GUYING 11

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 Electrical Safety Code (NESC) 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. Loading and other details for self sustained poles are covered in DCS **02 00 04 02**.

1. 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 in the table below . The maximum tensions shown are 90 percent of the rated breaking strength, in accordance with the NESC. In Illinios, 1/4" guy wire is not used.

Guy Wire Maximum Tension and Associated Fittings				
	Guy Wire		**Preformed Grip**	**Automatic Deadend**
STK #	Size & Grade	Max. Tension (lbs)	STK #	STK #
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 strands 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.

2. ANCHORS & ANCHOR RODS

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

   A. Power installed screw anchors are the preferred anchors for use in all soils other than solid rock. Access with a power digger equipped with a 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 Illinios for down guys on Sub-Transmission (34.5kV and 69kV).

   B. 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.

C. Rock anchors are an expanding type of anchor which must be installed in at least 12" of soild 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 DCS **11 00 60 **** thru **11 00 63 ****.

3. 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 configuations.

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.

A. Distribution

Only FG 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, 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

REV	DATE	ENG	DESCRIPTION
10	04/01/23	DG	Converted to new format
9	04/01/19	DG	

ii. If the guy wire breaks below the insulator, the insulator 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, 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. thru c. above 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 12" of a supply conductor and also passing within 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 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).

B. Sub Transmission

Guys associated with 34.5kV or 69kV circuits require use of FG guy strain insulators. 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 3.A. 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 69kV 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.

REV	DATE	ENG	DESCRIPTION
10	04/01/23	DG	Converted to new format
9	04/01/19	DG	

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.

C. Span Guys

All of the requirements of sections 3.A. and 3.B. of this DCS also apply to span guys.

D. OPGW Transition Coils

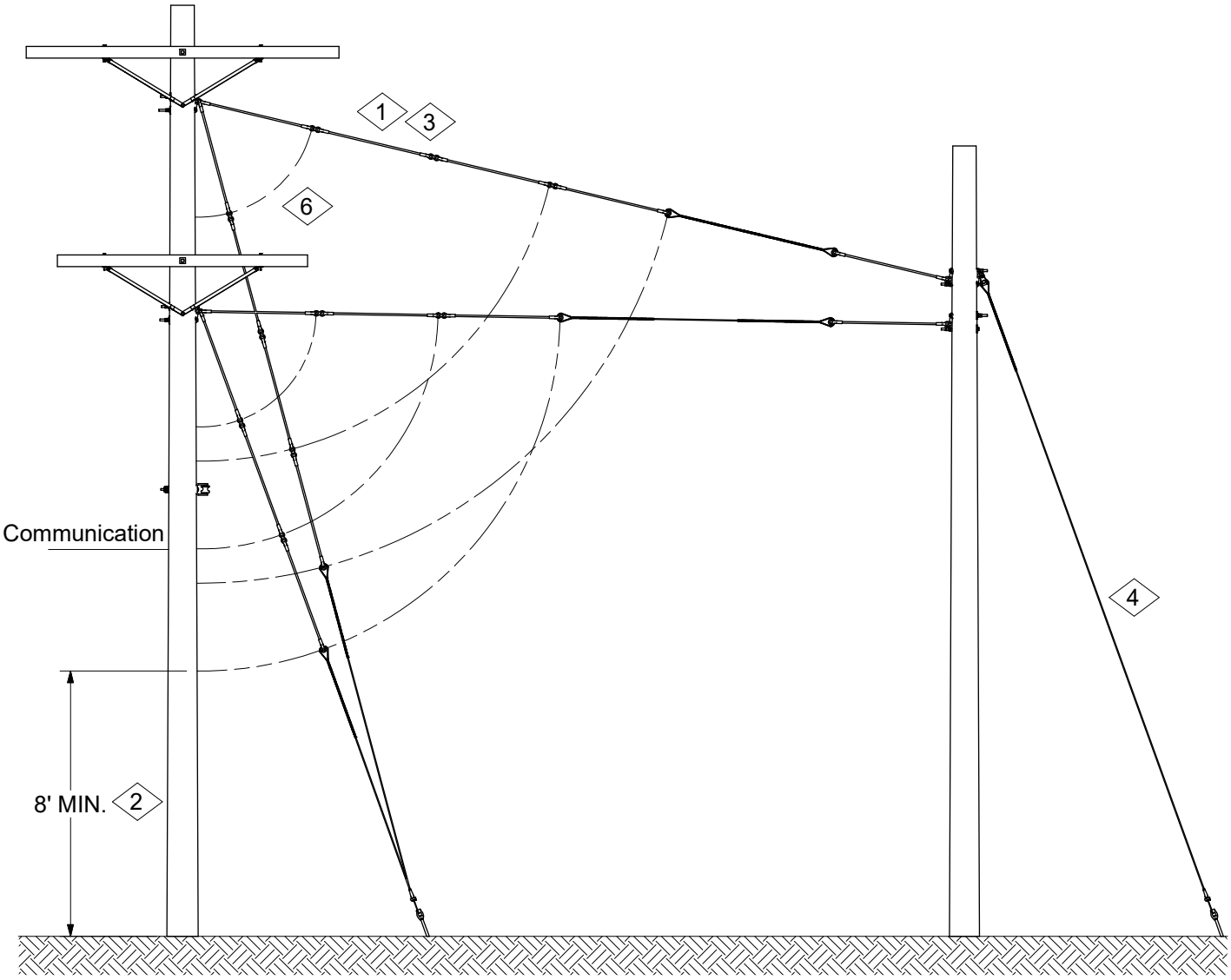
For down or span guys on structures with an OPGW Transition Coil installed on it, guy installation must be applied as follows:

a. A guy strain insulator (or at least 24" of a FG insulator) must be located between sub-transmission voltage and the top of the OPGW Transition Coil.
b. A guy strain insulator (or at least 12" of a FG insulator) must be located between primary voltage and the top of the OPGW Transition Coil.
c. A guy strain insulator (or at least 12" of FG insulator) must be located between the bottom of the OPGW Transition Coil and the next communication attachment below it.
d. If the OPGW coil is the lowest equipment on the structure, a guy strain insulator (or at least 12" of a FG insulator) must be located between the bottom of the OPGW Transition Coil and 8 ft. above the ground.
e. This insulator must be located so that:
   i. It prevents the possibility of voltage transfer between the supply circuits and the OPGW Transition Coil during normal operation of the guy, and
   ii. It prevents the possibility of voltage transfer between the supply circuits and the OPGW Transition Coil if the guy wire breaks below the insulator as it rests against the pole.
   iii. It prevents the possibility of voltage transfer between the OPGW Transition Coil and ground if the guy wire breaks below the insulator as it rests against the pole.

4. GUY MARKERS

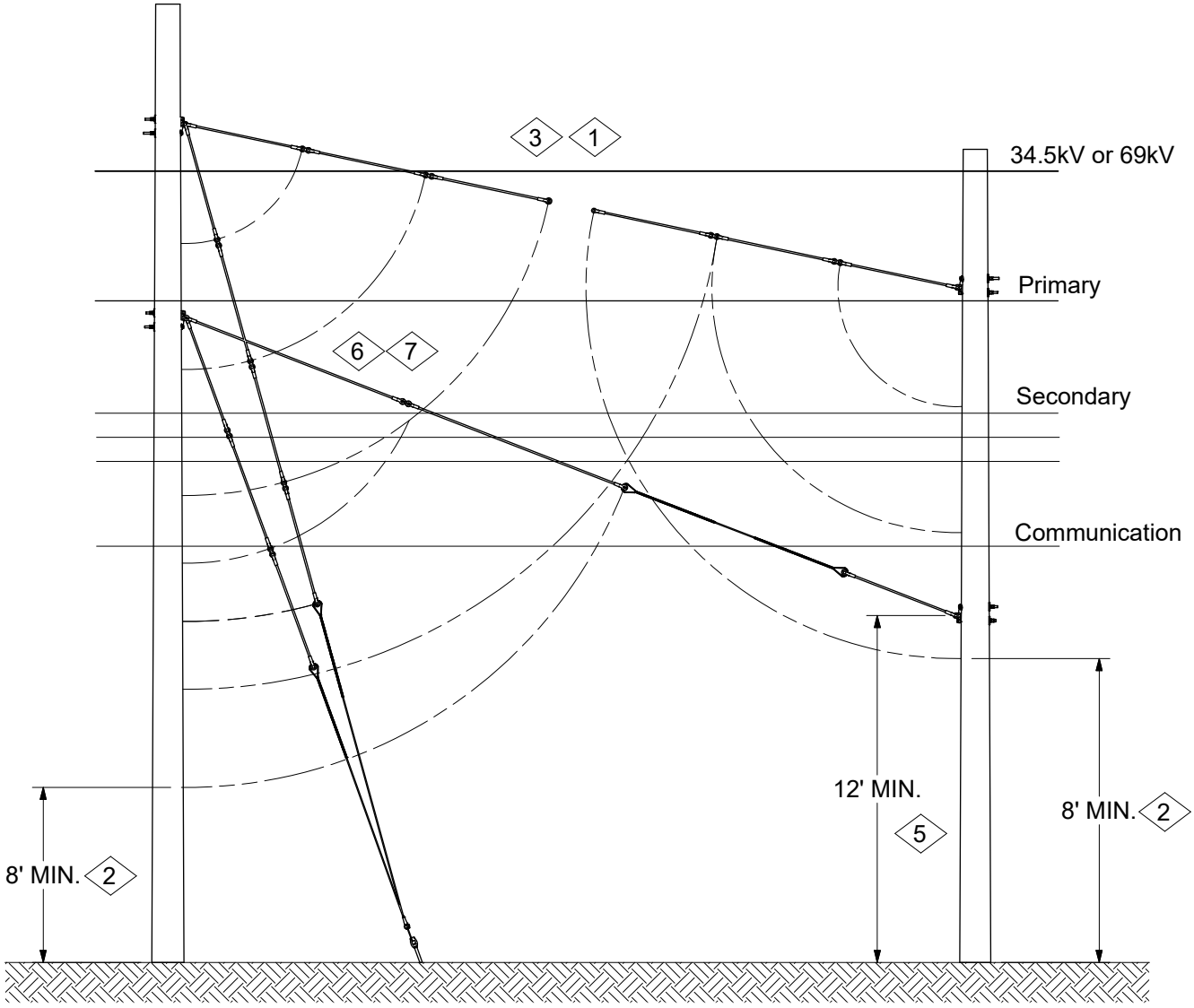
Guy Markers shall be installed on the ground end of all anchor guys. Where two or more guys are attached to the same anchor, only one marker is required and shall be installed on the highest guy wire.

Ameren has two colors of guy markers available for use. A yellow guy marker, Stock #23 78 091 is for use in most applications as it is typically the most visible. An orange guy marker, Stock #23 68 826 is for use on down guys adjacent to cultivated fields as the orange is more visible against the background of farm crops. The orange guy marker is also to be used on down guys installed within railroad right-of-way.



Perpendicular to Line

REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	04/01/19	DG	



Parallel to Line

CONSTRUCTION NOTE(s):

1. Guys must be installed such that if they break and fall into the pole, insulation will be provided between subtransmission 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 feet above ground level.

3. Fiberglass guy strain insulators shall be used.

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. Guys shall be attached a minimum of twelve feet above ground on a pole, or higher as needed to satisfy midspan clearance requirements. (This assumes a 45" guy insulator to meet the 8' Min. Ground level rule.)

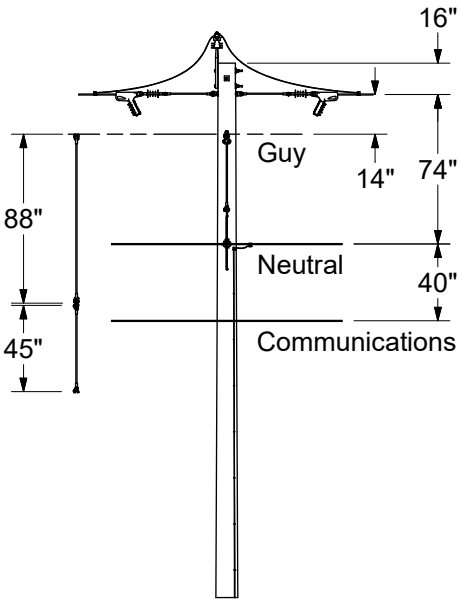
6. See DCS **11 00 02 03** for minimum clearances of guys to conductors.

7. If a span guy passes over or through supply conductors, two insulators shall be used, each satisfying the above requirements.

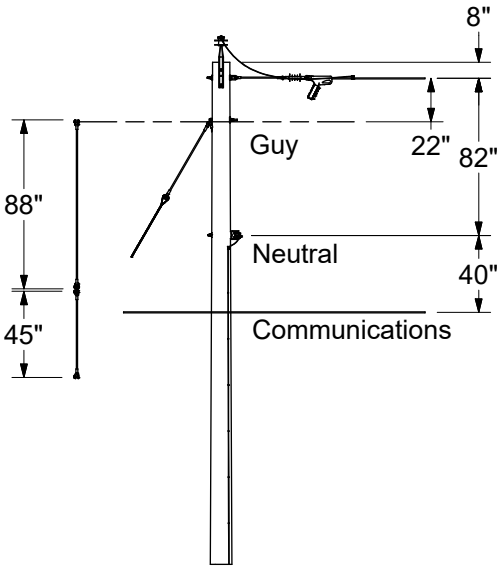
REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	04/01/19	DG	

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 communications 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.

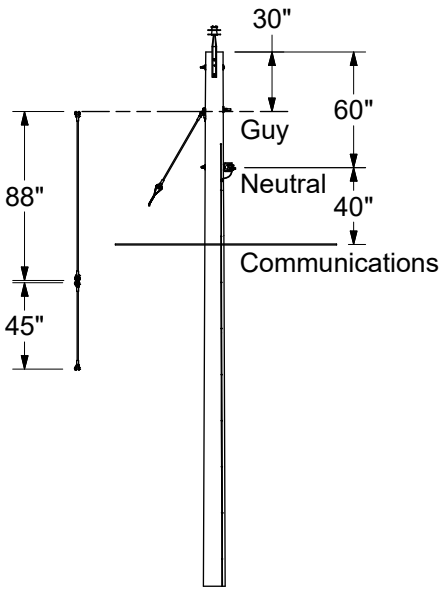
Single Phase



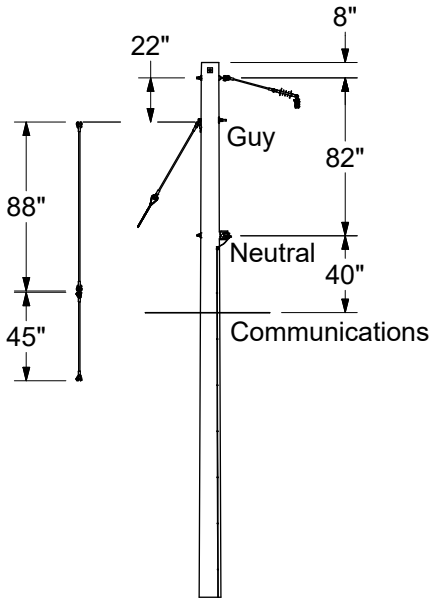
Loopover
03 12 01 07



Tap
03 12 01 08



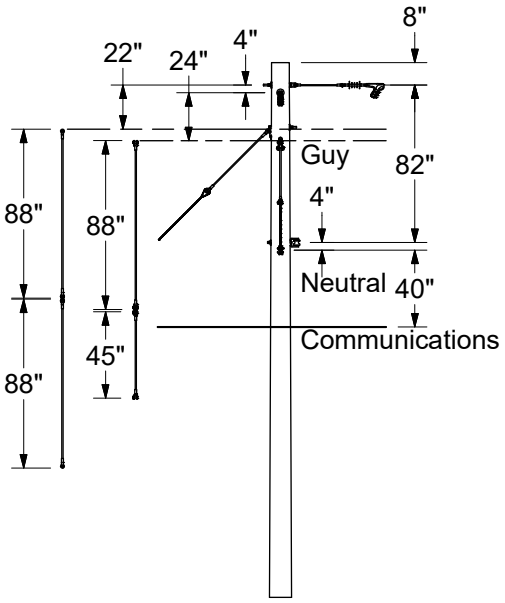
Pole Top Pin
03 12 01 02
03 12 01 22



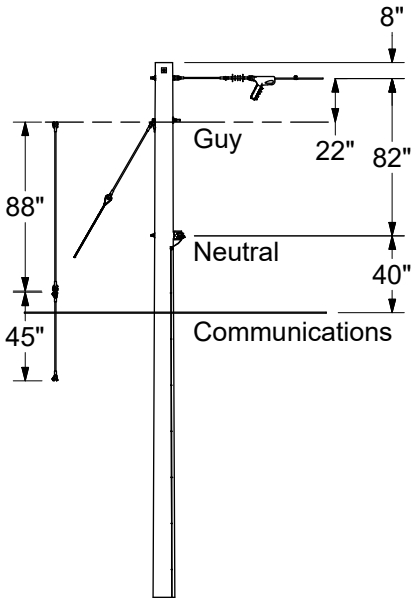
Floating Angle
03 12 01 04

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	07/01/20	DG	

Single Phase

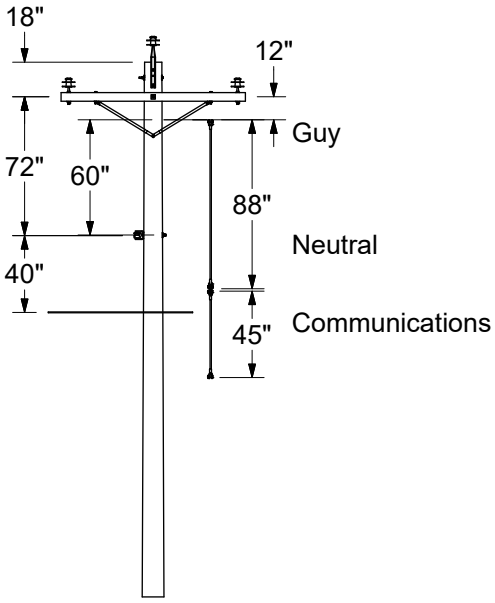


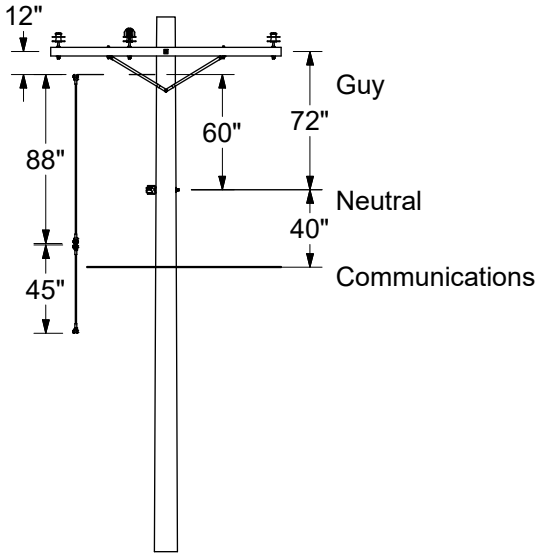
90° Angle
03 12 01 05



Deadend
03 12 01 06

One, Two, or Three-Phase
Angle on Crossarm



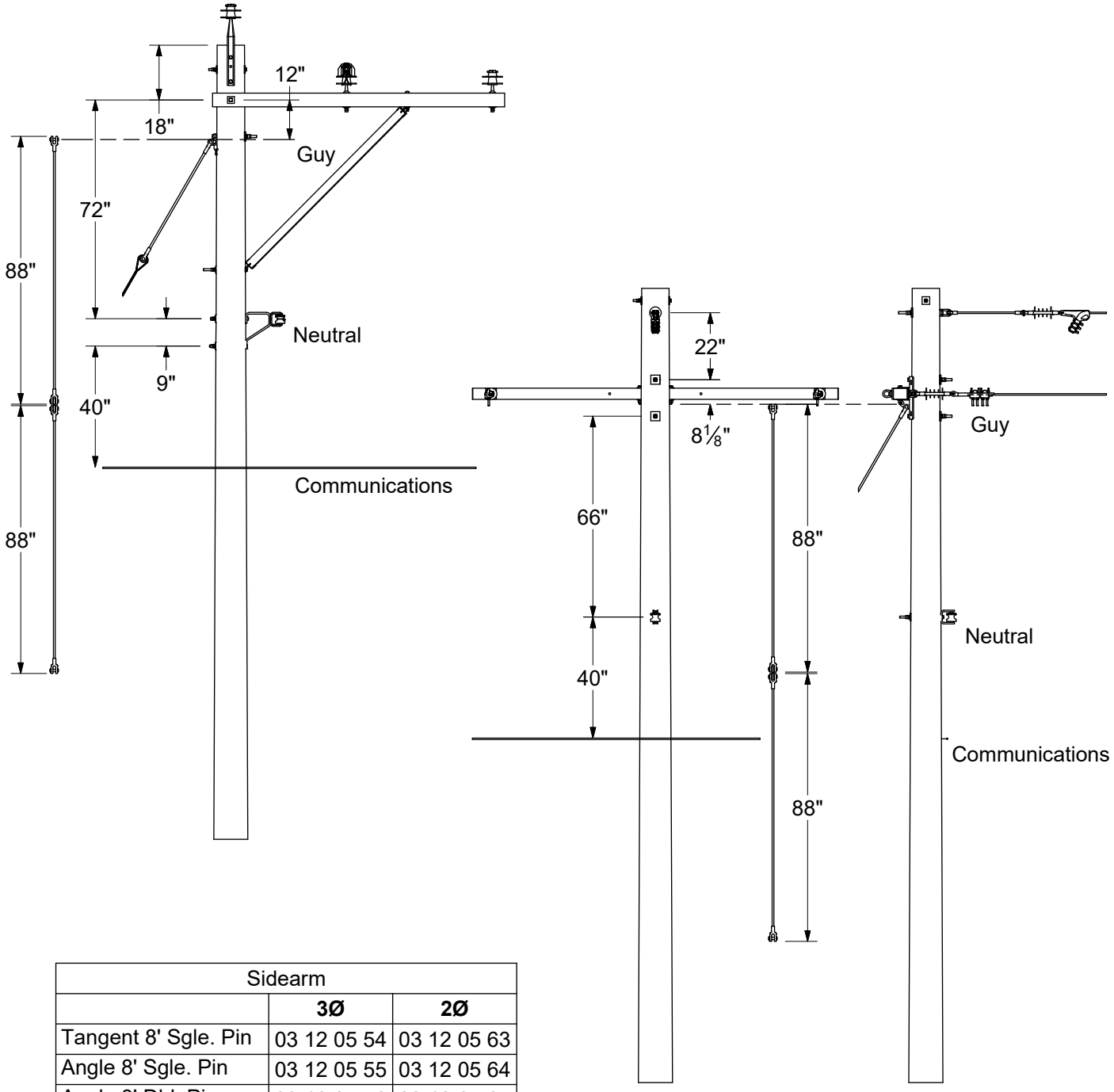


Angle		
	3Ø	**2Ø**
Angle 10' Sgle. Arm	03 12 05 05	03 12 05 11
Angle 8' Sgle. Arm	03 12 05 02	03 12 05 08

Underbuild			
	3Ø	**2Ø**	**1Ø**
Angle 8' Sgle. Pin	-	-	03 12 02 02
Angle 8' Dbl. Pin	-	-	03 12 02 03
Angle 10' Sgle. Pin	03 12 05 52	03 12 05 61	03 12 02 12
Angle 10' Dbl. Pin	-	-	03 12 02 13

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	07/01/20	DG	

One, Two, or Three-Phase
Angle on Crossarm

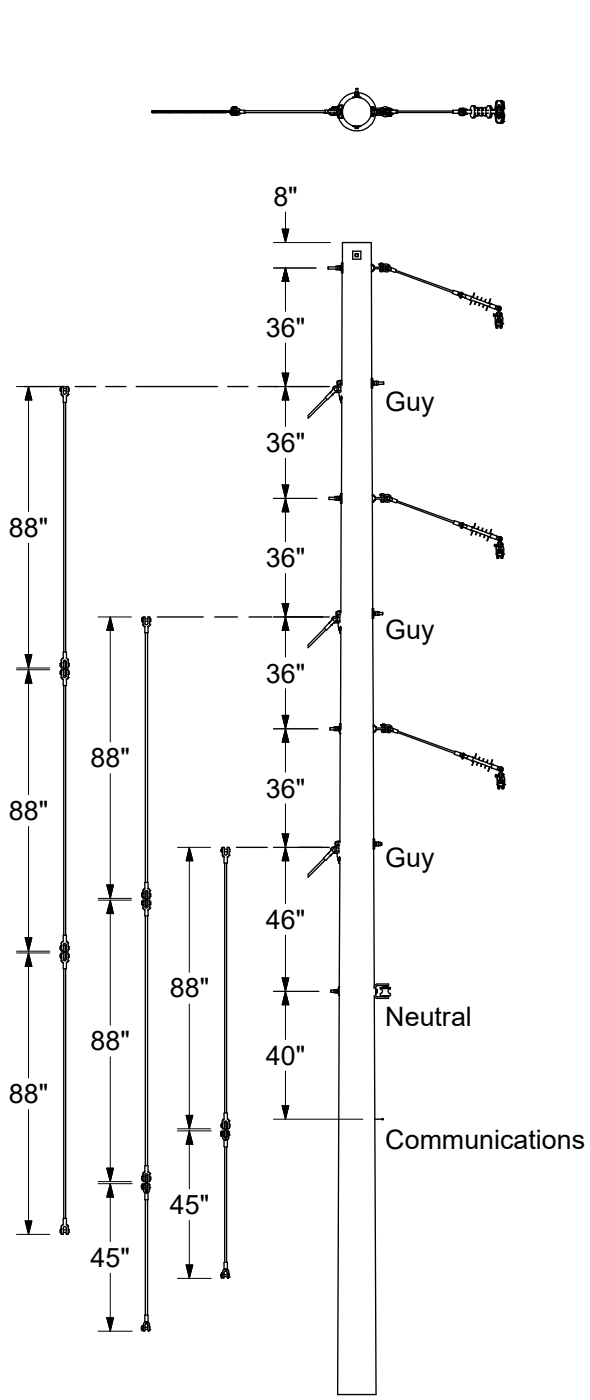


Sidearm		
	3Ø	**2Ø**
Tangent 8' Sgle. Pin	03 12 05 54	03 12 05 63
Angle 8' Sgle. Pin	03 12 05 55	03 12 05 64
Angle 8' Dbl. Pin	03 12 05 56	03 12 05 65

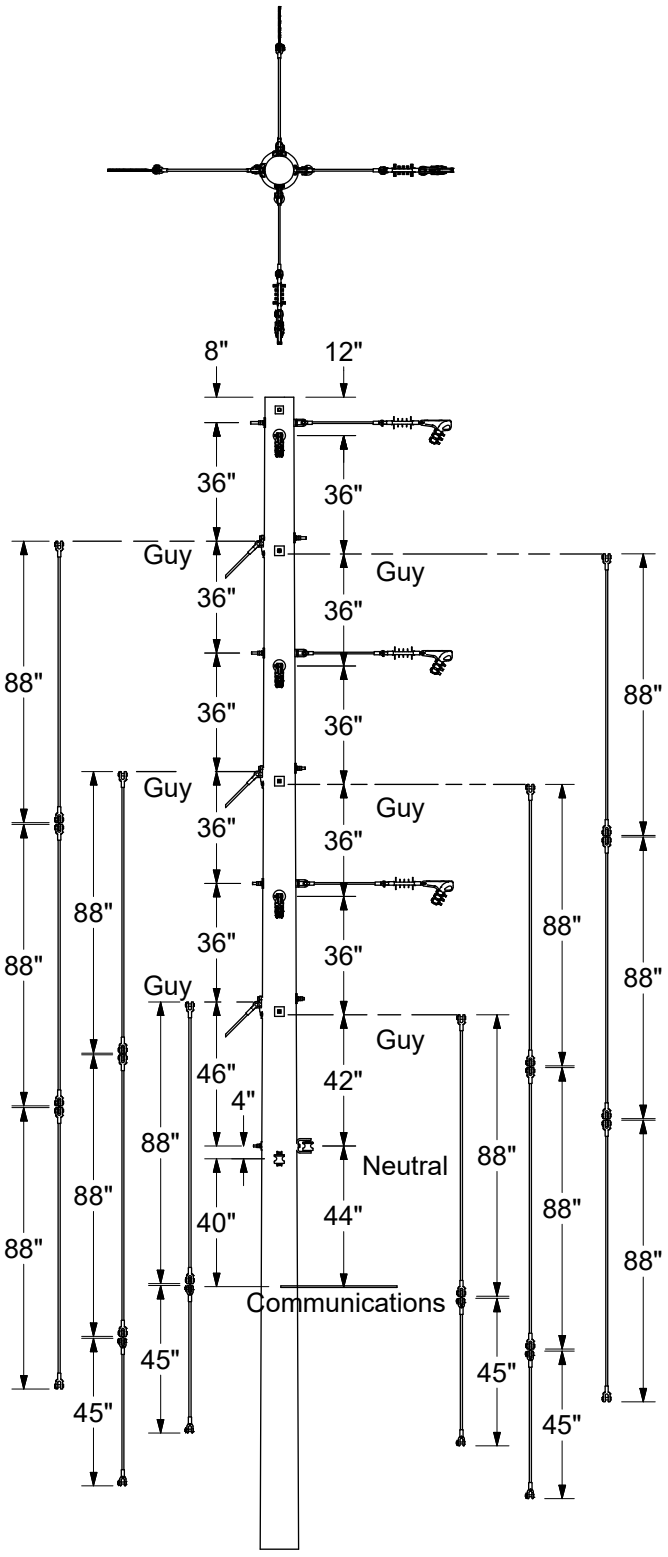
Deadend Arm - Pole Top or Underbuild			
	3Ø	**2Ø**	**1Ø**
DE Assy 8' Arm	03 12 11 51	03 12 11 31	03 12 02 06
DE Assy 10' Arm	03 12 11 52	03 12 11 54	03 12 02 16

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	07/01/20	DG	

Two or Three-Phase Floating and 90° Angle



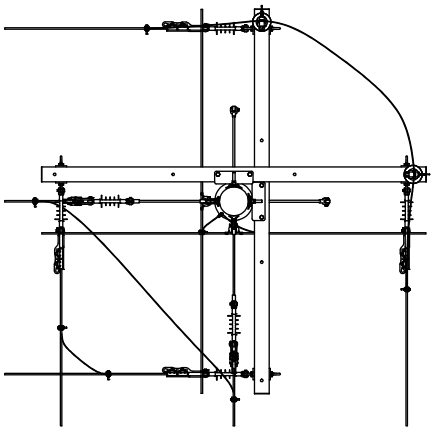
Vertical Floating Angle	
3Ø	03 12 07 02
2Ø	03 12 07 06

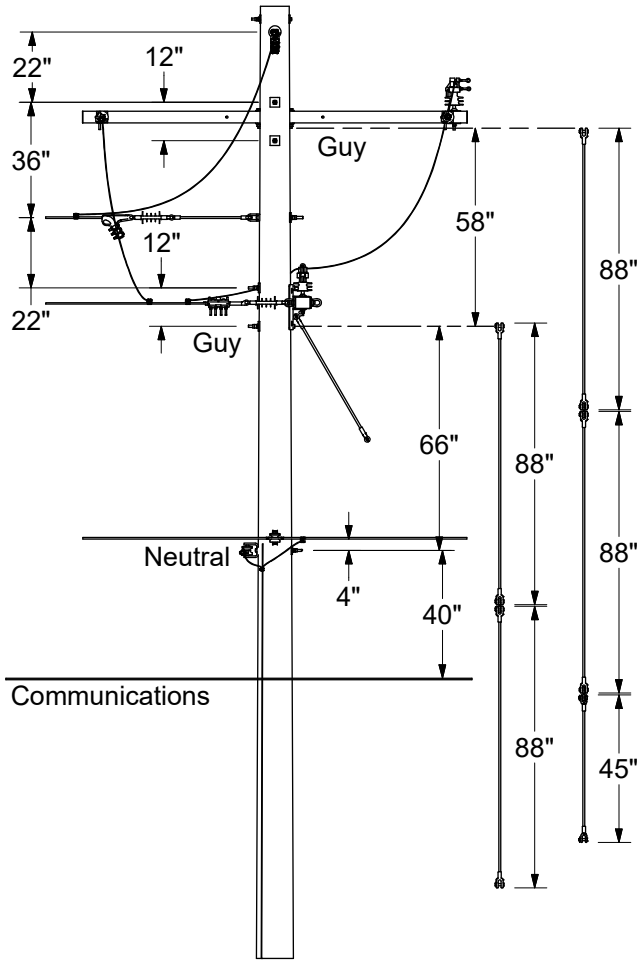


Vertical 90° Angle with FG Ext.	
3Ø	03 12 07 04
2Ø	03 12 07 08

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	07/01/20	DG	

Two or Three-Phase Buck Arm - 90° Angle

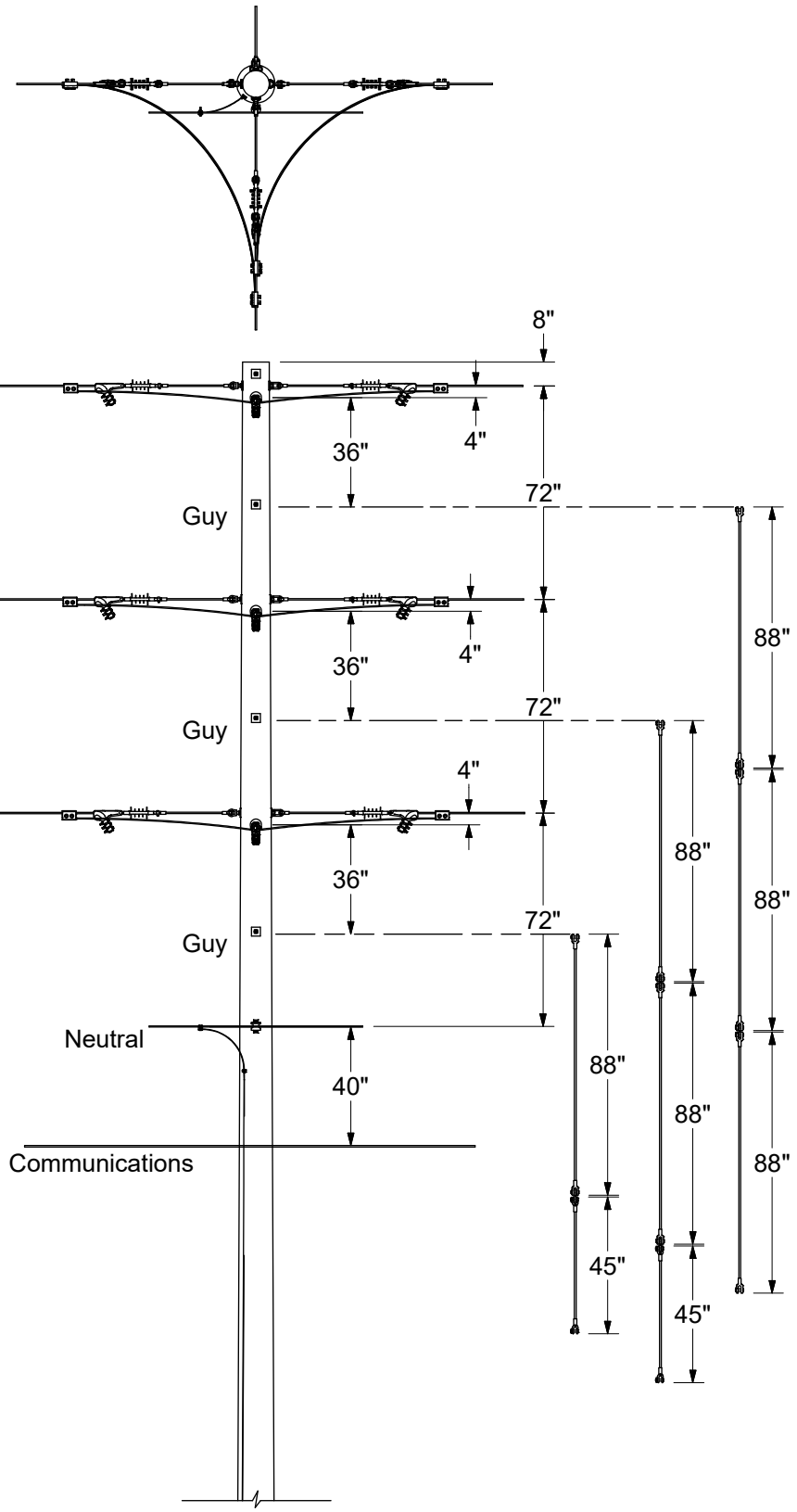




	3Ø	2Ø
	w/ Ext.	Not Shown
8' FG Arms	03 12 09 03	03 12 09 04
10' FG Arms	03 12 09 02	03 12 09 08

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	07/01/20	DG	

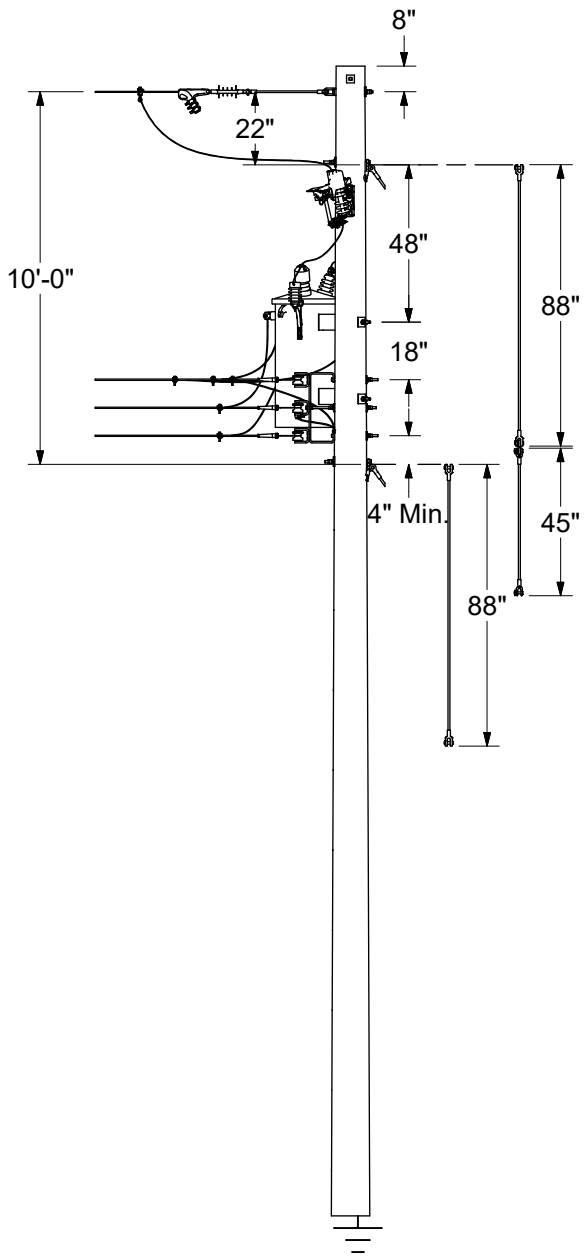
Two or Three-Phase - Vertical Tap



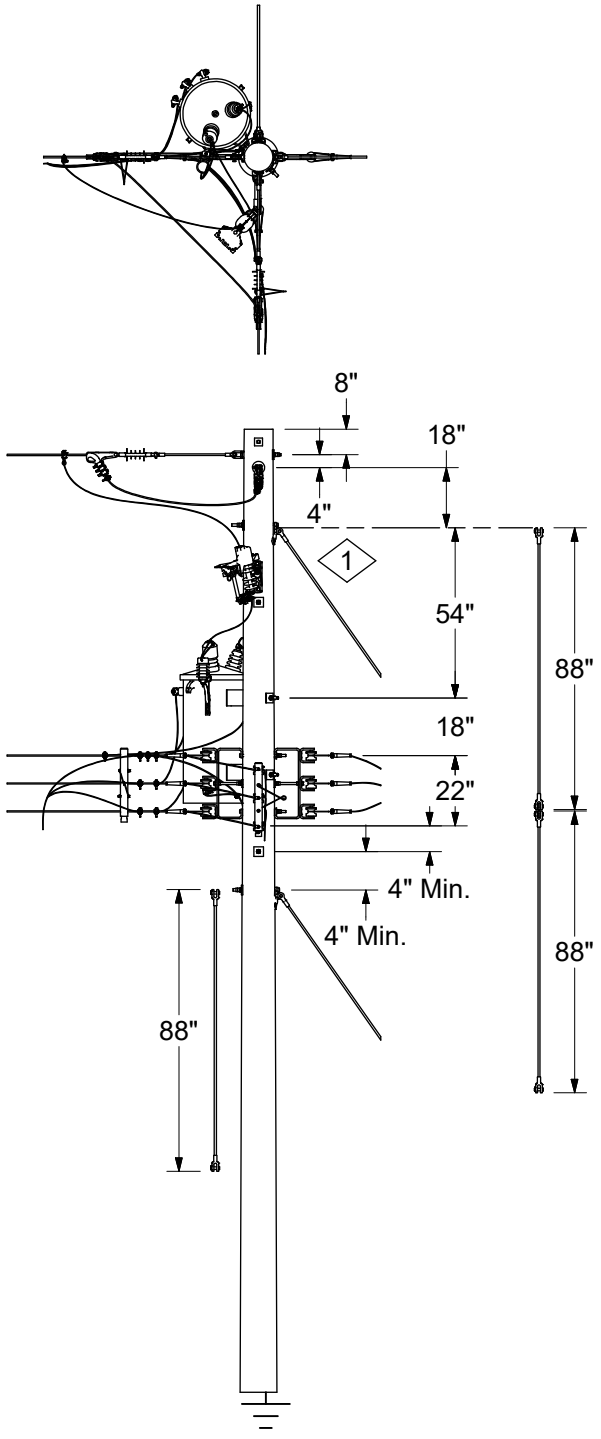
03 12 30 11

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	07/01/20	DG	

1 to 167kVA Deadend or "L" Corner



Deadend
13 12 07 **

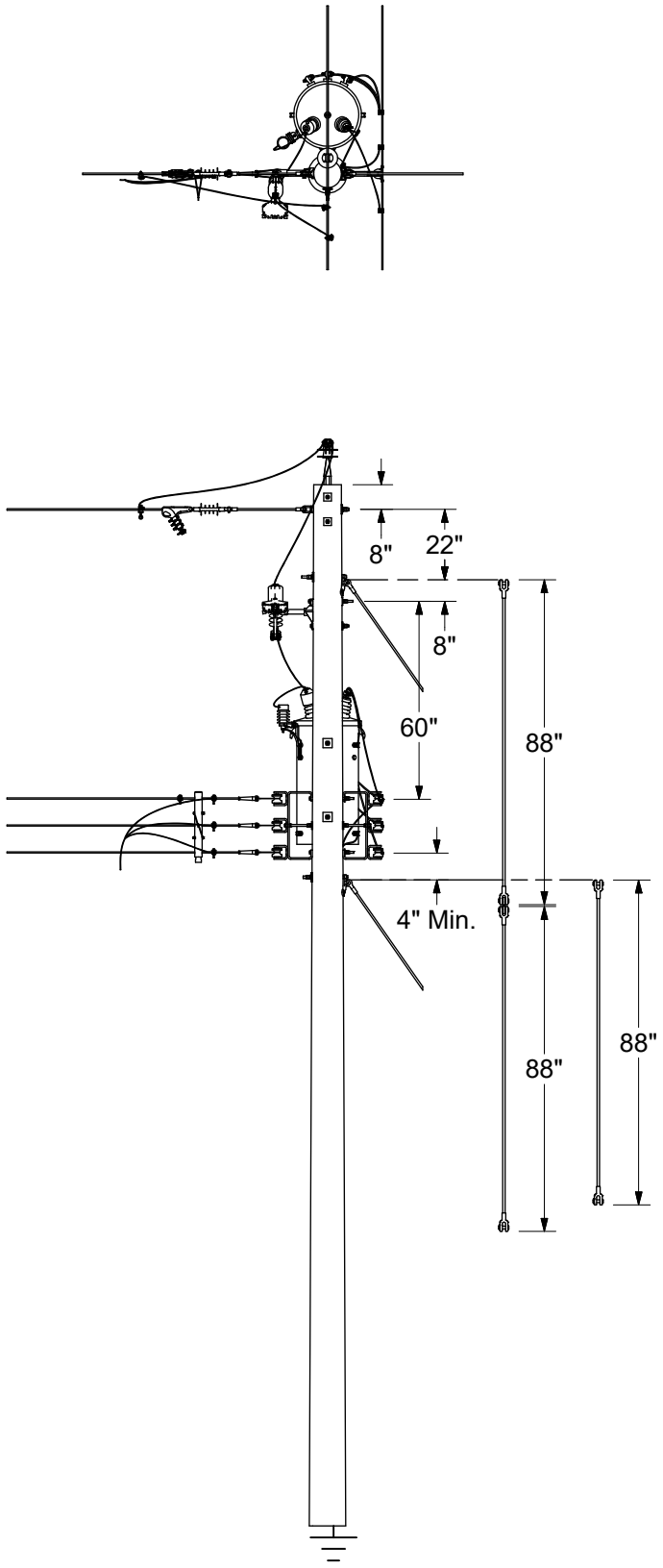


"L" Corner
13 12 10 **

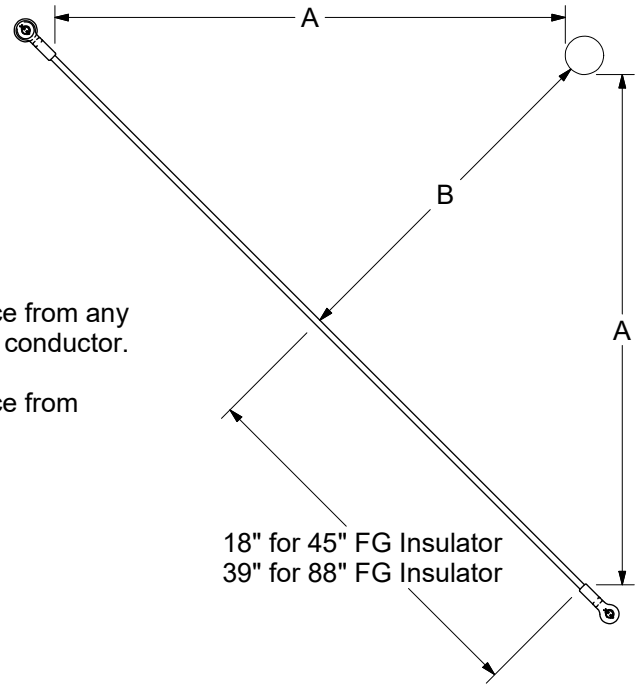
DESIGN NOTE(s):

1. 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 deadening 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.

Transformer, 1-Phase, T Corner



13 12 14 **



"A" is the minimum clearance from any conductive portion of guy to conductor.

"B" is the minimum clearance from fiberglass to conductor.

Minimum Clearances Guy to Conductor						
Reference: NESC, 2017 Edition, Rule 235E						
Phase To Phase Voltage	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
Communications 3,8	6"	5"	5"	6"	5"	5"
0–4.16 kV 9	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"

DESIGN NOTE(s):

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 of supply conductors and also pass within twelve inches 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 200kV BIL.

5. This clearance required to maintain the air gap clearance to conductive parts. No reduction in clearance is allowed.

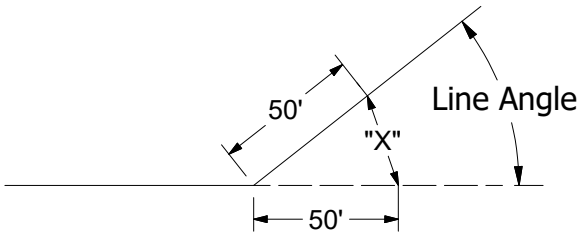
6. For neutral conductors, dimension "A" can be reduced to 6".

REV	DATE	ENG	DESCRIPTION
5	04/01/23	DG	Converted to new format
4	04/01/19	DG	

7. Longer FG insulators or daisy chained insulators will not allow further reduction of clearance to guy insulators.

8. Clearance of guy to communication cable may be reduced to 3" when abrasion protection is provided on the guy or communication cable.

9. Clearance of guy to 600V secondary conductor may be reduced to 3" when abrasion protection is provided on the guy or secondary conductor.

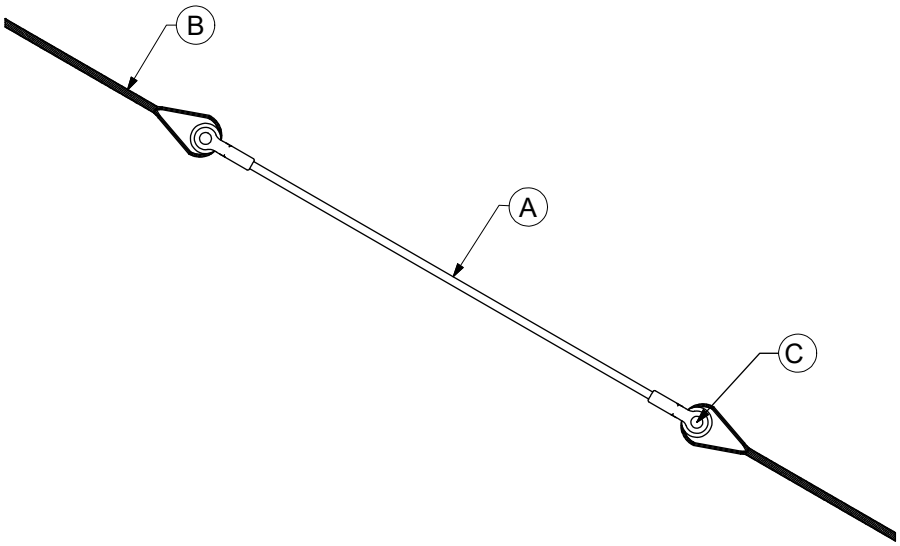


Line Angle Degrees	Distance "X"	Line Angle Degrees	Distance "X"	Line Angle Degrees	Distance "X"
1	0'-10"	21	18'-3"	41	35'-2"
2	1'-9"	22	19'-2"	42	36'-0"
3	2'-8"	23	20'-0"	43	36'-10"
4	3'-6"	24	20'-8"	44	37'-5"
5	4'-4"	25	21'-7"	45	38'-6"
6	5'-3"	26	22'-6"	46	39'-5"
7	6'-1"	27	23'-4"	47	40'-0"
8	7'-0"	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'-11"	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"

CONSTRUCTION NOTE(s):

1. 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 accurate results use the sketch and the table above.

REV	DATE	ENG	DESCRIPTION
2	04/01/23	DG	Converted to new format
1	06/11/98	DG	



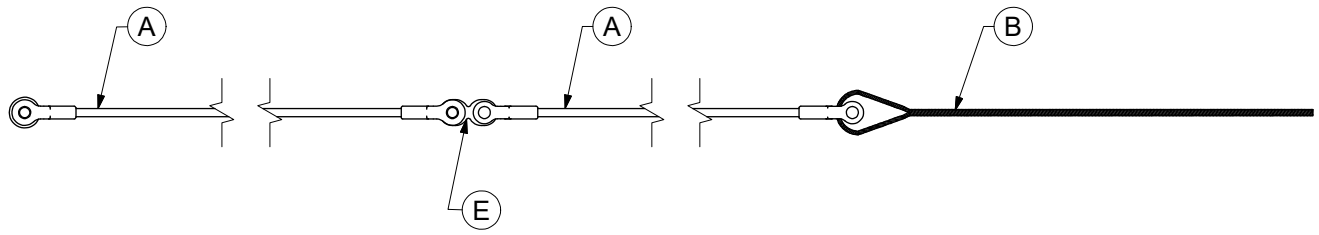
One Insulator		
DCS #	DESCRIPTION	Guy Wire
11 00 40 04	45" Fiberglass Insulator	1/4"
11 00 40 05	45" Fiberglass Insulator	3/8"
11 00 40 06	45" Fiberglass Insulator	7/16"
11 00 40 07	88" Fiberglass Insulator	1/4"
11 00 40 08	88" Fiberglass Insulator	3/8"
11 00 40 09	88" Fiberglass Insulator	7/16"

CONSTRUCTION NOTE(s):

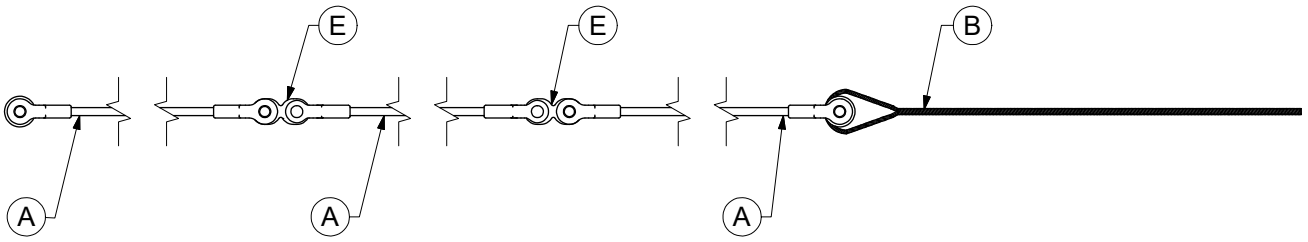
1. If installing insulator in existing guy, Operation Code 918 must be added.

	ITEM	STK / DCS #	DESCRIPTION 11 00 40 **	04	05	06	07	08	09
	A	25 56 070	Insulator - Fiberglass, 45"	1	1	1	-	-	-
		25 56 058	Insulator - Fiberglass, 88”	-	-	-	1	1	1
	B	23 68 241	Grip - Guy Wire 1/4"	2	-	-	2	-	-
		23 68 237	Grip - Guy Wire 3/8"	-	2	-	-	2	-
		23 68 238	Grip - Guy Wire 7/16"	-	-	2	-	-	2
	C	23 68 327	Roller - Guy	-	-	-	1	1	1
1@		918	Op Code, Install Guy	2	2	2	2	2	2

REV	DATE	ENG	DESCRIPTION
4	04/01/23	DG	Converted to new format
3	03/21/16	DDG	



Two Insulator

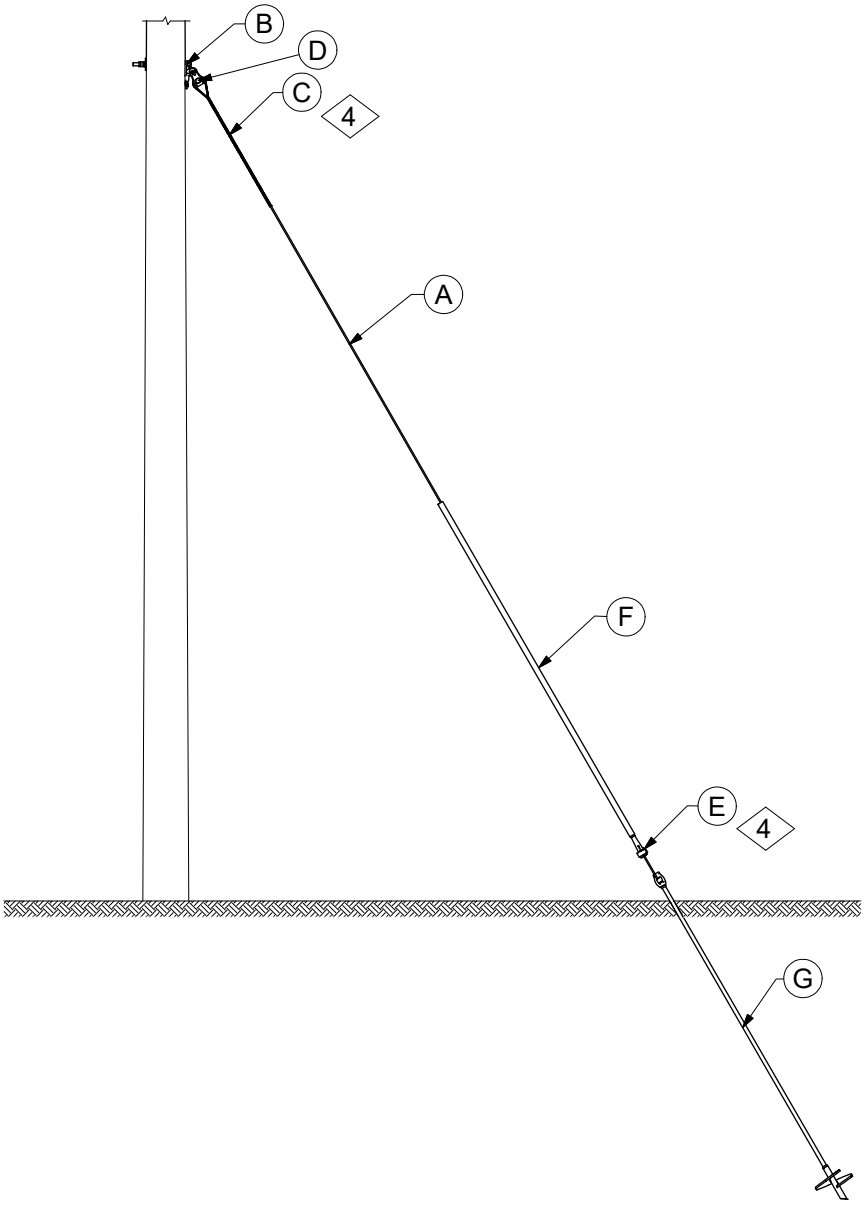


Three Insulator

Two or Three Insulator		
DCS #	DESCRIPTION	Guy Wire
11 00 40 10	One 45" and One 88" FG Insulator	3/8"
11 00 40 11	One 45" and One 88" FG Insulator	7/16"
11 00 40 12	Two 88" FG Insulators	3/8"
11 00 40 13	Two 88" FG Insulators	7/16"
11 00 40 14	One 45" and Two 88" FG Insulator	3/8"
11 00 40 15	One 45" and Two 88" FG Insulator	7/16"

	ITEM	STK / DCS #	DESCRIPTION 11 00 40 **	10	11	12	13	14	15
	A	25 56 058	Insulator - Fiberglass, 88”	1	1	2	2	2	2
		25 56 070	Insulator - Fiberglass, 45"	1	1	-	-	1	1
	B	23 68 238	Grip - Guy Wire 7/16"	-	1	-	1	-	1
		23 68 237	Grip - Guy Wire 3/8"	1	-	1	-	1	-
	E	23 59 064	Link - Figure 8	1	1	1	1	2	2
1@		918	Op Code, Install Guy	2	2	2	2	3	3

REV	DATE	ENG	DESCRIPTION
4	04/01/23	DG	Converted to new format
3	03/21/16	DDG	



CONSTRUCTION NOTE(s):

1. This DCS may only be used on guy stub poles where the span guy is insulated and there is no other energized conductor or communication attachments on the pole. Use DCS **11 00 43 ****** if insulated down guy is needed.

2. DCS **11 00 41 01** for 1/4" guy is not to be used in Illinois.

3. Separate multiple guy attachments at pole by minimum of 12".

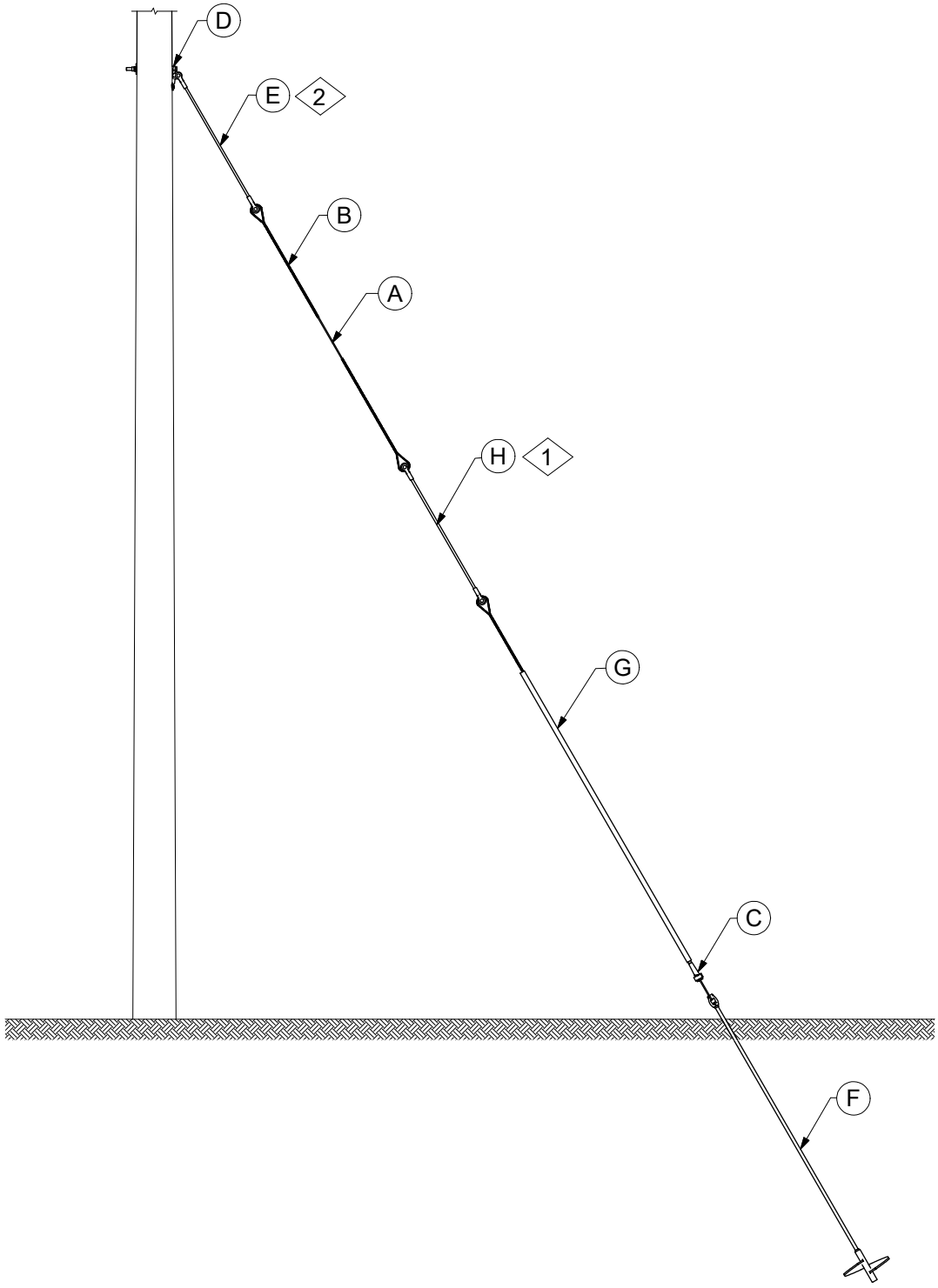
4. Locations of items C and E may be reversed for 3/8" and 7/16" down guys.

REV	DATE	ENG	DESCRIPTION
11	04/01/23	DG	Converted to new format
10	11/13/15	DG	

	DCS #	Guy Wire
2	11 00 41 01	1/4"
	11 00 41 02	3/8"
	11 00 41 04	7/16"

	ITEM	STK / DCS #	DESCRIPTION 11 00 41 **	01	02	04
	A	27 59 016	Guy Wire - 1/4"	40	-	-
		27 59 020	Guy Wire - 3/8"	-	40	-
		27 59 022	Guy Wire - 7/16"	-	-	40
	B	**11 00 56 01**	Guy Hook - Light Duty	1	-	-
		11 00 56 02	Guy Hook - Heavy Duty	-	1	1
	C	23 68 241	Grip - Guy Wire 1/4"	1	-	-
		23 68 237	Grip - Guy Wire 3/8"	-	1	-
		23 68 238	Grip - Guy Wire 7/16"	-	-	1
	D	23 58 054	Clevis - Thimble, Galvanized Steel	-	1	1
	E	23 68 300	Deadend - Automatic 1/4"	1	-	-
		23 68 299	Deadend - Automatic 3/8"	-	1	-
		23 68 301	Deadend - Auto 7/16"	-	-	1
@	F	23 78 091	Marker - Guy Wire Yellow	1	1	1
		23 68 826	Marker - Guy Wire Orange	1	1	1
@	G	**11 00 60 ****	Anchor - Screw	1	1	1
		11 00 63 **	Anchor - Screw, Hi-Torque	1	1	1
		918	Op Code, Install Guy	2	2	2

REV	DATE	ENG	DESCRIPTION
11	04/01/23	DG	Converted to new format
10	11/13/15	DG	



CONSTRUCTION NOTE(s):

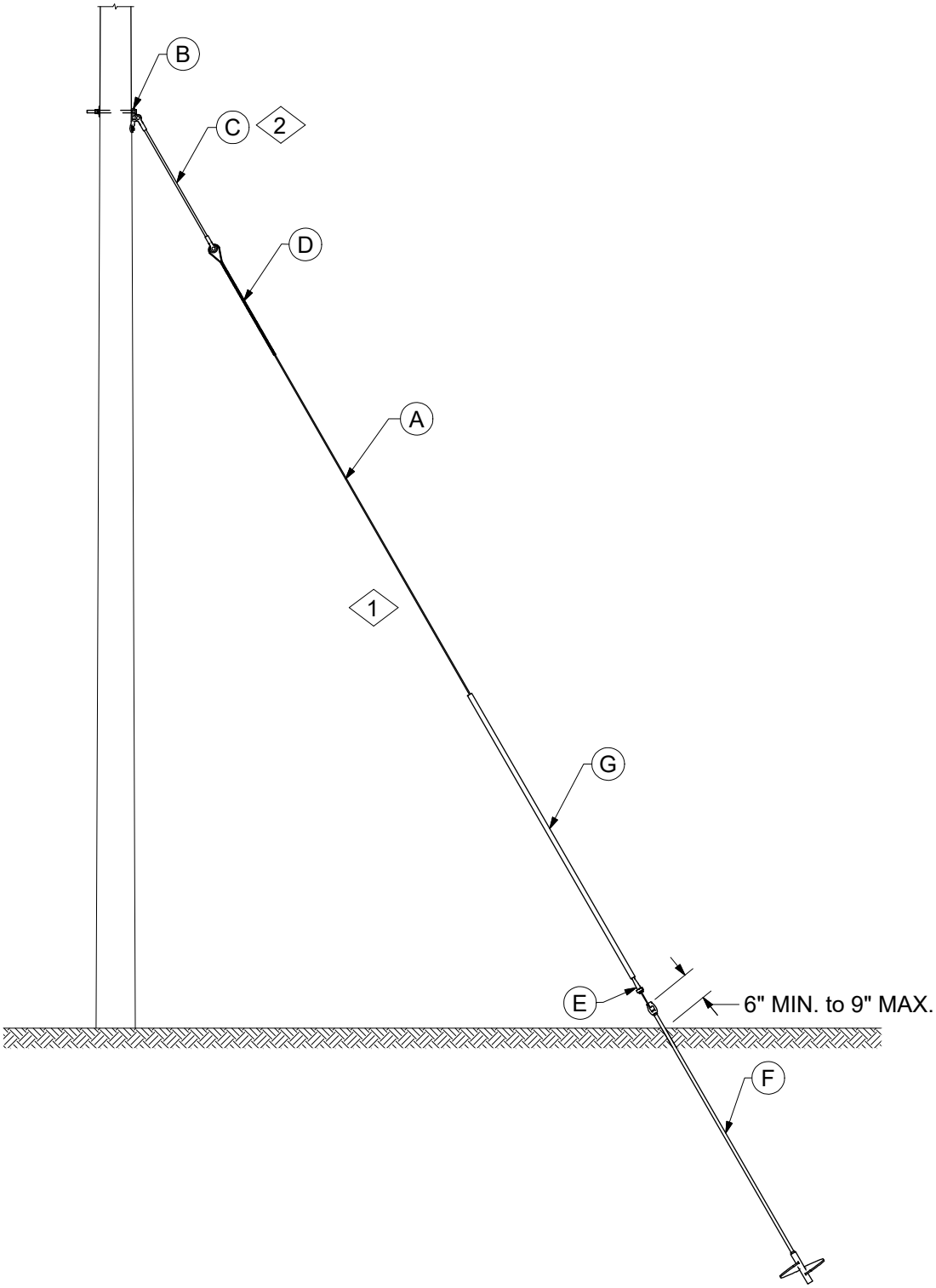
1. Omit insulator if not required. Insert additional insulators if needed. See DCS **11 00 02 01** and **11 00 02 02** for typical insulator location and requirements.
2. 88" FG insulator (Stock #25 56 058) may be used in place of the 45" FG insulator where required.
3. For anchors with three guys attached, use DCS **11 00 42 05** or **11 00 42 06**.

REV	DATE	ENG	DESCRIPTION
10	04/01/23	DG	Converted to new format
9	02/08/16	DG	

DCS #	Description	Guy Wire
11 00 42 02	Single Guy Wire	3/8"
11 00 42 04	Single Guy WIre	7/16"
11 00 42 05	Three Guy Wires	3/8"
11 00 42 06	Three Guy Wires	7/16"

	ITEM	STK / DCS #	DESCRIPTION 11 00 42 **	02	04	05	06
	A	27 59 020	Wire - Guy - 3/8"	60	-	180	-
		27 59 022	Wire - Guy - 7/16"	-	60	-	180
	B	23 68 237	Grip - Guy Wire 3/8"	1	-	3	-
		23 68 238	Grip - Guy Wire 7/16"	-	1	-	3
	C	23 68 299	Deadend - Automatic 3/8"	1	-	2	-
		23 68 744	Deadend - Automatic 3/8" Long Bail	-	-	1	-
		23 68 301	Deadend - Automatic 7/16"	-	1	-	2
		23 78 454	Deadend - Automatic 7/16" Long Bail	-	-	-	1
@	D	**11 00 56 03**	Guy Hook - Heavy Duty	1	1	3	3
		11 00 56 04	Guy Hook - Heavy Duty	1	1	3	3
2@	E	25 56 070	Insulator - Fiberglass, 45"	1	1	3	3
		25 56 058	Insulator - Fiberglass, 88"	1	1	3	3
@	F	**11 00 60 ** **	Anchor - Screw	1	1	1	1
		**11 00 63 ** **	Anchor - Screw, Hi-Torque	1	1	1	1
@	G	23 78 091	Marker - Guy Wire Yellow	1	1	1	1
		23 68 826	Marker - Guy Wire Orange	1	1	1	1
1@	H	**11 00 40 ** **	Assembly - Insulator, Guy	#	#	#	#
		918	Op Code, Install Guy	2	2	6	6

REV	DATE	ENG	DESCRIPTION
10	04/01/23	DG	Converted to new format
9	02/08/16	DG	



CONSTRUCTION NOTE(s):

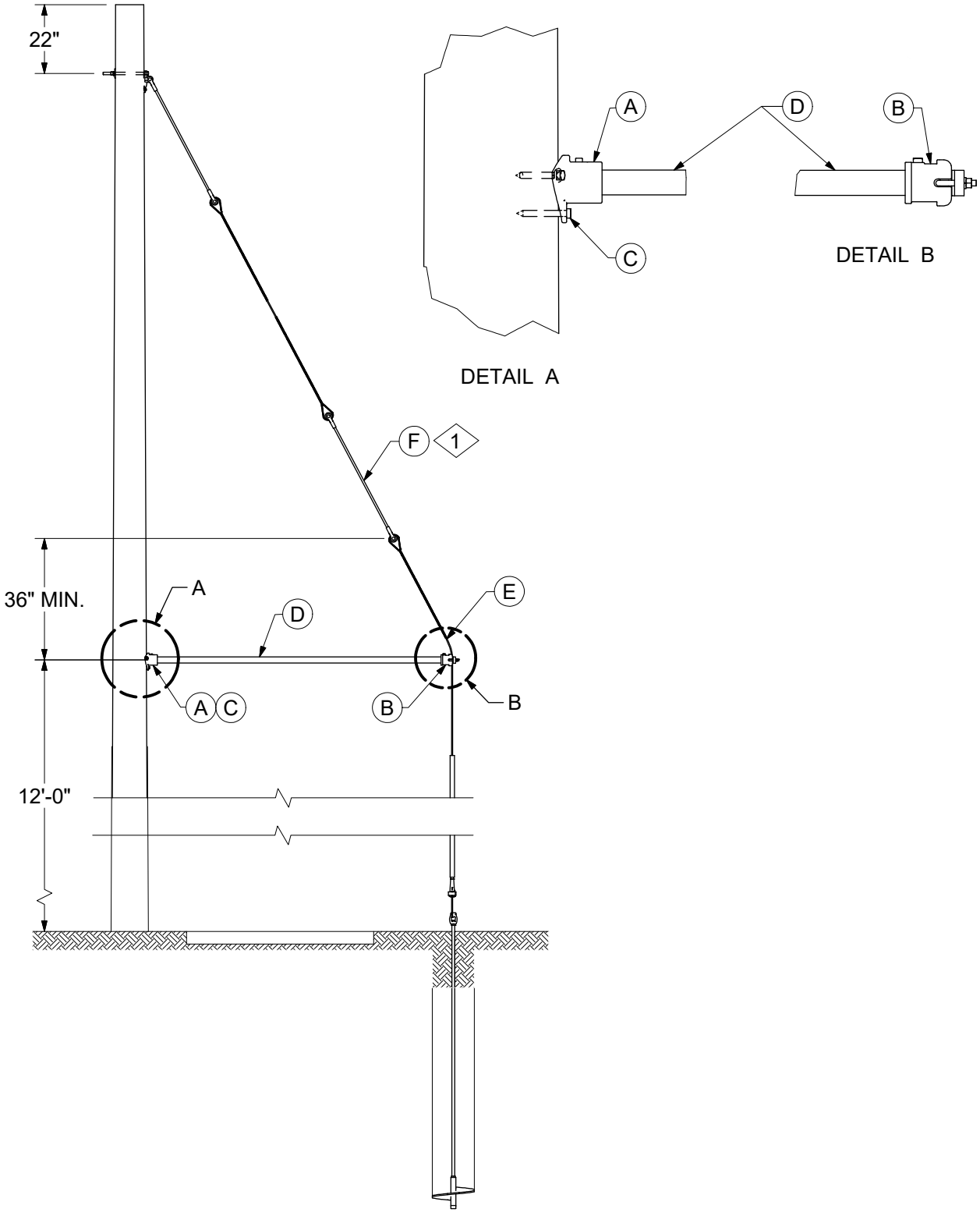
1. Insert additional insulators if needed. See DCS **11 00 02 01** and **11 00 02 02** for typical insulator location and requirements.

2. Use 88" guy strain if additional electrical clearance is required where 45" does not meet the NESC code.

REV	DATE	ENG	DESCRIPTION
11	04/01/23	DG	Converted to new format
10	11/18/15	KSP	

	ITEM	STK / DCS #	DESCRIPTION 11 00 43 **	01	03	05	07	09	11
	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**	Guy Hook - Heavy Duty	1	1	1	1	1	1
2	C	25 56 070	Insulator - Fiberglass, 45"	1	-	1	-	1	-
		25 56 058	Insulator - Fiberglass, 88"	-	1	-	1	-	1
	D	23 68 241	Grip - Guy Wire 1/4"	1	1	-	-	-	-
		23 68 237	Grip - Guy Wire 3/8"	-	-	1	1	-	-
		23 68 238	Grip - Guy Wire 7/16"	-	-	-	-	1	1
	E	23 68 300	Deadend - Automatic 1/4"	1	1	-	-	-	-
		23 68 299	Deadend - Automatic 3/8"	-	-	1	1	-	-
		23 68 301	Deadend - Automatic 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 Wire Yellow	1	1	1	1	1	1
		23 68 826	Marker - Guy Wire Orange	1	1	1	1	1	1
1 @	H	**11 00 40 ****	Assembly - Insulator, Guy	#	#	#	#	#	#
		918	Op Code, Install Guy	2	2	2	2	2	2

REV	DATE	ENG	DESCRIPTION
11	04/01/23	DG	Converted to new format
10	11/18/15	KSP	



CONSTRUCTION NOTE(s):

1. Add additional guy insulators if required per DCS **11 00 01 01**.

REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	06/11/15	DG	

	ITEM	STK / DCS #	DESCRIPTION 11 00 44 **	00
	A	23 67 263	Plate - Sidewalk Guy	1
	B	23 68 422	Fitting - Guy End	1
	C	23 60 007	Lag Screw - 1/2" x 4"	3
4	D	40 83 022	Pipe - 2" Galv. (ft.)	10
@	E	**11 00 43 ** @**	Guy - Anchor, Insulator	1
@	F	**11 00 40 ** @**	Assembly - Insulator, Guy	1
		918	Op Code, Install Guy	2

DESIGN NOTE(s):

2. A conductor tension unit is a resultant force (in 1,000 lb. units) for a given conductor and line angle.

3. These are the maximum resultant tensions 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.

4. 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.

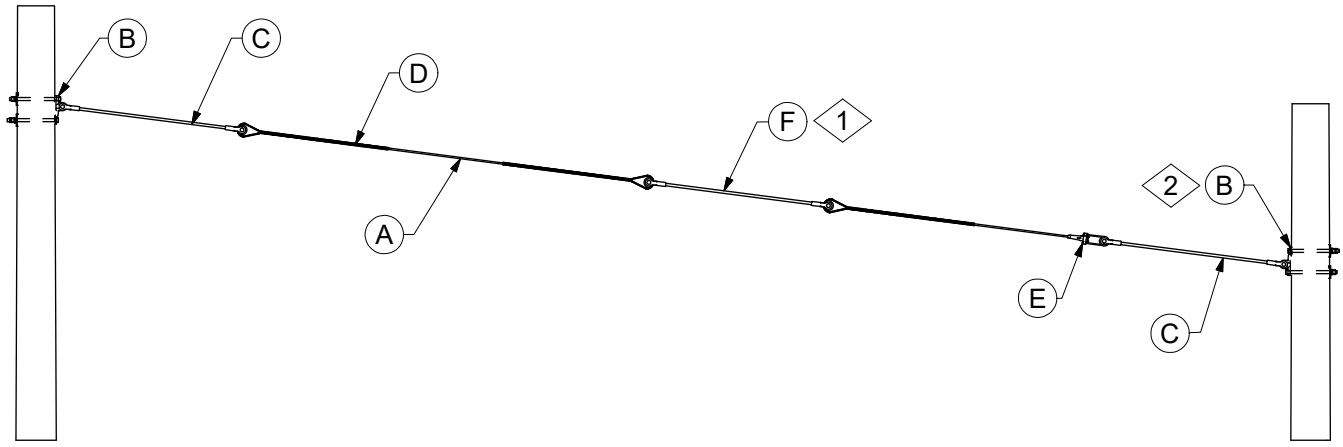
Table 1 - Max. Conductor Tension Units 2 3

Pole Height	Pole Class	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

REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	06/11/15	DG	

Table 2 - Max. Conductor Tension Units Limiting Component							
Pole Height	Pole Class	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

REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	06/11/15	DG	



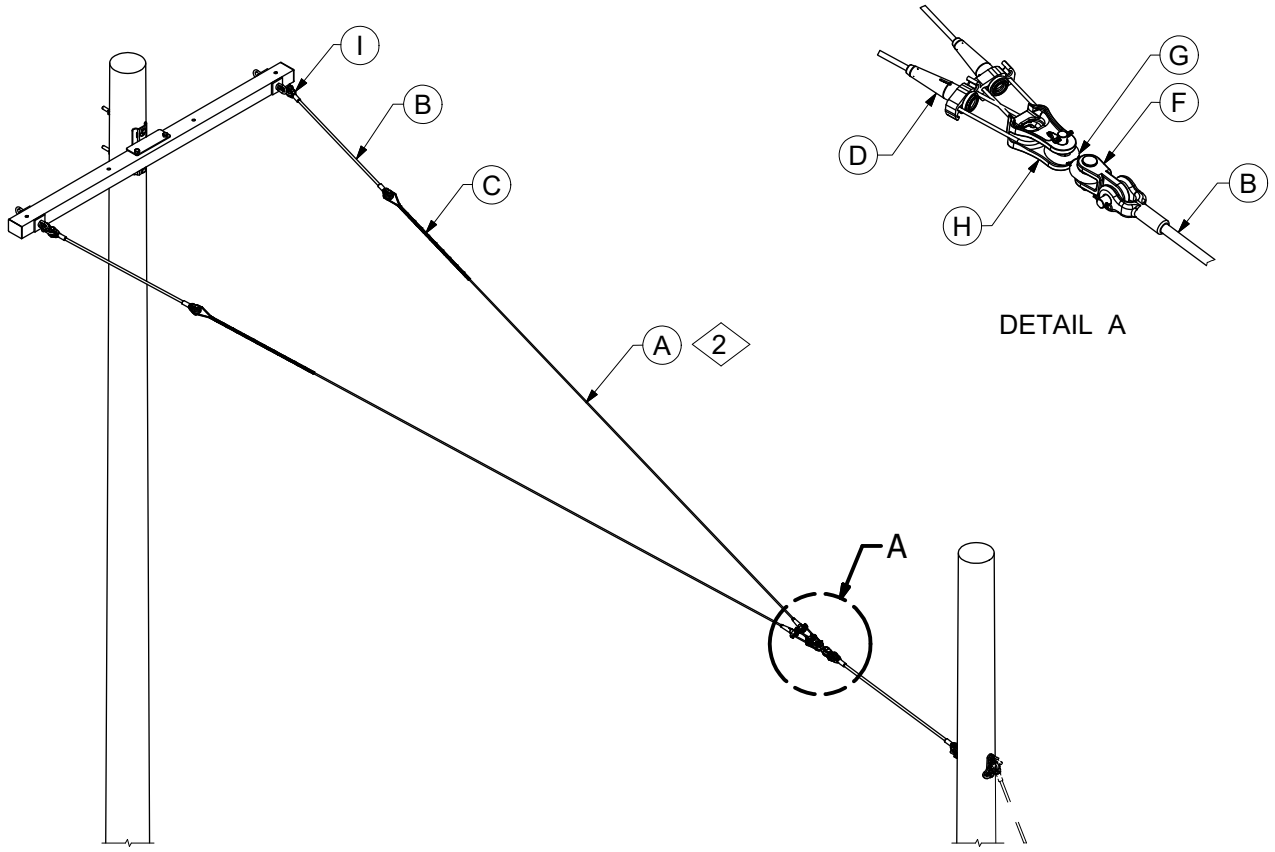
CONSTRUCTION NOTE(s):

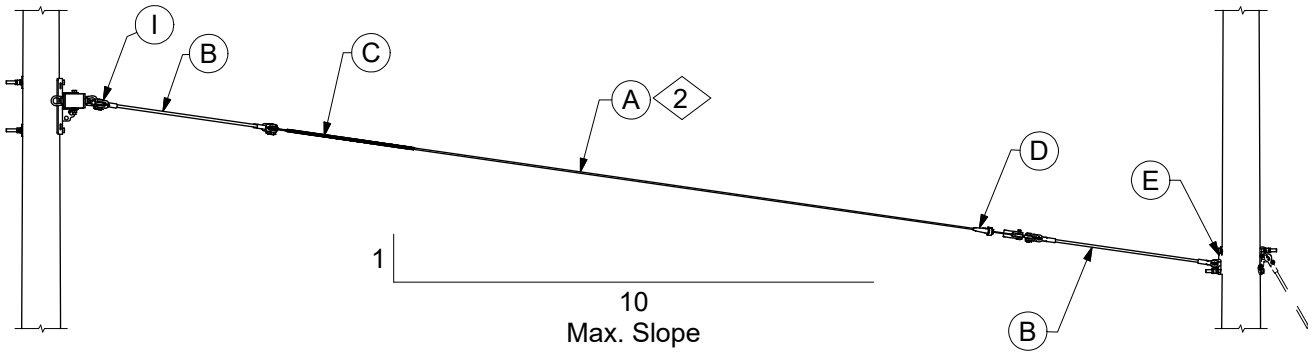
1. Add insulators as required. See DCS **11 00 01 01** for insulator location and requirements.

2. Install guy hook upside down when there is uplift on the guy to pole attachment.

	ITEM	STK / DCS #	DESCRIPTION 11 00 46 **	01	03	05	07	15	16
	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**	Guy Hook - Heavy Duty	2	2	2	2	2	2
	C	25 56 070	Insulator - Fiberglass, 45"	2	-	2	-	2	-
		25 56 058	Insulator - Fiberglass, 88"	-	2	-	2	-	2
	D	23 68 241	Grip - Guy Wire 1/4"	1	1	-	-	-	-
		23 68 237	Grip - Guy Wire 3/8"	-	-	1	1	-	-
		23 68 238	Grip - Guy Wire 7/16"	-	-	-	-	1	1
	E	23 68 300	Deadend - Automatic 1/4"	1	1	-	-	-	-
		23 68 299	Deadend - Automatic 3/8"	-	-	1	1	-	-
		23 68 301	Deadend - Automatic 7/16"	-	-	-	-	1	1
1@	F	**11 00 40 ****	Assembly - Insulator, Guy	#	#	#	#	#	#
		918	Op Code, Install Guy	2	2	2	2	2	2

REV	DATE	ENG	DESCRIPTION
12	04/01/23	DG	Converted to new format
11	11/30/15	KSP	





REV	DATE	ENG	DESCRIPTION
9	04/01/23	DG	Converted to new format
8	04/01/10	DG	

	ITEM	STK / DCS #	DESCRIPTION 11 00 48 **	01	02	03	04
3	A	27 59 016	Wire - Guy, 1/4"	300	300	-	-
		27 59 020	Wire - Guy, 3/8"	-	-	300	300
	B	25 56 070	Insulator - Fiberglass, 45"	3	-	3	-
		25 56 058	Insulator - Fiberglass, 88”	-	3	-	3
	C	23 68 241	Grip - Guy Wire 1/4"	2	2	-	-
		23 68 237	Grip - Guy Wire 3/8"	-	-	2	2
	D	23 68 300	Deadend - Automatic 1/4"	2	2	-	-
		23 68 299	Deadend - Automatic 3/8"	-	-	2	2
	E	**11 00 56 04**	Guy Hook - Heavy Duty	1	1	1	1
	F	23 59 057	Eye - Clevis, 90 Degree	1	1	1	1
	G	23 59 064	Link - Figure 8	1	1	1	1
	H	23 58 054	Clevis - Thimble, Galvanized Steel	1	1	1	1
	I	23 68 181	Shackle - Deadend	2	2	2	2
2@	J	**11 00 40 ****	Assembly - Insulator, Guy	#	#	#	#
		918	Op Code, Install Guy	2	2	2	2

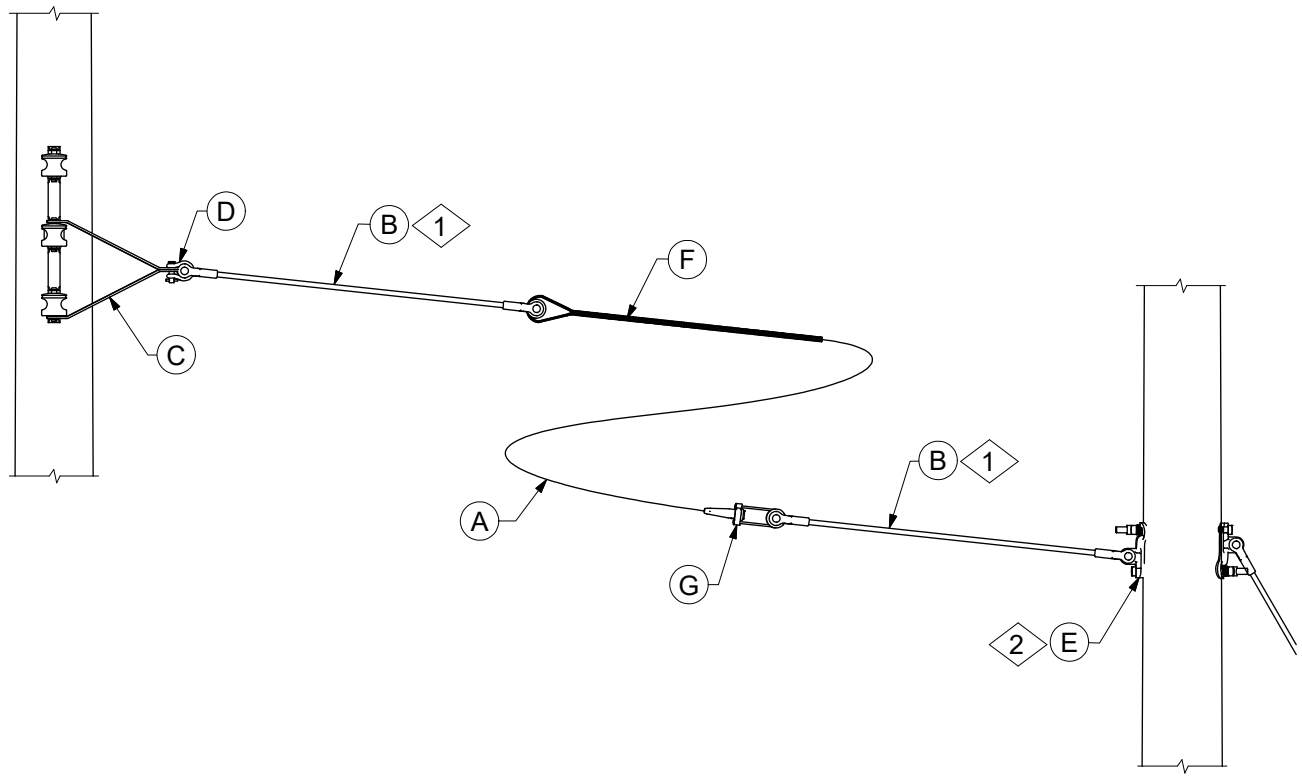
DESIGN NOTE(s):

1. This DCS is for use when loading on the deadend arm assembly is unbalanced.

2. Add insulators if required. See DCS **11 00 01 01** for insulator location and requirements.

3. DCS **11 00 48 (01 & 02)** for 1/4" guy are not to be used in Illinois.

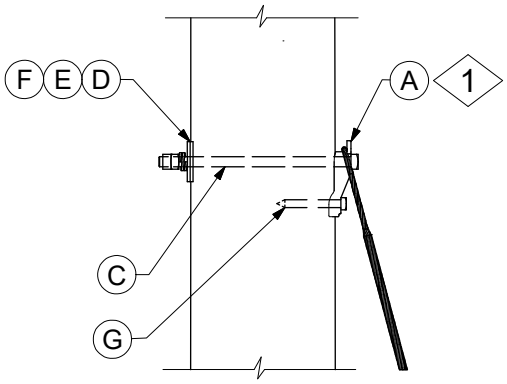
REV	DATE	ENG	DESCRIPTION
9	04/01/23	DG	Converted to new format
8	04/01/10	DG	



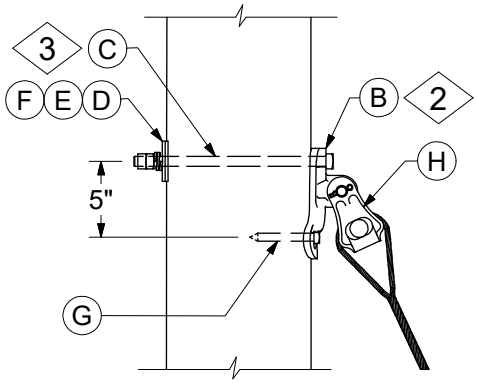
CONSTRUCTION NOTE(s):

1. If communications is below span guy, use 88" FG insulators. See DCS **11 00 01 01** for insulator location and requirements.
2. Install guy hook upside down when there is uplift on the guy to pole attachment.

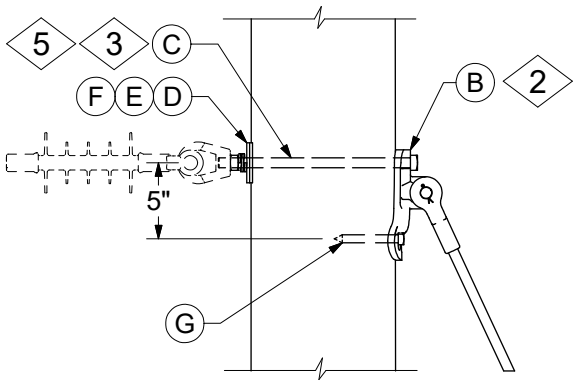
	ITEM	STK / DCS #	DESCRIPTION 11 00 49 **	01	02
1	A	27 59 016	Wire - Guy, 1/4"	150	150
	B	25 56 070	Insulator - Fiberglass, 45"	2	-
		25 56 058	Insulator - Fiberglass, 88"	-	2
	C	23 68 330	Link - Secondary Guy (Pair)	1	1
	D	23 68 181	Shackle - Deadend	1	1
	E	11 00 56 04	Guy Hook - Heavy Duty	1	1
	F	23 68 241	Grip - Guy Wire 1/4"	1	0
	G	23 68 300	Deadend - Automatic 1/4"	1	0
		918	Op Code, Install Guy	2	2



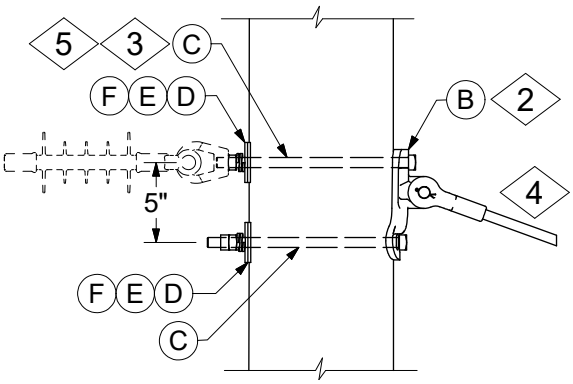
11 00 56 01
Guy Stub Pole 6



11 00 56 02
11 00 56 05
Guy Stub Pole 6



11 00 56 03
11 00 56 06
Down Guy



11 00 56 04
Span Guy or Composite Pole 7

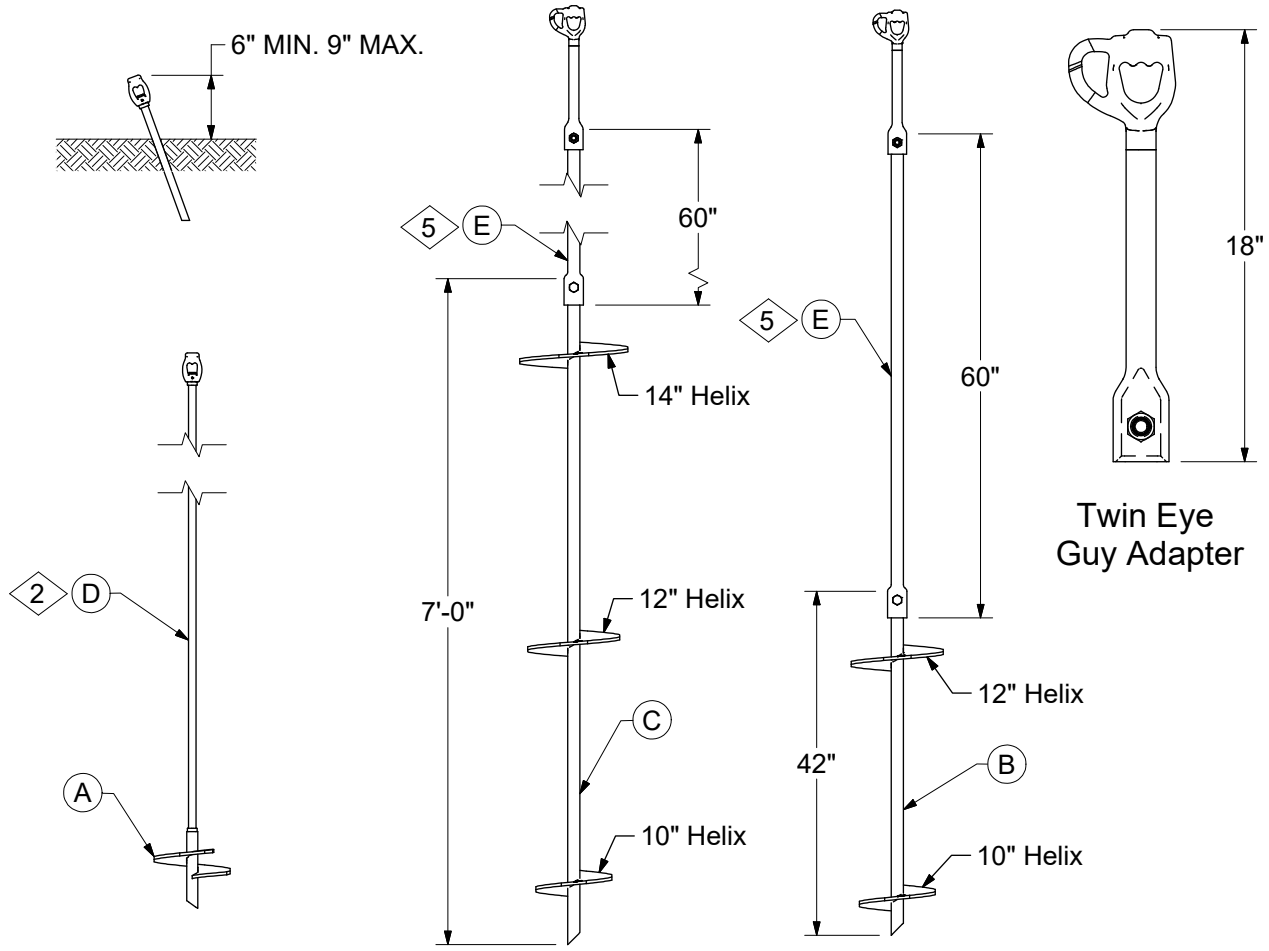
CONSTRUCTION NOTE(s):

1. Working Load of light duty hook (90% of ultimate) is 9,000 lb.
2. Working load of heavy duty hook (90% of ultimate) is 18,000 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 screws are not to be used with composite poles.

REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	02/03/16	KSP	

	ITEM	STK / DCS #	DESCRIPTION 11 00 56 **	01	02	03	04	05	06
1	A	23 68 056	Guy Hook - Light Duty	1	-	-	-	-	-
2	B	23 78 345	Guy Hook - Heavy Duty	-	1	1	1	1	1
3	C	23 52 066	Bolt, Mach., 5/8" x 14" w/ square nut	1	-	-	-	1	1
		23 52 219	Bolt, Mach., 3/4" x 14" w/ square nut	-	1	1	2	-	-
	D	23 66 207	Washer, Curved, Square, 5/8"	1	-	-	-	1	1
		23 66 031	Washer, Curved, Square, 3/4"	-	1	1	2	-	-
	E	23 66 134	Lock Washer - 5/8" Double Coil	1	-	-	-	1	1
		23 66 135	Lock Washer - 3/4" Double Coil	-	1	1	2	-	-
	F	23 65 043	Lock Nut - 5/8" Square	1	-	-	-	1	1
		23 55 042	Lock Nut - 3/4" Square	-	1	1	2	-	-
7	G	23 60 007	Lag Screw - 1/2" x 4"	1	2	2	-	2	2
	H	23 58 054	Clevis, NM, Thimble, Galvanized Steel	-	1	-	-	1	-

REV	DATE	ENG	DESCRIPTION
6	04/01/23	DG	Converted to new format
5	02/03/16	KSP	



Twin Eye
Guy Adapter

11 00 60 (01 & 03)
Round Rod Single Helix

11 00 60 06

11 00 60 07
Square Shaft Multi Helix 8

DCS #	Helix Size	Torque Rating ft. - lbs.	Holding Power - Lbs.		
			Sand	Clay	Clay Pan
11 00 60 01	10"	6,000	12,000	15,000	16,500
11 00 60 03	14"	6,000	18,000	22,000	25,000
11 00 60 07	10" & 12"	5,500	25,000	30,000	40,000
11 00 60 06	10", 12", & 14"	5,500	35,000	40,000	60,000

CONSTRUCTION NOTE(s):

1. Expanding anchors DCS **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. Helix must be a minimum of 5' deep. 3'-6" sectional rods (Stock #23 63 097) may also be used in poor soil to obtain greater setting depth of the anchor.

3. High torque screw anchors DCS **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.

REV	DATE	ENG	DESCRIPTION
7	04/01/23	DG	Converted to new format
6	08/31/15	DG	

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 3/4" or 1" round rod - 23 59 075
   - Triple eye nut for 3/4" or 1" round rod - 23 59 132
   - Triple eye adapter for 1-1/2" square shaft - 23 13 112

5. The top helix must be a minimum of 6' deep. Therefore, extension rod (Stock #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.

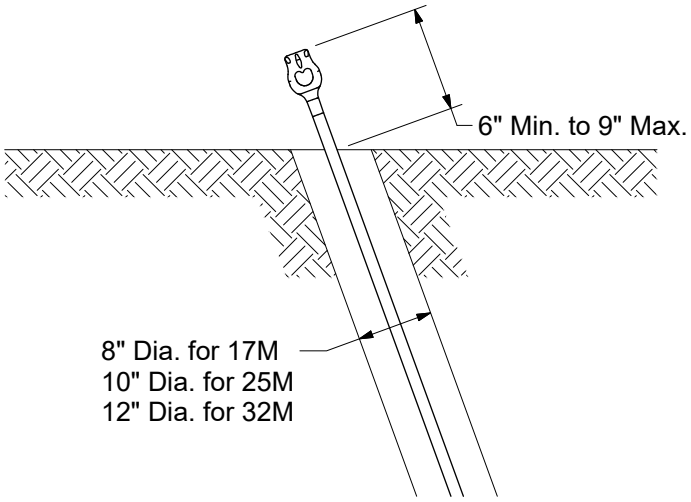
6. Drive wrench for square shaft anchors is Stock #86 14 736.

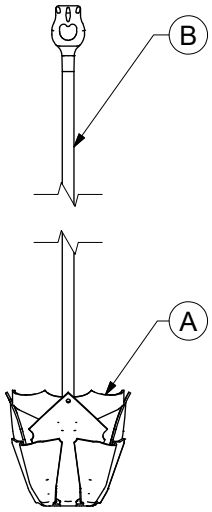
7. Multiple anchors must be spaced a minimum of 5' apart.

8. Square shaft anchors Stock #23 13 110 and Stock #23 13 138 must be used for 34.5kV and 69kV structures in Illinois.

	ITEM	STK / DCS #	DESCRIPTION 11 00 60 **	01	03	06	07
	A	23 13 131	Anchor - 10" Helix 1-3/8" Hub	1	-	-	-
		23 13 092	Anchor - 14" Helix 1-3/8" Hub	-	1	-	-
	B	23 13 110	Anchor - 10" & 12" Helix, w/Twin Eye Guy Adaptor	-	-	-	1
	C	23 13 138	Anchor - 10", 12", & 14" Helix, w/Twin Eye Guy Adapter	-	-	1	-
2	D	23 60 090	Anchor Rod - 7' with Twin Eye Nut	1	1	-	-
5	E	23 13 099	Rod - Anchor, 5' Extension 1-1/2" Square	-	-	1	1

REV	DATE	ENG	DESCRIPTION
7	04/01/23	DG	Converted to new format
6	08/31/15	DG	





DCS #	Helix Size	Holding Power - lbs.		
		Sand	Clay	Hard Pan
11 00 61 01	17M	11,500	17,500	23,000
11 00 61 02	25M	17,000	25,000	32,000
11 00 61 03	32M	32,000	32,000	36,000

CONSTRUCTION NOTE(s):

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

ITEM	STK / DCS #	DESCRIPTION 11 00 61 **	01	02	03
A	23 13 005	Anchor - Expansion, 17M	1	-	-
	23 13 007	Anchor - Expansion, 25M	-	1	-
	23 13 094	Anchor - Expansion, 32M	-	-	1
B	23 63 019	Rod - Anchor Guy, 3/4" x 8', Double Strand Eye	1	-	-
	23 63 022	Rod - Anchor Guy Rod 1" x 8', Double Strand Eye	-	1	1

INSTRUCTIONS - Installation of Expanding Anchors

1. Using an adjustable earth auger (Stock #85 01 026), drill a hole of such depth that the anchor rod will extend 6" to 9" 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 17M anchors, the hole shall be 8" in diameter; for 22M anchors, the hole shall be 10" in diameter; and for 32M anchors, the hole shall be 12" 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.

REV	DATE	ENG	DESCRIPTION
3	04/01/23	JSS	Converted to new format
2	06/26/07	DG	

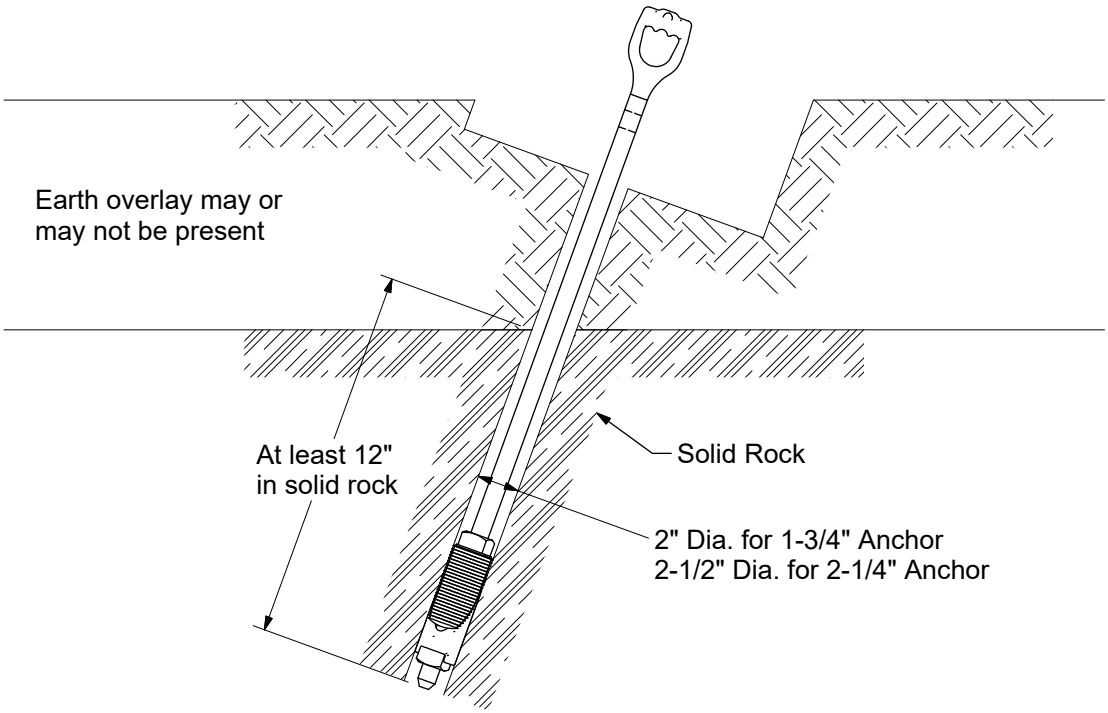
3. Clean all loose dirt from the bottom of the hole and insert the anchor. Press the anchor firmly against the bottom of the hole, with the anchor rod held as close as possible to the angle the guy wire will assume after the load has been applied.

4. Expand the anchor, using a tubular anchor spreader (Stock #85 32 093) for 17M anchors. For 25M and 32M anchors, use expanding and tamping bar (Stock #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.

5. 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.

6. 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.

7. Where expanding anchors are installed in good soil under water or in good soil that is very wet, the first 30" 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.



STK #	Anchor Diameter	Rod Diameter	Rod Length	Breaking Load	Size Rock Drill
23 13 053	1-3/4"	3/4"	30"	23,000	2"
23 13 054	1-3/4"	3/4"	53"	23,000	2"
23 13 106	1-3/4"	3/4"	72"	23,000	2"
23 13 056	1-3/4"	3/4"	96"	23,000	2"
23 13 118	2-1/4"	1"	53"	36,000	2-1/2"
23 13 117	2-1/4"	1"	96"	36,000	2-1/2"

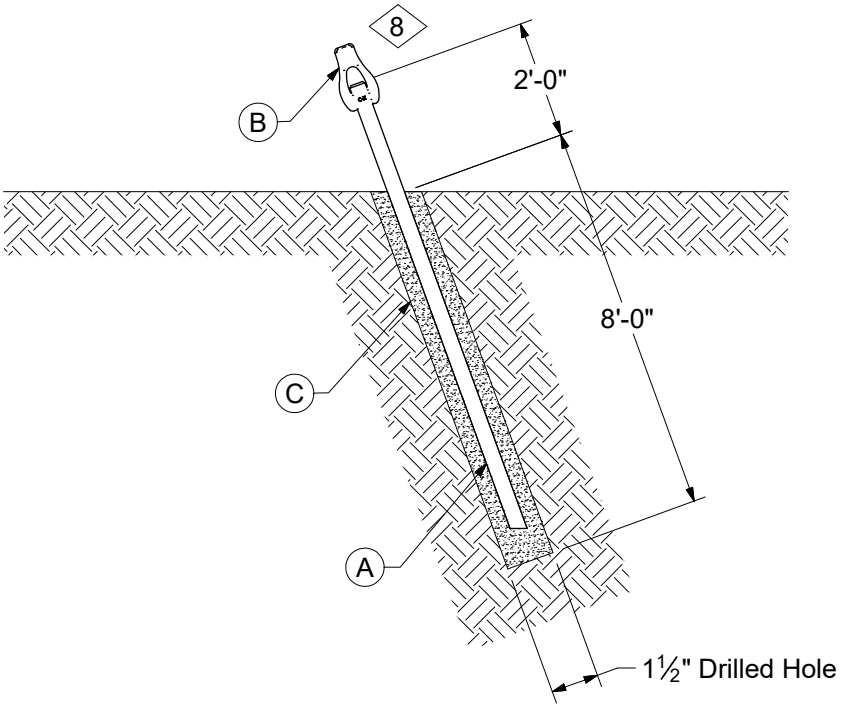
CONSTRUCTION NOTE(s):

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.

DESIGN NOTE(s):

3. 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.
4. Ameren has two standard sizes of expanding type rock anchors available:
   1-3/4" Anchor with 3/4" Diameter Tripleye Rod
   2-1/4" Anchor with 1" Diameter Tripleye Rod

REV	DATE	ENG	DESCRIPTION
3	04/01/23	DG	Converted to new format
2	04/18/01	DDG	



CONSTRUCTION NOTE(s):

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.

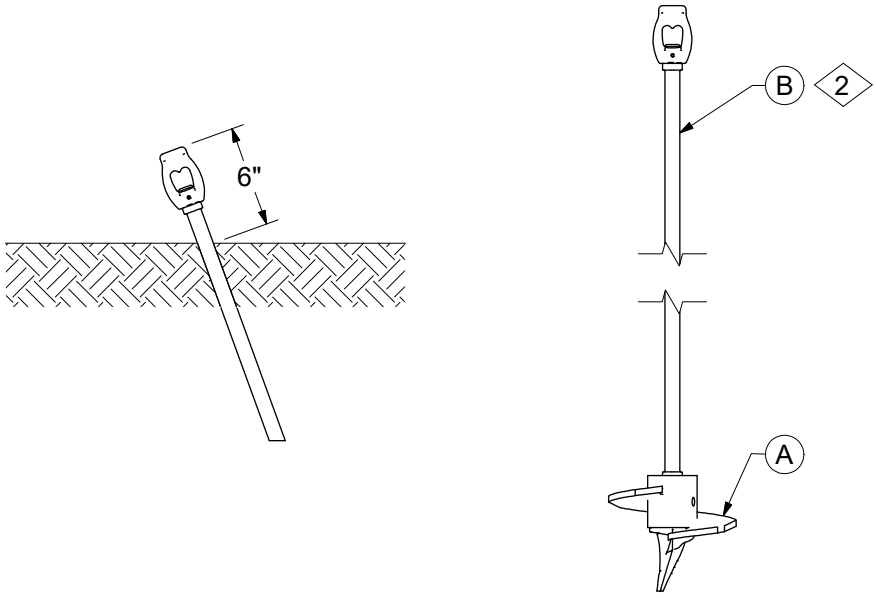
6. Following cartridge insertion, the 10 foot rebar (item A) should be inserted in the hole, puncturing the cartridges. A 3/4 inch adaptor should be attached to the threaded end of the rebar and the rebar rotated 60 seconds using a mechanical driver to disperse the hardener throughout the resin.

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.

ITEM	STK / DCS #	DESCRIPTION 11 00 62 **	01
A	23 13 154	Anchor - #8 Rebar, 10', with Threaded End	1
B	23 65 061	Nut - Thimbleeye	1
C	14 12 377	Anchor - Fast Lock T-Resin (Celitite), WilliamsForm Cat. No. S6R-32-305-15-30	7
D	23 63 097	Extension - 1" Dia. x 3-1/2 ft. Threaded w/Coupler	1

REV	DATE	ENG	DESCRIPTION
1	04/01/23	DG	Converted to new format
0	10/16/07		



DCS #	Helix Size	Holding Power - Lbs.			
		Clay	Claypan	Hardpan	Laminated Rock
11 00 63 01	8"	◇3	12,500	20,000	24,000
11 00 63 03	10"	◇3	16,500	25,000	28,000

CONSTRUCTION NOTE(s):

1. Expanding anchors DCS **11 00 61 ** may be used if power installation equipment is unavailable or if soil condition, particularly rocks, makes use of high torque screw anchors impossible.

◇2. Helix must be a minimum of 5' deep. 3'-6" rods stock # 23 63 097 must be used with some installation equipment.

◇3. Screw anchors DCS **11 00 60 ** must be used in clay type soil. They should also be used where soil conditions permit because of the increased expense of these high torque screw anchors over regular screw anchors.

ITEM	STK / DCS #	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

REV	DATE	ENG	DESCRIPTION
2	04/01/23	DG	Converted to new format
1	05/14/99	DDG	

NOTES