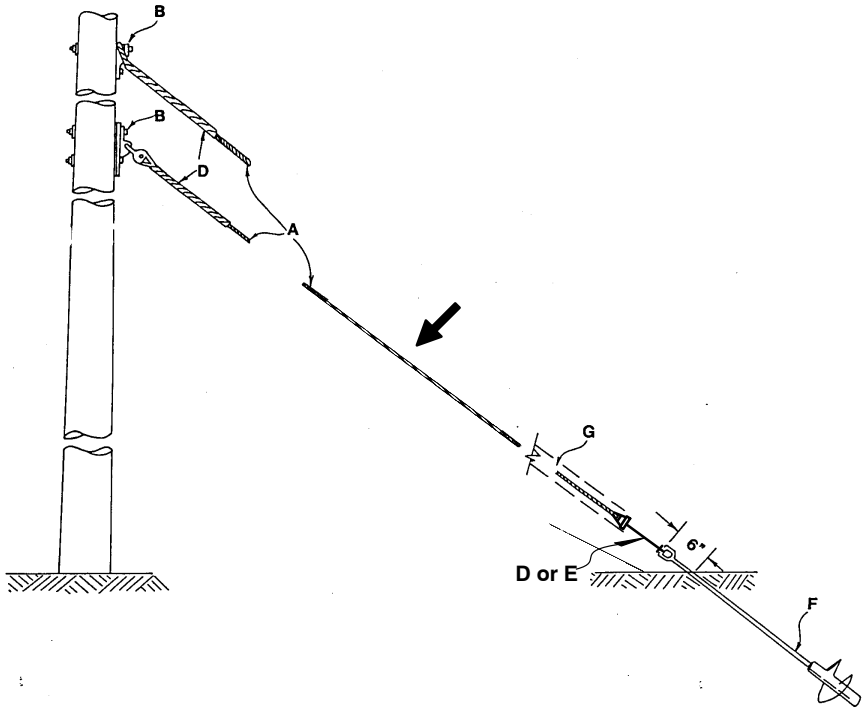
NOTE:

1. If installing insulator in existing guy, Operation Code 918 must be added.
2. Porcelain insulators to be used in Missouri only.

| | | Stnd. / Stk. No. | Description 11 00 40 ** | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 15kV Insl. | | | Fiberglass Insl. | | | | | |
| | | 25 56 047 | Insulator – 15kV, 1/4" | 1 | | | | | | | | |
| 2 | A | 25 56 048 | Insulator – 15kV, 3/8" or 7/16" | | 1 | 1 | | | | | | |
| | | 25 56 070 | Insulator – Fiberglass, 45" | | | | 1 | 1 | 1 | | | |
| | | 25 56 058 | Insulator – Fiberglass, 88" | | | | | | | 1 | 1 | 1 |
| | | 23 68 241 | Grip – Guy, 1/4" | 2 | | | 2 | | | 2 | | |
| | B | 23 68 237 | Grip – Guy, 3/8" | | 2 | | | 2 | | | 2 | |
| | | 23 68 238 | Grip – Guy, 7/16" | | | 2 | | | 2 | | | 2 |
| | C | 23 68 327 | Roller – Guy | | | | | | | 1 | 1 | 1 |
| 1@ | D | 918 | Install Guy | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |



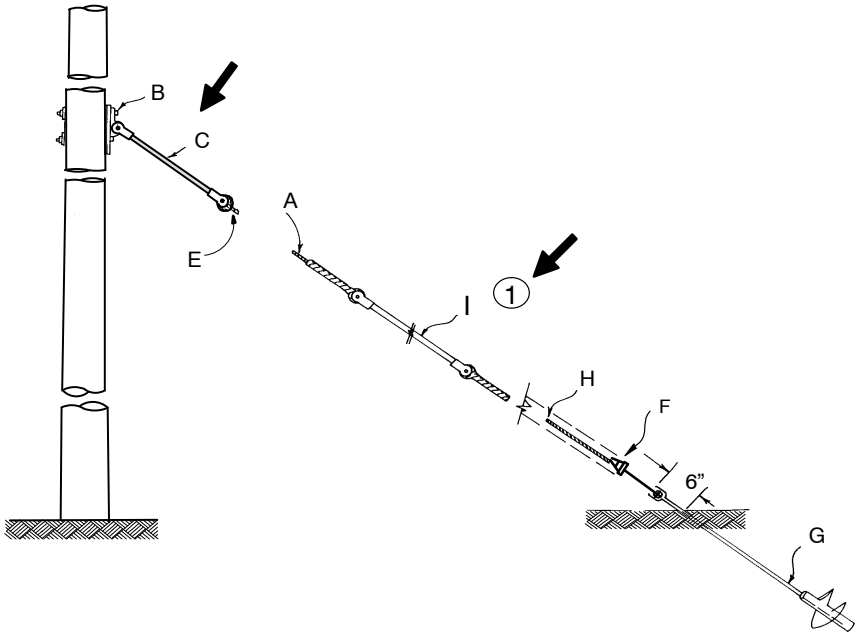

| | | Stnd. /Stk. No. | Description 11 00 40 ** | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|
| | A | 25 56 070 | Insulator – Fiberglass, 45" | 1 | 1 | | | 1 | 1 |
| | | 25 56 058 | Insulator – Fiberglass, 88" | 1 | 1 | 2 | 2 | 2 | 2 |
| | B | 23 68 237 | Grip – Guy 3/8" | 1 | | 1 | | 1 | |
| | | 23 68 238 | Grip – Guy 7/16" | | 1 | | 1 | | 1 |
| | C | 23 59 064 | Link – Figure 8 | 1 | 1 | 1 | 1 | 2 | 2 |
| | D | 918 | Install Guy | 2 | 2 | 2 | 2 | 3 | 3 |




NOTE:

1. This DCS may only be used on guy stub poles where the span guy is insulated and there are no other energized conductor or communication attachments on the pole.
2. DCS 11 00 41 01 for 1/4" guy is not to be used in Illinois.

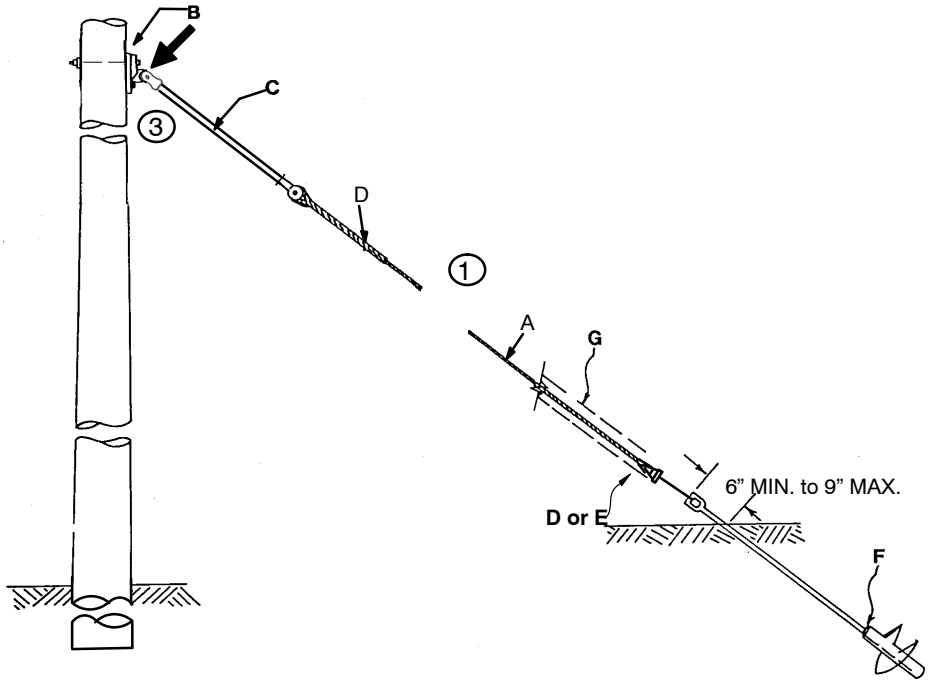
| | | Stnd. / Stk. No. | Description 11 00 41 ** | 01 | 02 | 04 |
|---|---|---|---|---|---|---|
| | | | | 1/4" | 3/8" | 7/16" |
| | A | 27 59 016 | Wire – Guy, 1/4" | 40 | | |
| | | 27 59 020 | Wire – Guy, 3/8" | | 40 | |
| | | 27 59 022 | Wire – Guy, 7/16" | | | 40 |
| | B | **11 00 56 01** | Hook – Guy, Light Duty | 1 | | |
| | | **11 00 56 02** | Hook – Guy, Heavy Duty | | 1 | 1 |
| | D | 23 68 241 | Grip – Guy, 1/4" | 3 | | |
| | | 23 68 237 | Grip – Guy, 3/8" | | 3 | |
| | | 23 68 238 | Grip – Guy, 7/16" | | | 3 |
| | E | 23 68 300 | Deadend – Auto 1/4" | 1 | | |
| | | 23 68 299 | Deadend – Auto 3/8" | | 1 | |
| | | 23 68 301 | Deadend – Auto 7/16" | | | 1 |
| @ | F | **11 00 60 **** | Anchor – Screw | 1 | 1 | 1 |
| | | **11 00 63 **** | Anchor – Screw, Hi–Torque | 1 | 1 | 1 |
| | G | 23 78 091 | Protector – Guy | 1 | 1 | 1 |
| @ | I | **11 00 40 **** | Assembly – Insulator, Guy | 1 | 1 | 1 |
| | | 918 | Install Guy | 2 | 2 | 2 |




NOTES:

1. Omit insulator if not required. Insert additional insulators if needed. See DCS **11 00 01 ****** for insulator location and requirements.
2. 88"FG insulator (Stk. No. 25 56 058) may be used in place of the 45"FG insulator where required.
3. For anchors with three guys attached, use DCS 11 00 42 05 or 11 00 42 06.

| | | Stnd. / Stk. No. | Description 11 00 42 ** | 02 | 04 | 05 | 06 |
|---|---|---|---|---|---|---|---|
| | | | | 3/8" | 7/16" | 3/8" | 7/16" |
| | A | 27 59 020 | Wire – Guy, 3/8" | 40 | | 120 | |
| | | 27 59 022 | Wire – Guy, 7/16" | | 40 | | 120 |
| @ | B | **11 00 56 03** | Hook – Guy, Heavy Duty | 1 | 1 | 3 | 3 |
| | | **11 00 56 04** | Hook – Guy, Heavy Duty | 1 | 1 | 3 | 3 |
| 2@ | C | 25 56 070 | Insulator – Guy, FG 45" | 1 | 1 | 3 | 3 |
| | | 25 56 058 | Insulator – Guy, FG 88" | 1 | 1 | 3 | 3 |
| | E | 23 68 237 | Grip – Guy, 3/8" | 1 | | 3 | |
| | | 23 68 238 | Grip – Guy, 7/16" | | 1 | | 3 |
| 3 | F | 23 68 299 | Deadend – Auto, 3/8" | 1 | | 2 | |
| | | 23 68 301 | Deadend – Auto, 7/16" | | 1 | | 2 |
| | | 23 68 744 | Deadend – Auto, 3/8", Long Bail | | | 1 | |
| | | 23 78 454 | Deadend – Auto, 7/16", Long Bail | | | | 1 |
| @ | G | **11 00 60 ****** | Anchor – Screw | 1 | 1 | 1 | 1 |
| | | **11 00 63 ****** | Anchor – Screw, Hi–Torque | 1 | 1 | 1 | 1 |
| | H | 23 78 091 | Marker – Guy | 1 | 1 | 1 | 1 |
| 1@ | I | **11 00 40 ****** | Assembly – Insulator, Guy | 1 | 1 | 3 | 3 |
| | | 918 | Install Guy | 2 | 2 | 6 | 6 |

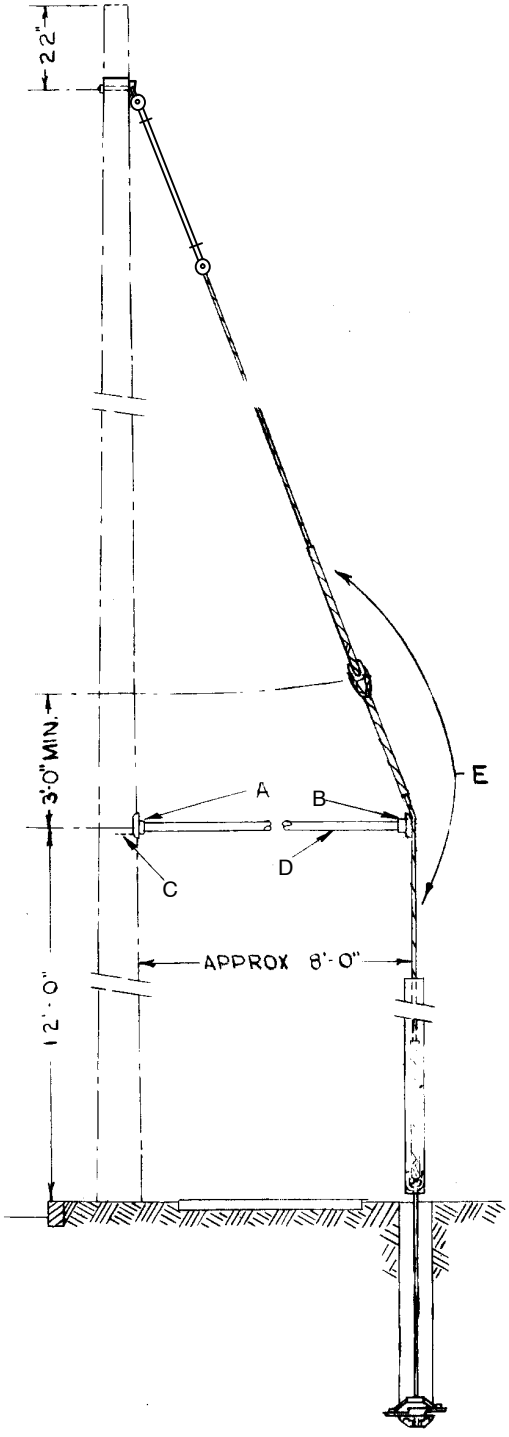


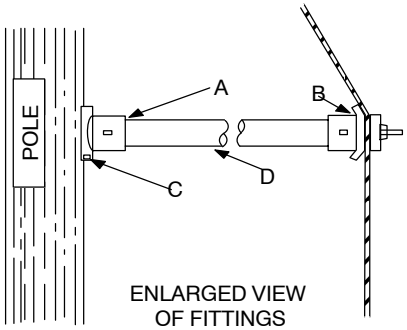

NOTES:

1. Insert additional insulator if needed. See DCS **11 00 01 **** for insulator location and requirements.
2. Use 88" guy strain if additional electrical clearance is required where 45" does not meet the NESC code.
3. See DCS **11 00 56 **** for guy hook assembly.

| | | Stnd. / Stk. No. | Description 11 00 43 ** | 01 | 03 | 05 | 07 | 09 | 11 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 1/4" | | 3/8" | | 7/16" | |
| | A | 27 59 016 | Wire – Guy, 1/4" | 40 | 40 | | | | |
| | | 27 59 020 | Wire – Guy, 3/8" | | | 40 | 40 | | |
| | | 27 59 022 | Wire – Guy, 7/16" | | | | | 40 | 40 |
| | B | **11 00 56 03** | Hook – Guy, HD | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | C | 25 56 070 | Insulator – Guy, FG 45" | 1 | | 1 | | 1 | |
| | | 25 56 058 | Insulator – Guy, FG 88" | | 1 | | 1 | | 1 |
| | D | 23 68 241 | Grip – Guy, 1/4" | 1 | 1 | | | | |
| | | 23 68 237 | Grip – Guy, 3/8" | | | 1 | 1 | | |
| | | 23 68 238 | Grip – Guy, 7/16" | | | | | 1 | 1 |
| | E | 23 68 300 | Deadend–Auto, 1/4" | 1 | 1 | | | | |
| | | 23 68 299 | Deadend–Auto, 3/8" | | | 1 | 1 | | |
| | | 23 68 301 | Deadend–Auto, 7/16" | | | | | 1 | 1 |
| @ | F | **11 00 60 **** | Anchor – Screw | 1 | 1 | 1 | 1 | 1 | 1 |
| | | **11 00 63 **** | Anchor – Screw, Hi–Torque | 1 | 1 | 1 | 1 | 1 | 1 |
| | G | 23 78 091 | Marker – Guy | 1 | 1 | 1 | 1 | 1 | 1 |
| 1@ | H | **11 00 40 **** | Assembly – Insulator, Guy | 1 | 1 | 1 | 1 | 1 | 1 |
| | | 918 | Install Guy | 2 | 2 | 2 | 2 | 2 | 2 |

# GUYING
## Sidewalk Guy Assembly Unit




ENLARGED VIEW
OF FITTINGS

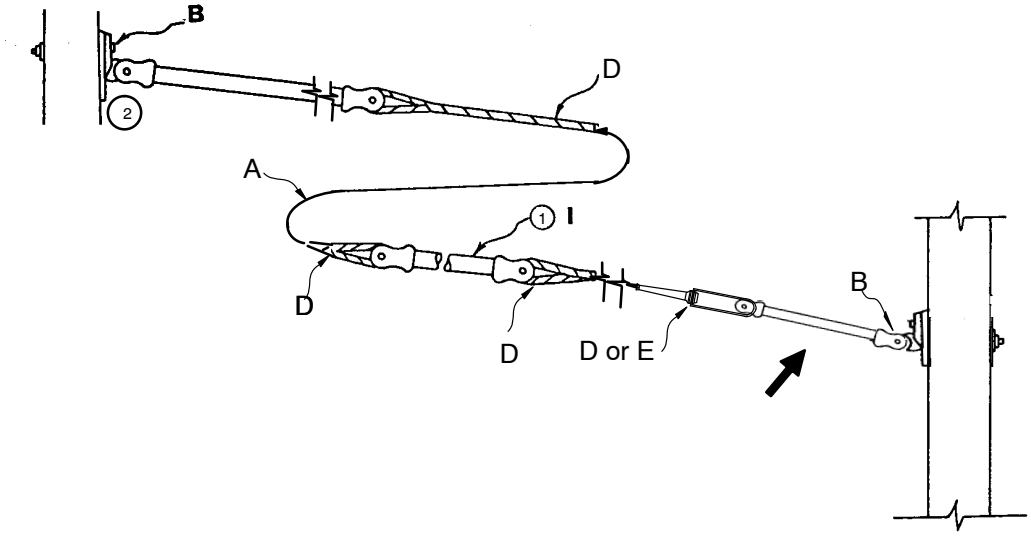
| Pole Ht. | Pole Class | Max. Conductor Tension Units[1,2] | | | | | |
|---|---|---|---|---|---|---|---|
| | | Grade C | | | Grade B | | |
| | | 1/4" Guy | 3/8" Guy | 7/16" Guy | 1/4" Guy | 3/8" Guy | 7/16" Guy |
| 30 | 4 | 1.53 | 2.28 | 2.28 | 1.02 | 1.16 | 1.16 |
| | 5 | 1.53 | 1.78 | 1.78 | 0.91 | 0.91 | 0.91 |
| 35 | 1 | 1.40 | 3.25 | 4.39 | 0.93 | 2.17 | 2.78 |
| | 3 | 1.40 | 3.25 | 3.54 | 0.93 | 1.80 | 1.80 |
| | 4 | 1.40 | 2.77 | 2.77 | 0.93 | 1.41 | 1.41 |
| | 5 | 1.40 | 2.13 | 2.13 | 0.93 | 1.08 | 1.08 |
| 40 | 3 | 1.26 | 2.92 | 3.95 | 0.84 | 1.94 | 2.14 |
| | 4 | 1.26 | 2.92 | 3.32 | 0.84 | 1.70 | 1.70 |
| 45 | 4 | 1.13 | 2.39 | 2.39 | 0.75 | 1.59 | 1.59 |

| Pole Ht. | Pole Class | Max. Conductor Tension Units Limiting Component | | | | | |
|---|---|---|---|---|---|---|---|
| | | Grade C | | | Grade B | | |
| | | 1/4" Guy | 3/8" Guy | 7/16" Guy | 1/4" Guy | 3/8" Guy | 7/16" Guy |
| 30 | 4 | Guy Wire | Pole @ Strut | Pole @ Strut | Guy Wire | Pole @ Strut | Pole @ Strut |
| | 5 | Guy Wire | Pole @ Strut | Pole @ Strut | Pole @ Strut | Pole @ Strut | Pole @ Strut |
| 35 | 1 | Guy Wire | Guy Wire | Guy Wire | Guy Wire | Guy Wire | Pole @ Strut |
| | 3 | Guy Wire | Guy Wire | Pole @ Strut | Guy Wire | Pole @ Strut | Pole @ Strut |
| | 4 | Guy Wire | Pole @ Strut | Pole @ Strut | Guy Wire | Pole @ Strut | Pole @ Strut |
| | 5 | Guy Wire | Pole @ Strut | Pole @ Strut | Guy Wire | Pole @ Strut | Pole @ Strut |
| 40 | 3 | Guy Wire | Guy Wire | Guy Wire | Guy Wire | Guy Wire | Pole @ Strut |
| | 4 | Guy Wire | Guy Wire | Column Loading | Guy Wire | Pole @ Strut | Pole @ Strut |
| 45 | 4 | Guy Wire | Column Loading | Column Loading | Guy Wire | Column Loading | Column Loading |

| | DIST. STD STOCK NO. | DESCRIPTION | REQ'D |
|---|---|---|---|
| A | 23 67 263 | Plate, Sidewalk Guy | 1 |
| B | 23 68 422 | Fitting, Guy End | 1 |
| C | 23 60 007 | Screw, Lag, 1/2" x 4" | 3 |
| 3 D | 40 83 022 | Pipe, Galv, 2" x 10'–0" | 10 |
| @ E | **11 00 43 **** | Guy–Anchor, Insulator | 1 |
| | 918 | Install Guy | 2 |

**Notes:**

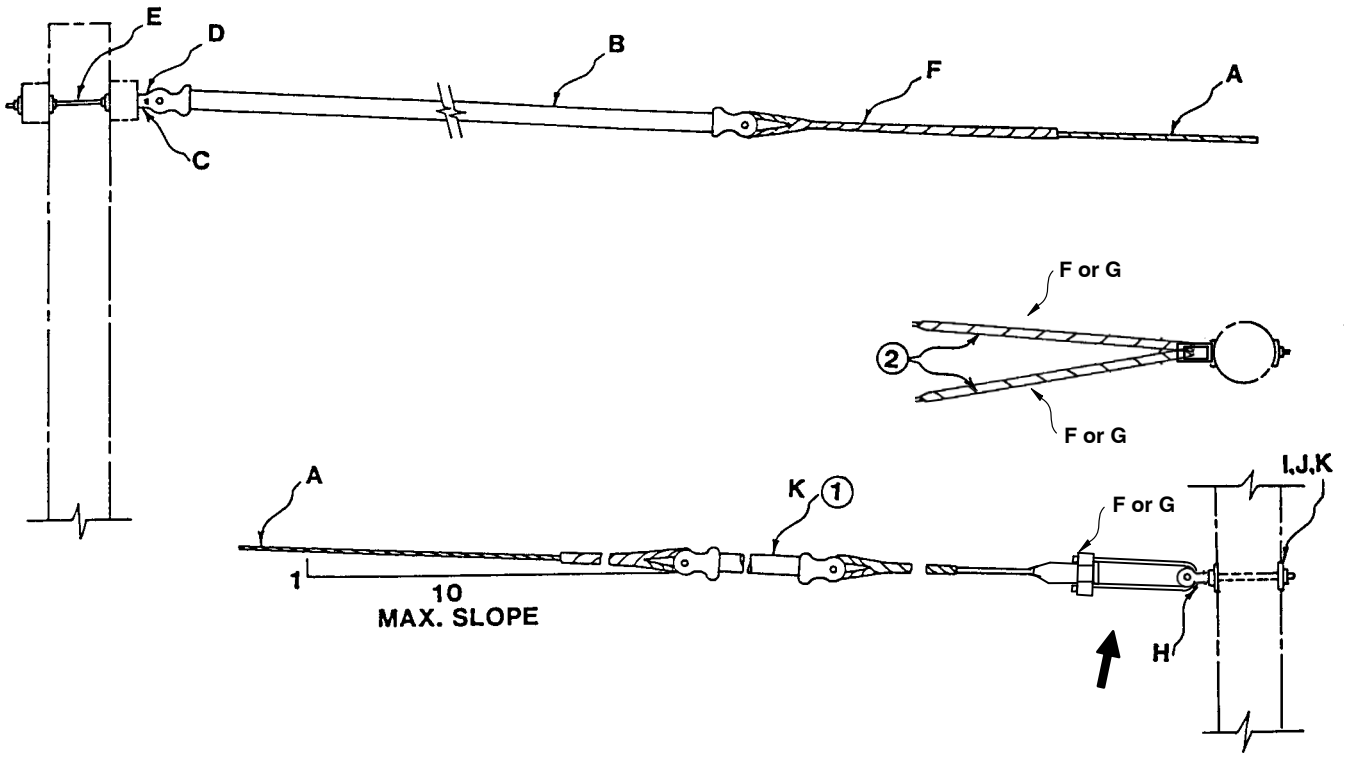
1. A conductor tension unit is a resultant force (in 1,000 lb. units) for a given conductor and line angle.
2. These are the maximum resultant tensions (before applying NESC Load Factors) that these poles can support under these given installation parameters. For other pole heights, classes, guy and strut attachment heights, refer to Engineering Design Manual LS–30 and associated Guying Tool.
3. Maximum conductor tension limits are based on an 8ft guy strut. Using the full 10ft length of pipe for the guy strut will allow slightly higher conductor tensions.




NOTES

1. Add insulators as required. See DCS **11 00 01 01** for insulator location and requirements.
2. See DCS **11 00 56 ****** for guy hook installation.

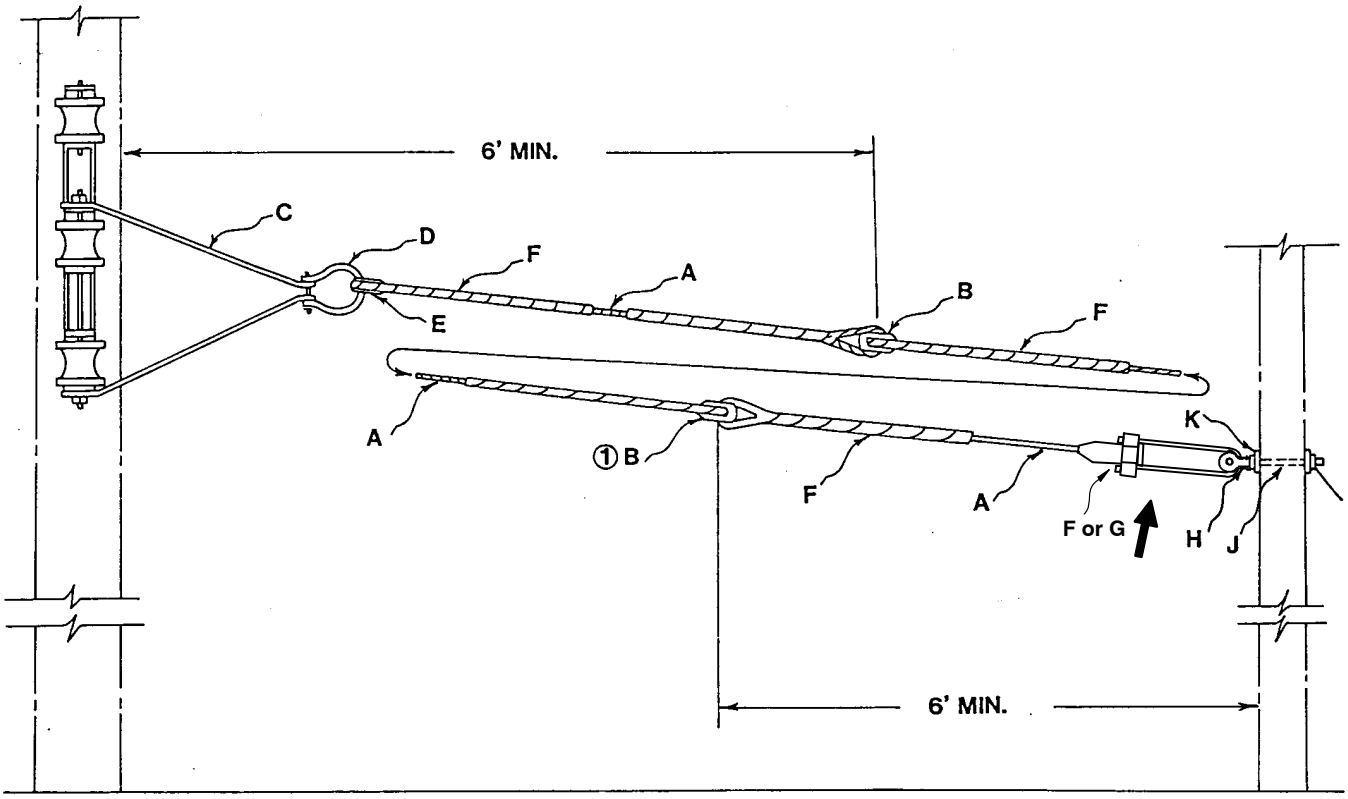
| | | Stnd. / Stk. No. | Description 11 00 46 ** | 01 | 03 | 05 | 07 | 15 | 16 |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 1/4" Guy | | 3/8" Guy | | 7/16" Guy | |
| | A | 27 59 016 | Wire – Guy, 1/4" | 150 | 150 | | | | |
| | | 27 59 020 | Wire – Guy, 3/8" | | | 150 | 150 | | |
| | | 27 59 022 | Wire – Guy, 7/16" | | | | | 150 | 150 |
| | B | **11 00 56 04** | Hook – Guy, HD | 2 | 2 | 2 | 2 | 2 | 2 |
| | C | 25 56 070 | Insulator – Guy, FG 45" | 2 | | 2 | | 2 | |
| | | 25 56 058 | Insulator – Guy, FG 88" | | 2 | | 2 | | 2 |
| | D | 23 68 241 | Grip – Guy, 1/4" | 1 | 1 | | | | |
| | | 23 68 237 | Grip – Guy, 3/8" | | | 1 | 1 | | |
| | | 23 68 238 | Grip – Guy, 7/16" | | | | | 1 | 1 |
| | E | 23 68 300 | Deadend – Auto, 1/4" | 1 | 1 | | | | |
| | | 23 68 299 | Deadend – Auto, 3/8" | | | 1 | 1 | | |
| | | 23 68 301 | Deadend – Auto, 7/16" | | | | | 1 | 1 |
| @1 | I | **11 00 40 ****| Assembly – Insulator, Guy | 1 | 1 | 1 | 1 | 1 | 1 |
| | | 918 | Install Guy | 2 | 2 | 2 | 2 | 2 | 2 |




NOTES:

1. Omit second insulator if not required. See Dist. Std. **11 00 01 ****  for insulator location and requirements.
2. Materials listed are for single unit. For double unit call for two guys.

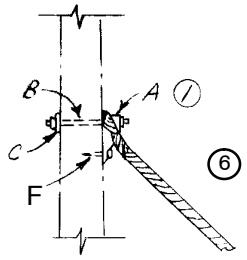
| | | Stnd. / Stk. No. | Description 11 00 48 ** | 01 | 02 | 03 | 04 |
|---|---|---|---|---|---|---|---|
| | A | 27 59 016 | Wire – Guy, 1/4” | 150 | 150 | | |
| | | 27 59 020 | Wire – Guy, 3/8” | | | 150 | 150 |
| | B | 25 56 070 | Insulator – Guy, FG 45” | 1 | | 1 | |
| | | 25 56 058 | Insulator – Guy, FG 88” | | 1 | | 1 |
| | C | 23 65 012 | Eyenut, 5/8” | 1 | 1 | 1 | 1 |
| | D | 23 66 027 | Washer – Sq. 2–1/4” | 4 | 4 | 4 | 4 |
| | E | 23 53 002 | Bolt – Mach., 5/8” x 16” | 1 | 1 | 1 | 1 |
| | F | 23 68 241 | Grip – Guy, 1/4” | 1 | 1 | | |
| | | 23 68 237 | Grip – Guy, 3/8” | | | 1 | 1 |
| | G | 23 68 300 | Deadend – Auto, 1/4” | 1 | 1 | | |
| | | 23 68 299 | Deadend – Auto, 3/8” | | | 1 | 1 |
| | H | 23 68 096 | Eye – Guy | 1 | 1 | 1 | 1 |
| | I | 23 66 031 | Washer Curved | 2 | 2 | 2 | 2 |
| | J | 23 52 095 | Bolt – Mach., 3/4” x 10” | 1 | 1 | 1 | 1 |
| @ | K | **11 00 40 ****  | Assembly – Insulator, Guy | 1 | 1 | 1 | 1 |
| | | 918 | Install Guy | 2 | 2 | 2 | 2 |



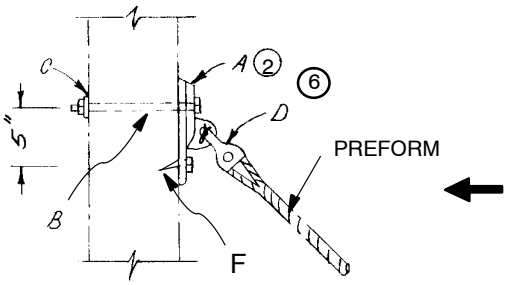

NOTE:

1. Omit second insulator if not required. See Dist. Std. 11 00 01 ** for insulator location and requirements.

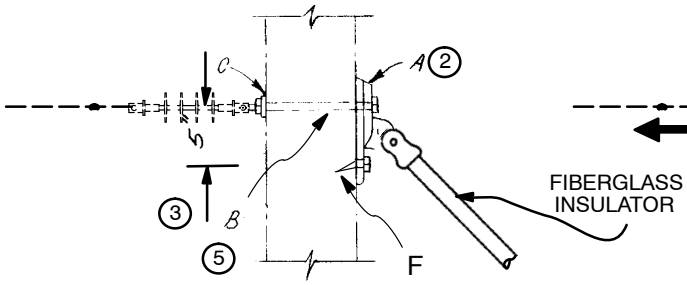
| | | Stnd. / Stk. No. | Description 11 00 49 ** | 01 |
|---|---|---|---|---|
| | A | 27 59 016 | Wire – Guy, 1/4"GS (Ft.) | 150 |
| | B | 25 56 047 | Insulator – Guy, 15kV | 2 |
| | C | 23 68 330 | Link, Guy (Pair) | 1 |
| | D | 23 68 181 | Shackle, Deadend | 1 |
| | E | 23 68 094 | Thimble, Guy, 3/8" | 1 |
| | F | 23 68 241 | Grip, Pref., 1/4 GS | 3 |
| | G | 23 68 300 | Deadend – Auto, 1/4" | 1 |
| | H | 23 68 096 | Eye – Guy | 1 |
| | J | 23 52 095 | Bolt – Mach., 3/4" x 10" | 1 |
| | K | 23 66 031 | Washer, Curved | 2 |
| | | 918 | Install Guy | 2 |



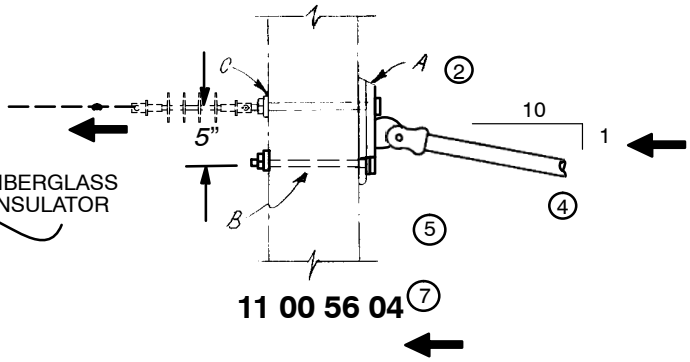

**11 00 56 01**




**11 00 56 02**
**11 00 56 05** (3)




Primary DE **11 00 56 03**
Secondary DE **11 00 56 06**

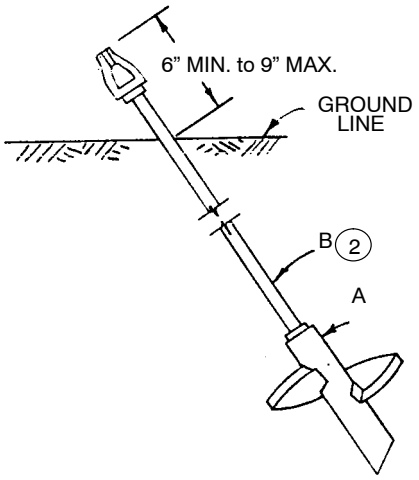



**11 00 56 04** (7)

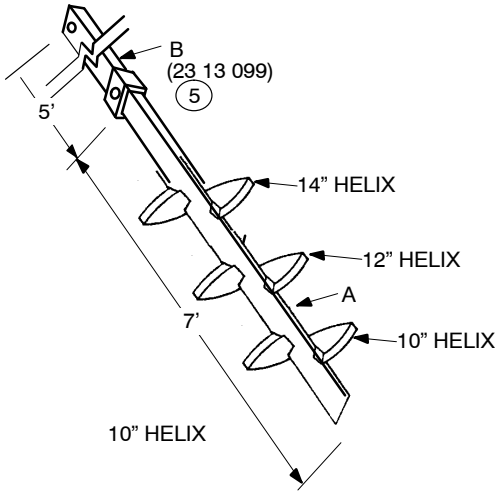
NOTES:

1. Working load of light duty hook (90 % of ultimate) is 9000 lb.
2. Working load of heavy duty hook (90 % of ultimate) is 18000 lb.
3. Use a 5/8" bolt only when guy is behind a 5/8" eyelet, secondary clevis, or light duty guy hook w/ 1/4" guy wire.
4. See DCS **11 00 46 ****** for span guy.
5. The top bolt used for guy hook attachment may also be used to attach polymer DE or eyelet bolt.
6. These configurations may only be used for stub pole guys with no energized conductors.
7. For composite pole applications, only through−bolt mounting DCS 11 00 56 04 is acceptable. Lag bolts are not to be used with composite poles.

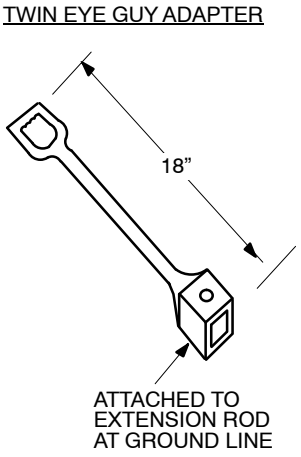
| | | Stnd. /Stk. No. | Description 11 00 56 ** | 01 | 02 | 03 | 04 | 05 | 06 |
|---|---|---|---|---|---|---|---|---|---|
| 1 | A | 23 68 056 | Hook, Guy, Light Duty | 1 | | | | | |
| 2 | | 23 78 345 | Hook, Guy, Heavy Duty | | 1 | 1 | 1 | 1 | 1 |
| 3 | B | 23 52 063 | Bolt, Mach., 5/8" x 10" | 1 | | | | 1 | 1 |
| | | 23 52 097 | Bolt, Mach., 3/4" x 12" | | 1 | 1 | 2 | | |
| | C | 23 66 031 | Washer, Curved, 3−1/4" x 3−1/8" | 1 | 1 | 1 | 2 | 1 | 1 |
| | D | 23 58 054 | Clevis, Thimble | | 1 | | | 1 | |
| 7 | F | 23 60 007 | Screw, Lag, 1/2" x 4" | 1 | 2 | 2 | | 2 | 2 |




ROUND ROD SINGLE HELIX
10" 11 00 60 01
14" 11 00 60 03




SQUARE SHAFT MULTI HELIX
10", 12" & 14" 11 00 60 06

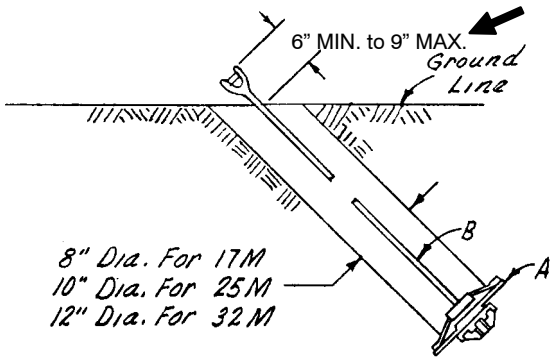



| Size | Holding Power – Lbs. | | | Standard |
|---|---|---|---|---|
| | Sand | Clay | Clay Pan | |
| 10" | 12,000 | 15,000 | 16,500 | 11 00 60 01 |
| 14" | 18,000 | 22,000 | 25,000 | 11 00 60 03 |
| 10", 12", & 14" | 35,000 | 40,000 | 60,000 | 11 00 60 06 |

NOTES:

1. Expanding anchors, Dist. Std. **11 00 61 ****  may be used if power installation equipment is unavailable or if soil condition, particularly rocks makes use of screw anchor or high torque screw anchor impractical.
2. 3'–6" sectional rods (Stk. No. 23 63 097) may also be used in poor soil to obtain greater setting depth of the anchor.
3. High torque screw anchors, Dist. Std. **11 00 63 ****  should be used only where power installation equipment is available and soil conditions are such that regular screw anchors would twist off at the helix.
4. Guy eye nut/adapter is provided with the rod. If it is necessary to order separately, the stock numbers are;
   –Twin eye nut for round rod – 23 59 075
   –Triple eye adapter for square shaft – 23 13 112
5. The top helix must be a minimum 6' deep. Therefore, extension rod (23 13 099) must be used in all cases. Continue to install until there is approximately one–quarter (1/4) turn per foot in the square shaft.
6. Drive wrench for square shaft anchors is Stock No. 86 14 736.
7. Multiple anchors must be spaced a minimum 5' apart.

| | | **Stnd. / Stk. No.** | **Description 11 00 60 **** | **01** | **03** | **06** |
|---|---|---|---|---|---|---|
| | A | 23 13 131 | Anchor – 10" Helix, 1–3/8" Hub | 1 | | |
| | | 23 13 092 | Anchor – 14" Helix, 1–3/8" Hub | | 1 | |
| | | 23 13 138 | Anchor – 10", 12", & 14" Helix, w/Twin Eye Guy Adaptor | | | 1 |
| | B | 23 63 090 | Rod – Anchor, 7', with Twin Eye Nut | 1 | 1 | |
| | | 23 13 099 | Rod – Anchor Extension, 5' | | | 1 |




| Anchor Size | Holding Power – Lbs. | | | Standard No. |
|---|---|---|---|---|
| | Sand | Clay | Hard Pan | |
| 17M | 11,500 | 17,500 | 23,000 | 11 00 61 01 |
| 25M | 17,000 | 25,000 | 32,000 | 11 00 61 02 |
| 32M | 21,000 | 32,000 | 36,000 | 11 00 61 03 |

NOTE:

1. Screw anchors, Dist. Std. **11 00 60 ****  are preferred and should be used if power installation equipment is available and soil condition is satisfactory.

| | | Stnd. / Stk. No. | Description 11 00 61 ** | 01 | 02 | 03 |
|---|---|---|---|---|---|---|
| | A | 23 13 005 | Anchor – Exp., 17M | 1 | | |
| | | 23 13 007 | Anchor – Exp., 25M | | 1 | |
| | | 23 13 094 | Anchor – Exp., 32M | | | 1 |
| | B | 23 63 019 | Rod – Anchor, 3/4" x 8' | 1 | | |
| | | 23 63 022 | Rod – Anchor, 1" x 8' | | 1 | 1 |

Installation of Expanding Anchors

1. Using an adjustable earth auger (Stock No. 85−01−026), drill a hole of such depth that the anchor rod will extend 6 to 9 inches above the ground line when the anchor is expanded; and at such an angle that the anchor rod will be as near as possible to the angle the guy wire will assume after the load is applied to it.

   For 17−M anchors, the hole shall be 8 inches in diameter; for 22−M anchors, the hole shall be 10 inches in diameter; and for 32−M anchors, the hole shall be 12 inches in diameter.

2. Screw the anchor rod into the unexpanded anchor. Take any measurements of the anchor and rod which may be necessary in checking for complete expansion later.

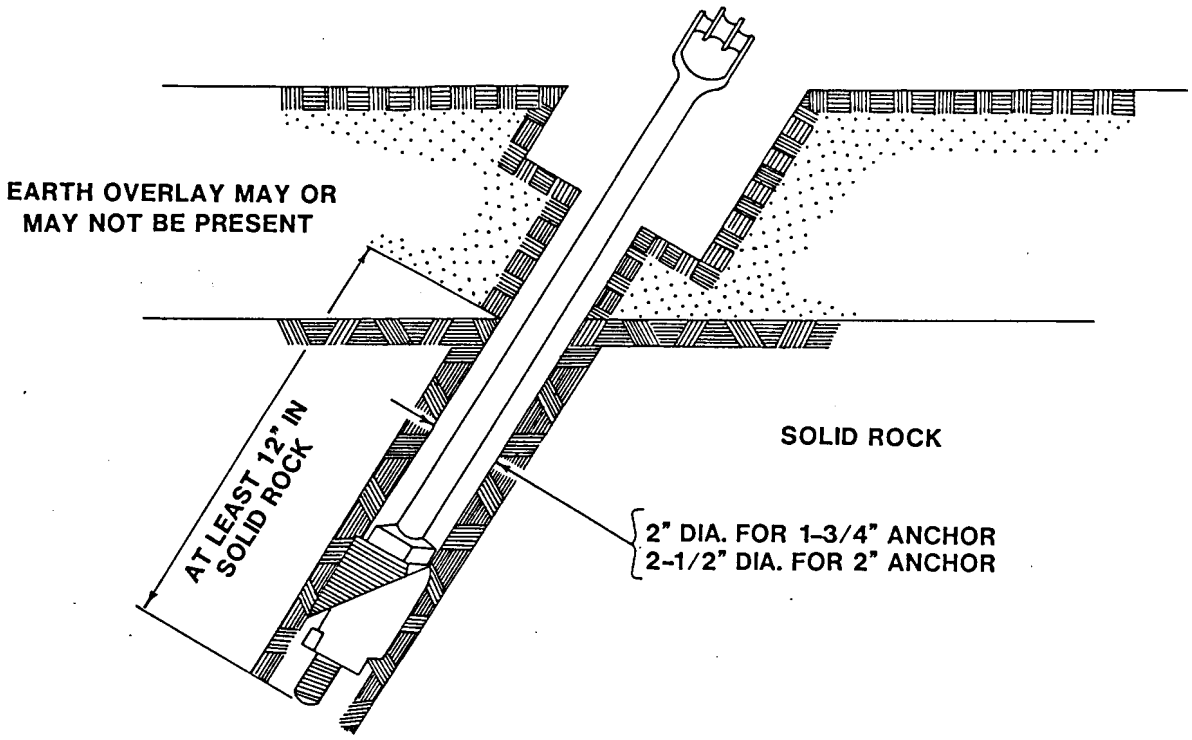
   Clean all loose dirt from the bottom of the hole and insert the anchor. Press the anchor firmly against the bottom of the hole, with the anchor rod held as close as possible to the angle the guy wire will assume after the load has been applied.

3. Expand the anchor, using a tubular anchor spreader (Stock No. 85−32−093) for 17−M anchors. For 25−M and 32−M anchors, use expanding and tamping bar (Stock No. 85−36−001). When the latter is used, it must be rotated around the anchor rod between blows in order that the expanding force will be distributed to all sides of the anchor. The first few blows must be heavy to insure the shearing of retaining bolts or wire, and proper positioning of the anchor blades in the side walls of the hole.

4. Make sure the anchor is completely expanded. When expansion is complete, the sound of the spreader striking the anchor will be a more ”solid” sound than while the anchor is being expanded. Check visually, using a light; and take measurements to compare with those made before the anchor was placed in the hole to determine whether the anchor is completely expanded.

5. The backfill is one of the most important factors in making a good anchor installation. Cover the anchor with a thin layer of loose dirt, and tamp as solidly as possible around the anchor blades. Complete the backfill to the ground line, tamping each shovel−full of earth thoroughly. All of the earth which was removed from the hole should be used in the backfill.

6. Where expanding anchors are installed in good soil under water or in good soil that is very wet, the first 30 inches of backfill shall consist of very thoroughly tamped chat, crushed stone (not larger than egg size) or clean gravel. The backfill shall then be completed as usual. The use of chat, crushed stone or gravel will substantially improve the anchor’s holding power under these adverse conditions allowing normal tensions to be applied.




Size and Use
Standard Rock Anchors

1–3/4" Anchor with 3/4" Diameter Tripleye Rod
2–1/4" Anchor with 1" Diameter Tripleye Rod

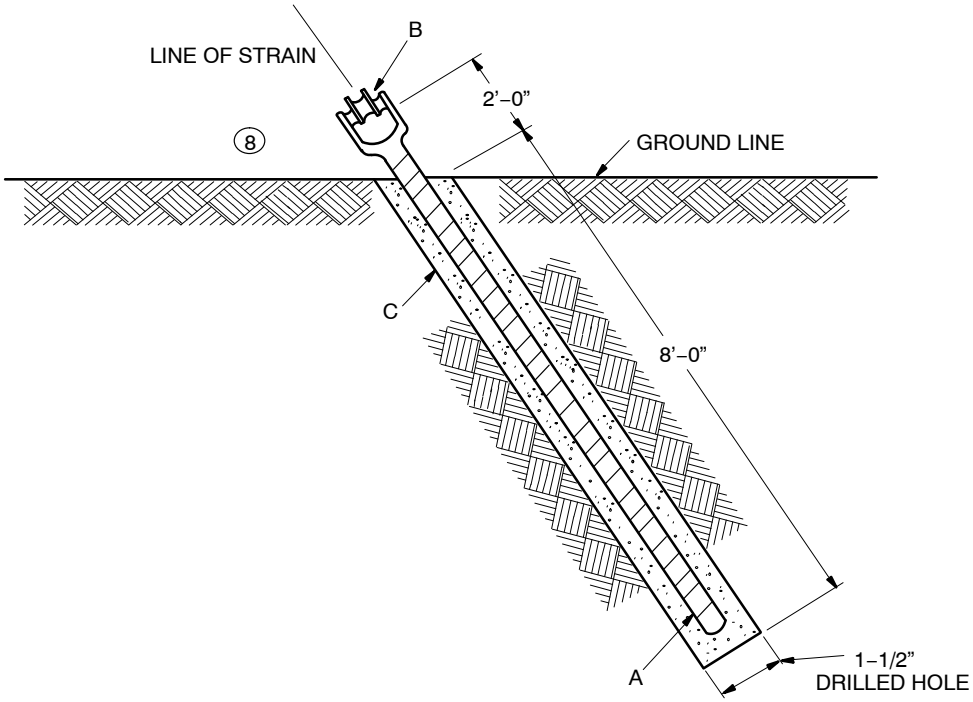
These are expanding type anchors and do not require grout or concrete for installation. When set in solid rock at least 12" deep, these anchors will develop the full strength of the anchor rod.

| Stock No. | Rod Length | Rod Diameter | *Breaking Load | Size Rock Drill |
|---|---|---|---|---|
| 23 13 053 | 30" | 3/4" | 23,000 | 2" |
| 23 13 054 | 53" | 3/4" | 23,000 | 2" |
| 23 13 106 | 72" | 3/4" | 23,000 | 2" |
| 23 13 056 | 96" | 3/4" | 23,000 | 2" |
| 23 13 118 | 53" | 1" | 36,000 | 2–1/2" |
| 23 13 117 | 96" | 1" | 36,000 | 2–1/2" |

*Rated tensile strength of rod. Actual holding strength will depend on characteristics of installation, i.e., Type of rock, Depth in rock.

Installation of Rock Anchors

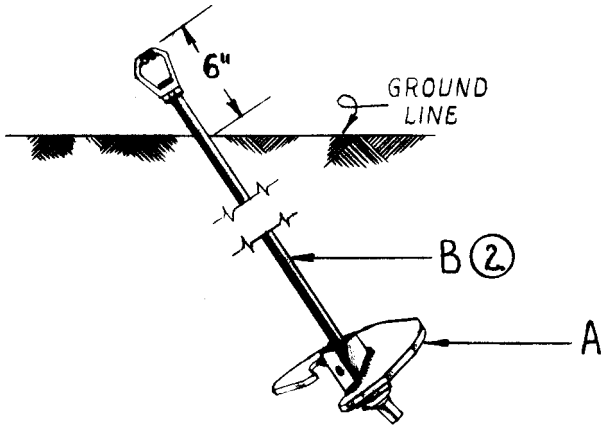
1. Rock anchors shall be used only in solid rock. Drill a hole using a rock bit at least 12 inches deep in the rock. The hole shall be at such an angle that will allow the anchor rod to be as near as possible to the angle the guy wire will assume when it is loaded.
2. Place the anchor in the bottom of the hole. Expand the anchor by turning the rod with a wrench or bar in the eye of the rod.




NOTES:

1. 1–1/2" diameter hole can be drilled with boring bar if in a dry environment; for wet environment use a hammer drill.
2. Dust and loose rock chips must be removed prior to inserting resin cartridges.
3. Resin cartridges should be warmed to 55 – 60 F prior to insertion. Curing time at these temperatures is 15 to 30 minutes. Curing time increases at lower temperatures.
4. Use hooked rod to check for seams in drilled hole and for depth of hole.
5. Hole should be drilled as nearly in line with the down guy as possible. Misalignment by more than 10 degrees can result in premature failure.
6. Following cartridge insertion the 10 foot rebar (item A) should be inserted in the hole, puncturing the cartridges. A 3/4 inch adaptor should be attached to the threaded end of the rebar and the rebar rotated 60 seconds using a mechanical driver to disperse the hardener throughout the resin.
7. Center rebar in hole as nearly as possible and support while resin is curing.
8. If surface of rock is below surface of soil item D can be used to extend the attachment point. Thimbleye nut should not extend more than 2 feet above ground line.

| | | **Stock No.** | **Materials Description 11 00 62 **** | **01** |
|---|---|---|---|---|
| | A | 23 13 154 | Anchor–Rebar, #8 Grade 60, Galv., 10'–0" Long w/ 1" – 8 NC x 12" Long Threaded | 1 |
| | B | 23 65 061 | Nut, Thimbleye, for 1 – 8 NC Thrd., 36,000 Lb UTS | 1 |
| | C | 14 12 377 | Anchor – Fast Lock T – Resin (Celitite), WilliamsForm Cat. No. S6R–35–305–15–30. | 7 |
| | D | 23 63 097 | Extension, 1" Dia. x 3–1/2 Ft., Threaded w/Coupler | 1 |




| Anchor Size | Holding Power – Lbs. | | | | Standard No. |
|---|---|---|---|---|---|
| | Clay | Claypan | Hardpan | Laminated Rock | Single Section Rod |
| 8” | Note 3 | 12,500 | 20,000 | 24,000 | 11 00 63 01 |
| 10” | Note 3 | 16,500 | 25,000 | 28,000 | 11 00 63 03 |

NOTES:

1. Expanding anchors, Dist. Std. **11 00 61 ****  may be used if power installation equipment is unavilable or if soil condition, particularly rocks, makes use of high torque screw anchors impossible.
2. 3’–6” rods must be used with some installation equipment.
3. Screw anchors, Dist. Std. **11 00 60 ****  must be used in this type soil. They should also be used where soil condi-tions permit because of the increased expense of these high torque screw anchors over regular screw anchors.

| | | **Stnd. / Stk. No.** | **Description 11 00 63 **** | **01** | **03** |
|---|---|---|---|---|---|
| | A | 23 13 123 | Anchor – 8” Helix | 1 | |
| | | 23 13 124 | Anchor – 10” Helix | | 1 |
| | B | 23 63 090 | Rod – Anchor, 7’, with Twin Eye Nut | 1 | 1 |
| | | | | | |