OVERHEAD INSTRUCTIONS 29

Wherever practicable it is intended that poles be jointly used with other utilities. To effectively do this, some of the more important provisions in the National Electric Safety Code (NESC) pertaining to Joint Use are outlined below.

1. Scope

Communication company (Communication Co.) circuits in this DCS include Telephone, Telegraph, CATV, Railroad Signal, Messenger Call, Clock, Control, Fire and Police, and other alarm circuits.

2. NESC Requirements

The National Electric Safety Code forms the basis for construction specifications under our joint use agreements. All new construction shall conform to the NESC in effect at the time of construction. Where conductors or equipment are added, altered, or replaced on an existing structure, the installation should be brought into conformance with the NESC in effect at that time except as mutually agreed not to do so. This mutual agreement is allowed provided that the resulting installation will be in compliance with either (a) the NESC rules in effect at original installation, or (b) NESC rules in effect in a subsequent edition to which the structure has been previously brought into compliance. Exception: On these existing structures, clearances between luminaire brackets and communications equipment must comply with the NESC rules in effect at the time the structure is replaced. These provisions shall not be so applied as to require any then existing cables carried on one side of a joint pole to be rearranged to occupy the other side of the pole.

A. Setting Depth of Poles

Ameren poles shall be set in accordance with DCS 02 20 03 01. Variations in depth setting for self--sustaining shall be considered in arriving at the height of pole required for joint use.

B. Minimum ”Clearance Space to Ground” Requirements

The ”Clearance Space to Ground” for a conductor is the NESC minimum clearance between ground or rail and the conductor. For equipment such as transformers hung low on a pole it is the minimum clearance between ground and the bottom of the transformer case or hanger.

In Table 1 are listed the clearances for Communications Co. conductors (usually the lowest on the pole).

TABLE 1 - Clearance to Ground or Rail of Communications Co. Cables or Conductors

Nature of Object Crossed Over or Along	Clearance Above Ground or Rail (ft.) 1
Communications Co. Cables or Conductors Crossing Over:	
Track rails of railroads	23.5
Public streets or roads	15.5
Public alleys	15.5
Driveways to residence garages (No vehicles greater than 8 ft. anticipated)	11.5
Spaces or ways accessible to pedestrians only	9.5
Communications Co. Cables Running Along and Within Limits of:	
Public streets, roads or alleys	15.5
Where no part of line overhangs any part of the highway and where it is unlikely loaded vehicles will cross under the line	13.5
Spaces or ways accessible to pedestrians only	9.5

CONSTRUCTION NOTE(s):

1. The clearances given are for the lowest point in the span. The point of attachment on the pole must, therefore, be higher to compensate for conductor sag or ground irregularities. Clearances are per the 2017 NESC.

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C. Communication Worker Saftey Zone

The communication worker safety zone shall be an equipment free vertical space (except as noted below) between Ameren attachments and equipment and Communications Co. attachments and equipment. It shall measure not less than 40” for Ameren attachments and equipment of circuits up to 600 volts to ground and 72” for circuits exceeding 600 volts to ground.

Exceptions:

a. Where non-current carrying parts of equipment are effectively grounded consistently throughout well--defined areas,and where communications circuits are at lower levels, the neutral space may be reduced to 30”.

b. For street light span wires and brackets, see Section 2E,and for vertical runs, see Section 2F.

D. Ground Connections

On all structures where a pole ground is installed by either Ameren or the Communication Co., the electric supply neutral and communication metallic messengers shall be bonded together with a minimum #6 covered copper or equivalent bond wire.

The same grounding wire or artificial ground may be used for Ameren and Communications Co. attachments, where mutually agreed upon. If separate Ameren and communication grounds are installed on the same pole, they must be bonded together with a minimum #6 covered copper or equivalent bond wire to the same ground rod or at the base of the pole, and at the Communication Co. attachment level.

E. Minimum Clearances between Street Light Equipment and Communications Equipment

Table 2 gives the minimum clearances that shall be maintained between Ameren and Communications Co. facilities under various conditions.

TABLE 2 - Vertical Clearance of Luminaire Brackets and Span Wires to Communication Lines	
Location of Luminaire Bracket or Span Wire Supporting Luminaire	Minimum Vertical Clearance (in)
Above communication support arms (not allowed by Ameren)	40 2
Below communication support arms (not allowed by Ameren)	40 3
Above messengers carrying communication cables	40 4
Below messengers carrying communication cables	40 4
From terminal box of communication cable	40 4
From communication brackets, bridle wire rings, or drive hooks	40 4

CONSTRUCTION NOTE(s):

Ref. 2017 NESC Section 23 Table 238-2

2. This may be reduced to 20" for grounded luminaire brackets, or 12" for either span wires or metal parts of brackets at points 40" or more from the pole surface.

3. This may be reduced to 24" for grounded luminaire brackets.

4. This may be reduced to 20" for grounded luminaire brackets. (Note that this is greater than the NESC allowed 4”.)

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F. Vertical Runs on Pole Surface

In general, Ameren and Communications Co. vertical runs shall not be placed on the same pole if it is practicable to place them on separate poles.

If vertical runs of both companies must be placed on the same pole, the runs shall be placed in adjacent quadrants, or on standoff brackets if more than half the pole surface is needed.

a. Clearance Between Vertical Runs and Pole Equipment

Vertical runs, risers, ground wires and hardware supporting such runs belonging to Ameren shall have a clearance of 1/8 the pole circumference but in no case less than 2” from communications equipment.

Vertical runs, risers, ground wires and hardware supporting such runs shall be so located that they do not interfere with the free use of pole steps.

b. Coverings for Vertical Runs on Poles

Ameren ground wires fastened directly to the pole need not be covered with plastic molding except where required within 8' of the ground.

Ameren non-leaded cables shall be covered with plastic conduit from the ground to a point not less than 40 inches above the highest Communications Co. attachments.

c. Vertical Runs Supported Between Crossarms

Lamp leads for street lights may be run from an Ameren crossarm directly to the lamp bracket provided the luminaire bracket is 40" or more above all communication attachments.

G. Other Attachments

a. Longitudinal Cable

All attachments in the communication space by a third party shall be bolted directly to the pole. In order to maintain climbing space, extension arms for means of attaching are prohibited.

b. Aerial Supply Service Cables

The point where such cables leave the pole shall be not less than 40" above the highest or 40" below the lowest Communication Co. attachments.

c. Requirements for Joint Use/Third Party Power Supply Equipment on Ameren Poles

All power supply equipment and associated facilities attachments (including but not limited to wires, conduits, brackets, and ground wires) are subject to Ameren approval.

Climbing space on any Ameren pole will be maintained at all times. This requires one side of the pole (180 degrees of the same face of the pole) to be open from the ground to the top of the communication space. Any power supplies or similar facilities shall be mounted on the same side of the pole as any risers and cables. Under no circumstances is power supply equipment allowed above the communications space.

Risers and cables shall be installed in accordance with DCS **14 00 01 02**. No exceptions allowed.

Ameren’s wireless antenna location policy addresses the proper placement of any risers and cables above the communications space.

If climbing space cannot be maintained, the cabinet equipment shall be installed on the ground and shall be a minimum of 5’ horizontally, in any direction, from the base of the pole.

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H. Guys & Anchors

In Tables 3 and 4 are listed minimum clearances that shall be maintained between guys of either Ameren or the Communications Co. to the equipment listed and under the particular circumstances shown.

Anchors shall have a minimum of 5' separation from the pole face and to other anchors. Communication guys shall not be attached to Ameren anchors (see DCS **29 00 01 01** sheet 10).

TABLE 3 - Clearance to Grounded Guys when Crossing Over or Under Cables, Conductors or Guys of Another Line

Equipment Guy Crosses Over or Under	Clearance Required (ft.)
Communications Co. cable or conductors	2
Ameren triplex or quad cables	2
Ameren open conductors up to 750 volts	2 ⟨7⟩
Ameren open conductors above 750 volts	2 ⟨8⟩ ⟨6⟩
Other guys or street light span wires	2 ⟨5⟩

CONSTRUCTION NOTE(s):

Ref. 2017 NESC, Section 23, Table 233-1

⟨5.⟩ This clearance may be reduced where both guys are electrically interconnected.

⟨6.⟩ For voltages above 22 kV consult the Standards Group.

⟨7.⟩ 4' is required to communication guy.

⟨8.⟩ 5' is required to communication guy.

TABLE 4 - Clearance in Any Direction between Guys and Line Conductors or Cables Attached to the Same Structure

Equipment Guy Shall Clear	Parallel to Line (in.)	Not Parallel to Line (in.)
Communications Co. cables or conductors	6 ⟨9⟩	6 ⟨9⟩
Ameren conductors up to 8.7 kV phase to phase	12 ⟨9⟩	6
Ameren conductors (7.2/12.47 kV to14.4 kV)	15	9
Ameren 34.5 kV conductors	30	30

CONSTRUCTION NOTE(s):

Ref. 2017 NESC, Section 23, Table 235-6

⟨9.⟩ If guy passes within 12" of Ameren conductors and also passes within 12" of communication cables, the guy must be insulated with a strain insulator at a point below the lowest supply conductor and above the highest communication cable.

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I. Miscellaneous Requirements

Street lamp span wires shall not encircle the pole but shall be attached by means of a through bolt.

Street lamp brackets and their metal parts shall be confined to the half of the pole circumference nearest the lamp, except that where attachment by means of lag screws is impracticable the metal parts may be secured with through bolts. Lamp leads supported along a span wire or lamp bracket shall be so attached that insulation will not be injured.

Span wires shall have at least one strain insulator.

J. Communication Co. Antennas

Communication Co. antennas shall not be installed on any jointly used poles until reviewed by and approval is granted by Ameren. Communication Co. antennas shall not be installed on Ameren transformer poles, terminal poles, switch poles, capacitor poles, voltage regulator poles, recloser poles, deadend poles, or corner poles.

Exception: An installation on a transformer pole may be considered by Ameren to provide power to antenna where secondary does not exist.

Sections 2C, 2D, 2E, 2F, and 2G of this DCS shall also apply to Communication Co. antennas except where the clearances in this Section are more stringent.

a. Communication Co. Antennas Located in the Communication Space

Communication Co. antennas located in the communication space are considered equipment for the purpose of determining minimum clearance requirements.

Clearance from Communication Co. antennas to Ameren secondary shall be 40" (see DCS **29 00 01 01** sheet 14). See Section 2C of this DCS for minimum required clearance to higher voltage conductors when Ameren secondary is not present.

b. Communication Co. Antennas Located in the Supply Space

Communication Co. antennas located in the supply space shall be installed on the pole top only, and maintained only by personnel authorized and qualified to work in the supply space. Pole-top antennas shall only be allowed on poles that are truck accessible.

Minimum required clearances for Communication Co. antennas installed in the supply space above Ameren conductors shall be as shown in DCS **29 00 01 01** sheet 15.

Pole top extensions are not permitted for providing antenna clearance above Ameren conductors.

All exposed Communication Co. cable or wiring shall be covered or insulated. Antenna brackets shall be non-metallic or ungrounded.

Communication Co. antenna cable must extend down the pole in non-metallic conduit or U-guard from the antenna to below the communication worker safety zone. The non-metallic conduit or U-guard shall be located so that it does not obstruct climbing spaces or lateral working spaces between line conductors at different levels, or interfere with the safe use of pole steps.

c. Antenna Disconnect

Communication Co. shall provide a disconnect switch accessible to Ameren so that the antenna can be de-energized to prevent exposure to radiation at any time work is required in or near the space (Supply or Communication) where the antenna is installed.

K. Overhead Aerial Construction

DCS **29 00 01 01** sheets 7 thru 13 include drawings for compliance to NESC joint construction requirements.
DCS **29 00 01 01** sheets 14 thru 16 include drawings showing Ameren requirements for location of communication antennas.

3. Communication Attachments to Poles

A. Wood Poles

Holes for through-bolts shall be no closer than 4” apart to avoid compromising pole strength.

B. Composite Poles

All communication attachments to Ameren composite poles shall be made using pole-band attachment hardware. Drilling holes in Ameren composite poles shall not be allowed for any communication facilities attachment. All attachment hardware shall be free of any cleats or protrusions that will compress into the pole. Ameren has approved the use of an Aluma-Form pole-band kit rated for 3,000lbs of vertical load for this purpose. This kit consists of a 60” stainless steel pole-band, a mounting block for the Communication Co. attachment, and fastening hardware for tensioning the band. The Aluma-Form part number is 3-CSO-3HB. Any alternate hardware must be approved by Ameren prior to use.

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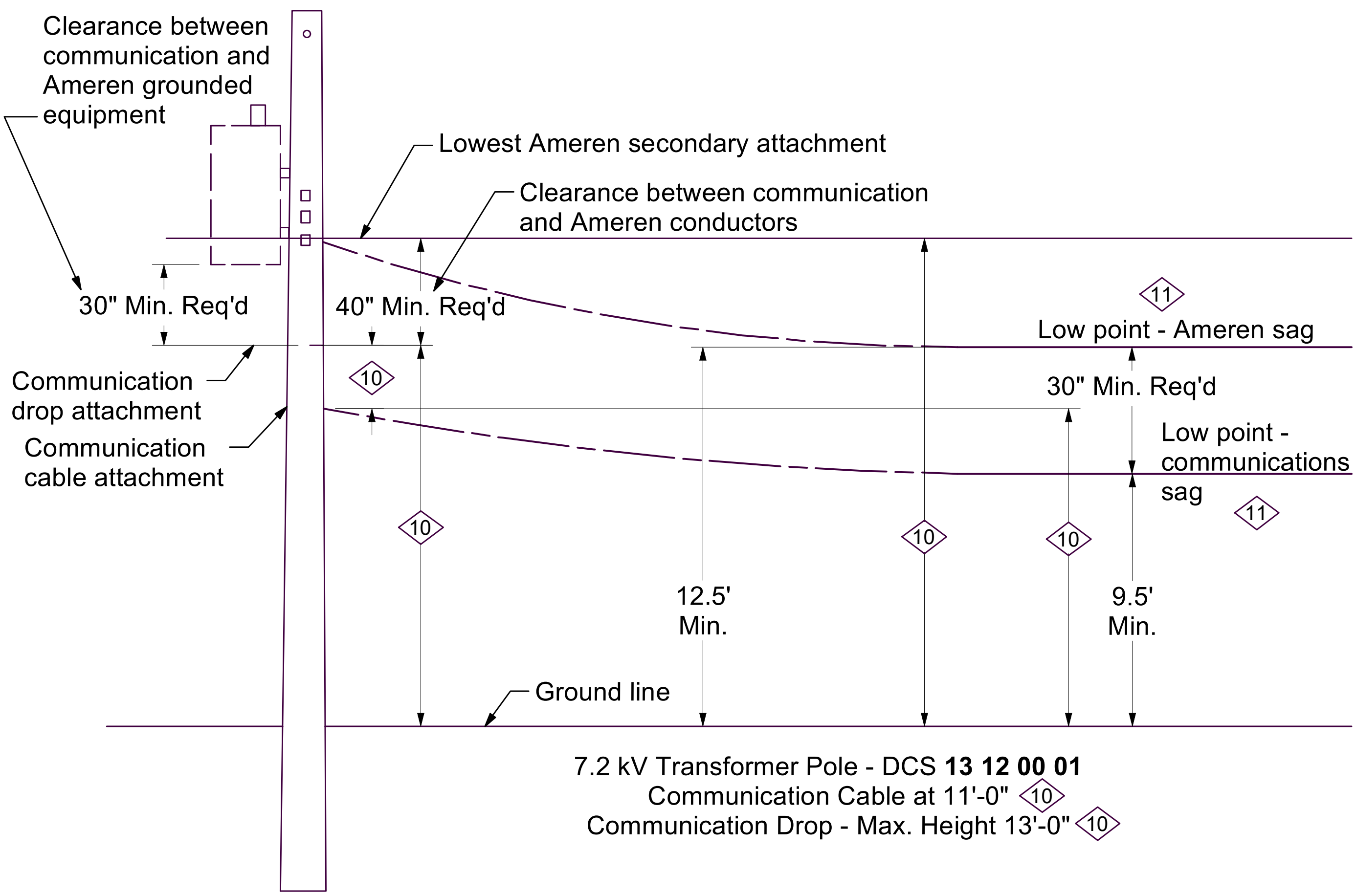

Figure 1 - Typical Pole Set on Private Property

CONSTRUCTION NOTE(s):

10 These mounting heights will vary in individual cases according to span lengths, conductor size, terrain and mounting height of customer drop attachment.

11 These minimum ground clearances are applicable in spaces or ways accessible to pedestrians only.

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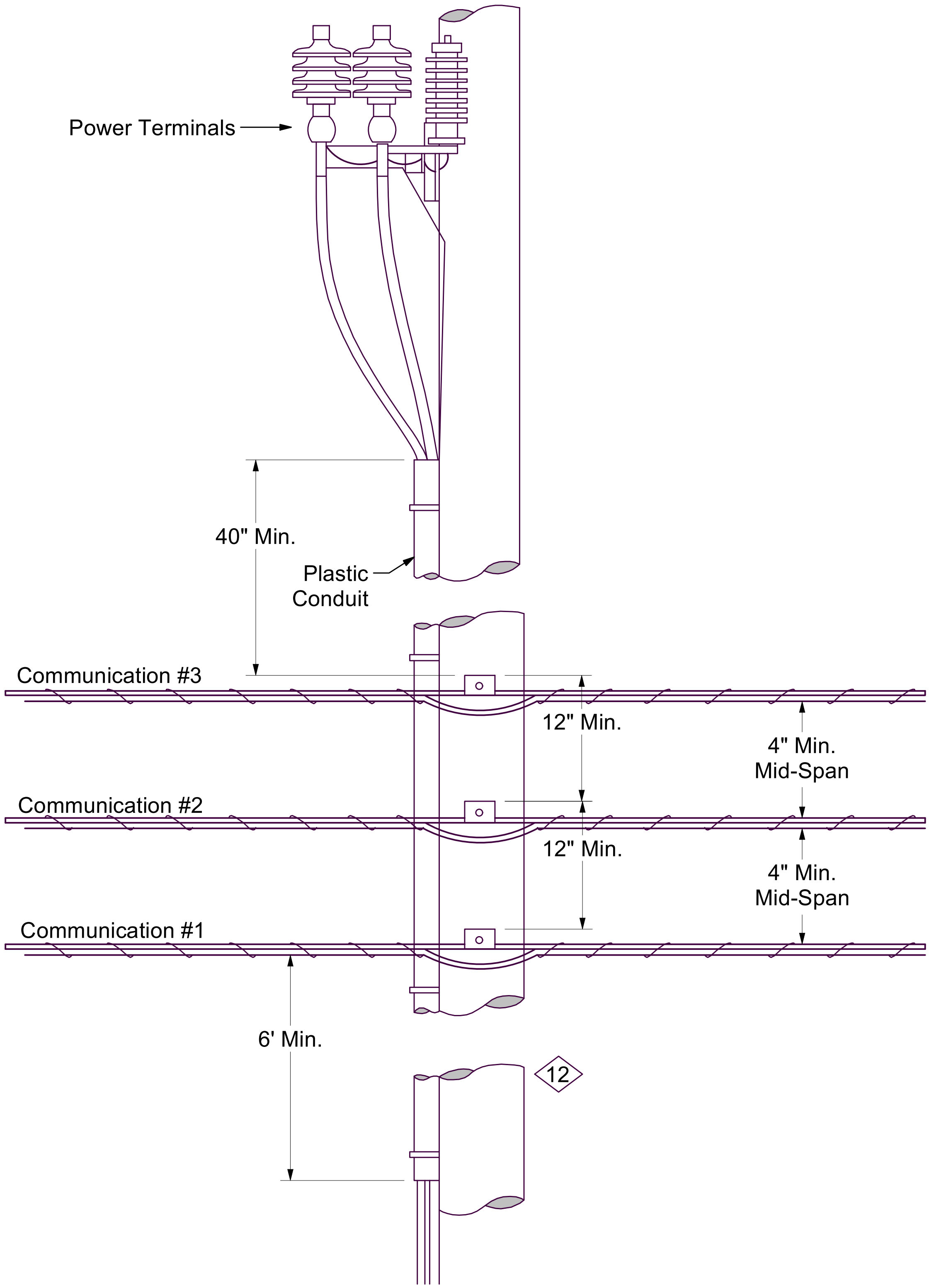

Figure 2 - Vertical Clearance to Power Lines

CONSTRUCTION NOTE(s):

12 Communication exposed through bolts and other exposed metal objects shall be no closer than 2” from power company riser

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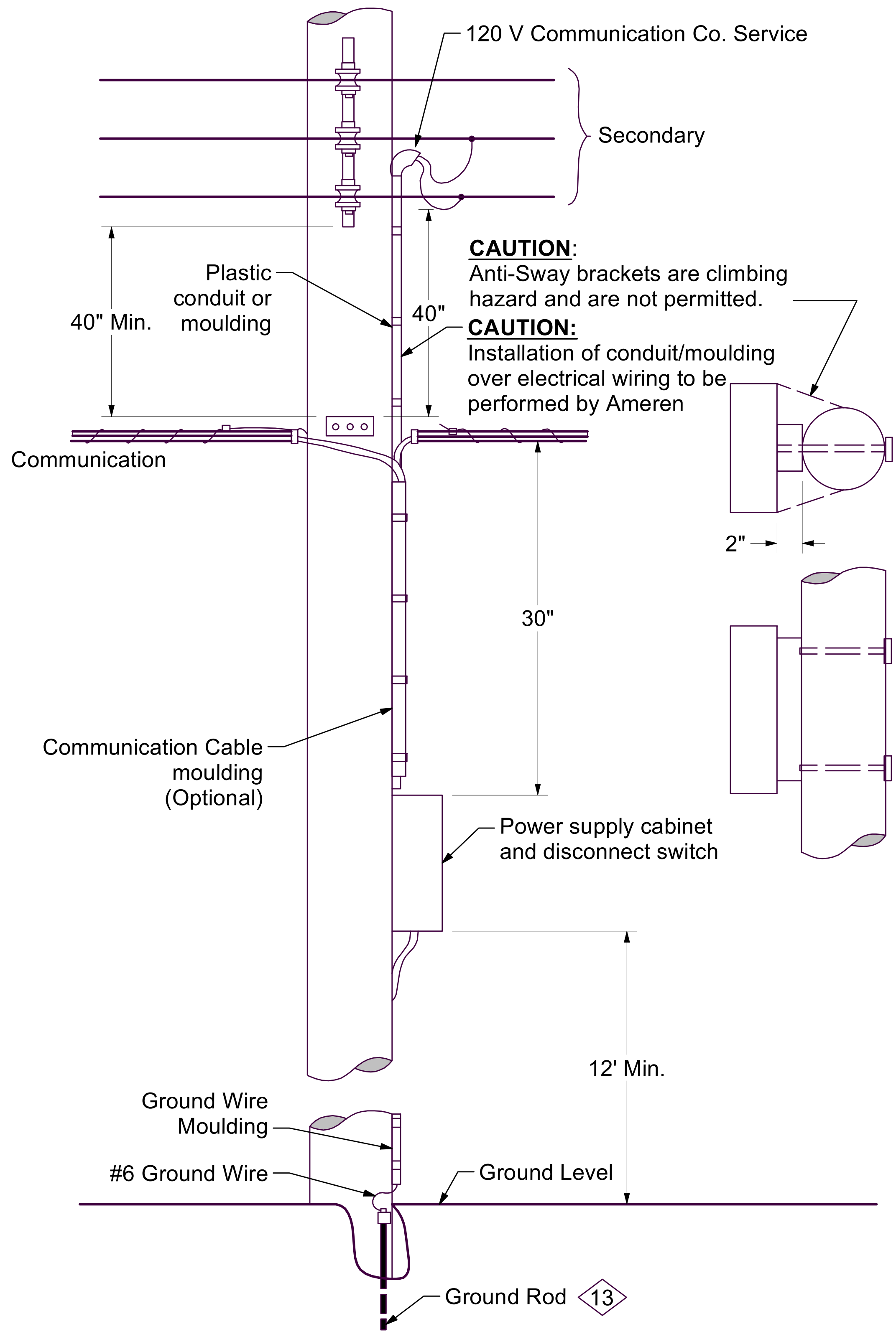

Figure 3 - Communication Co. Power Supplies

CONSTRUCTION NOTE(s):

13. If an Ameren vertical ground wire exists, Communication Co. must bond to the Ameren ground.

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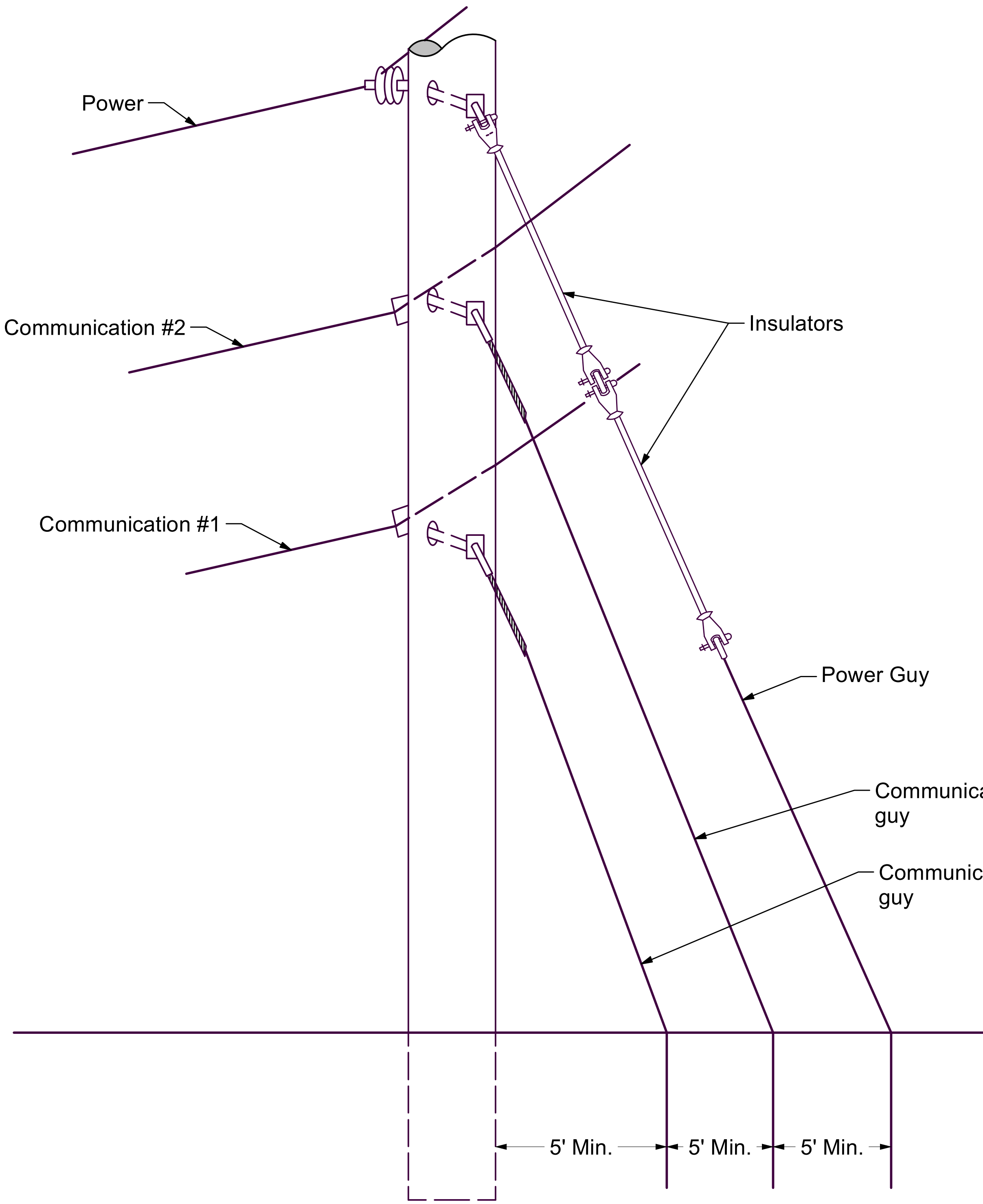

Figure 4 - Guy Anchor Clearance

CONSTRUCTION NOTE(s):

14. This guide is applicable to new guys only.
15. This guide is only to show minimum anchor separation at the ground.
16. Communication guys shall not be attached to Power (Ameren) anchors.

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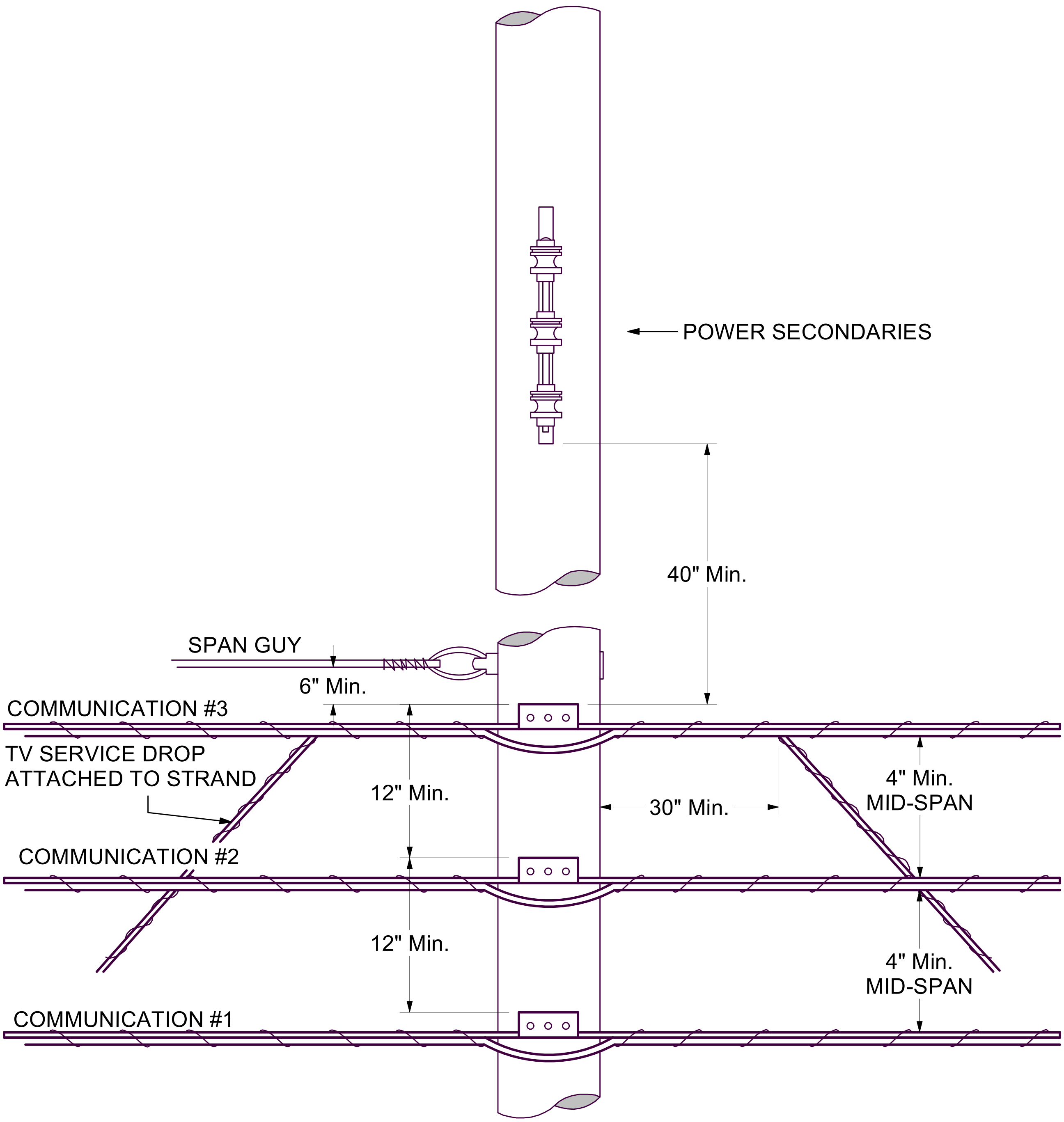

Figure 5 - Vertical Clearance at the Pole

CONSTRUCTION NOTE(s):

17. Any additional licensee's must adhere to clearances shown.

18. Spacing between attachment licensees and joint users must consider equipment which may be below strand and cable. Separation is defined by NESC and operating requirements.

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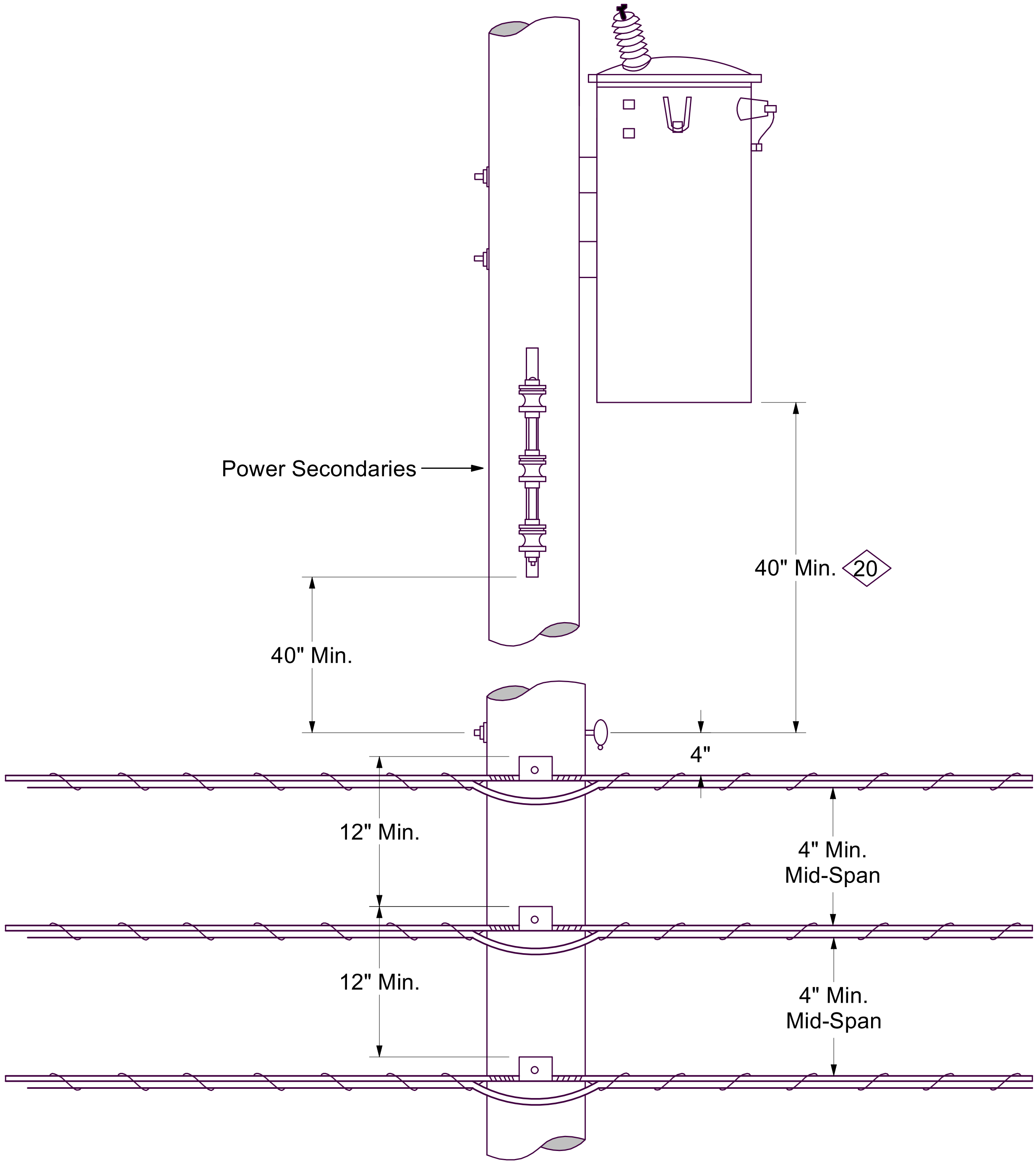

Figure 6 - Vertical Clearance to Power Equipment

CONSTRUCTION NOTE(s):

19. No communication equipment in cabinet shall be installed on a transformer pole.

20. May be 30" if case is effectively grounded.

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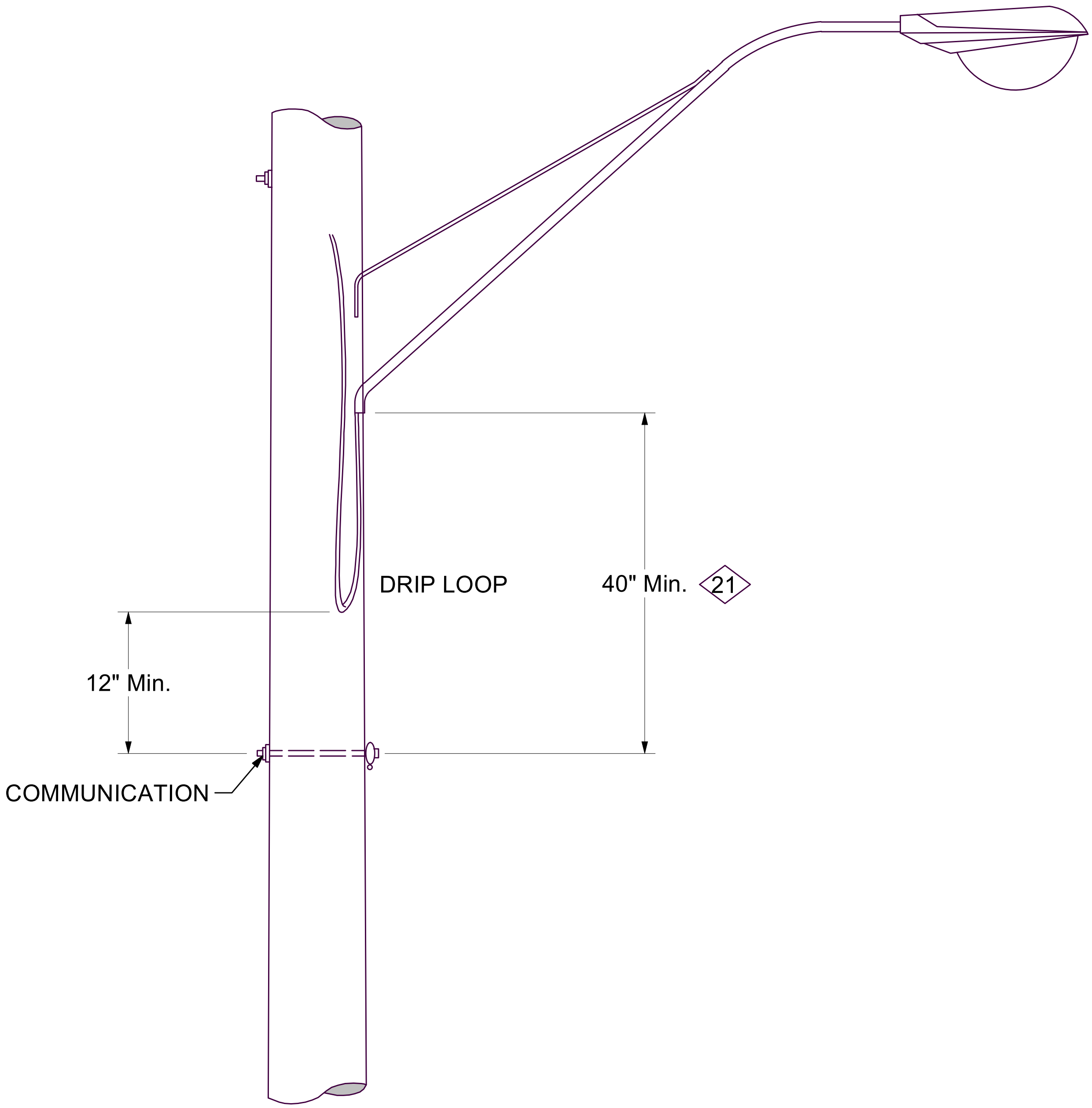

Figure 7 - Vertical Clearance to Streetlights

CONSTRUCTION NOTE(s):

21. 40" Minimum from bottom of ungrounded bracket
20" Minimum from bottom of grounded bracket

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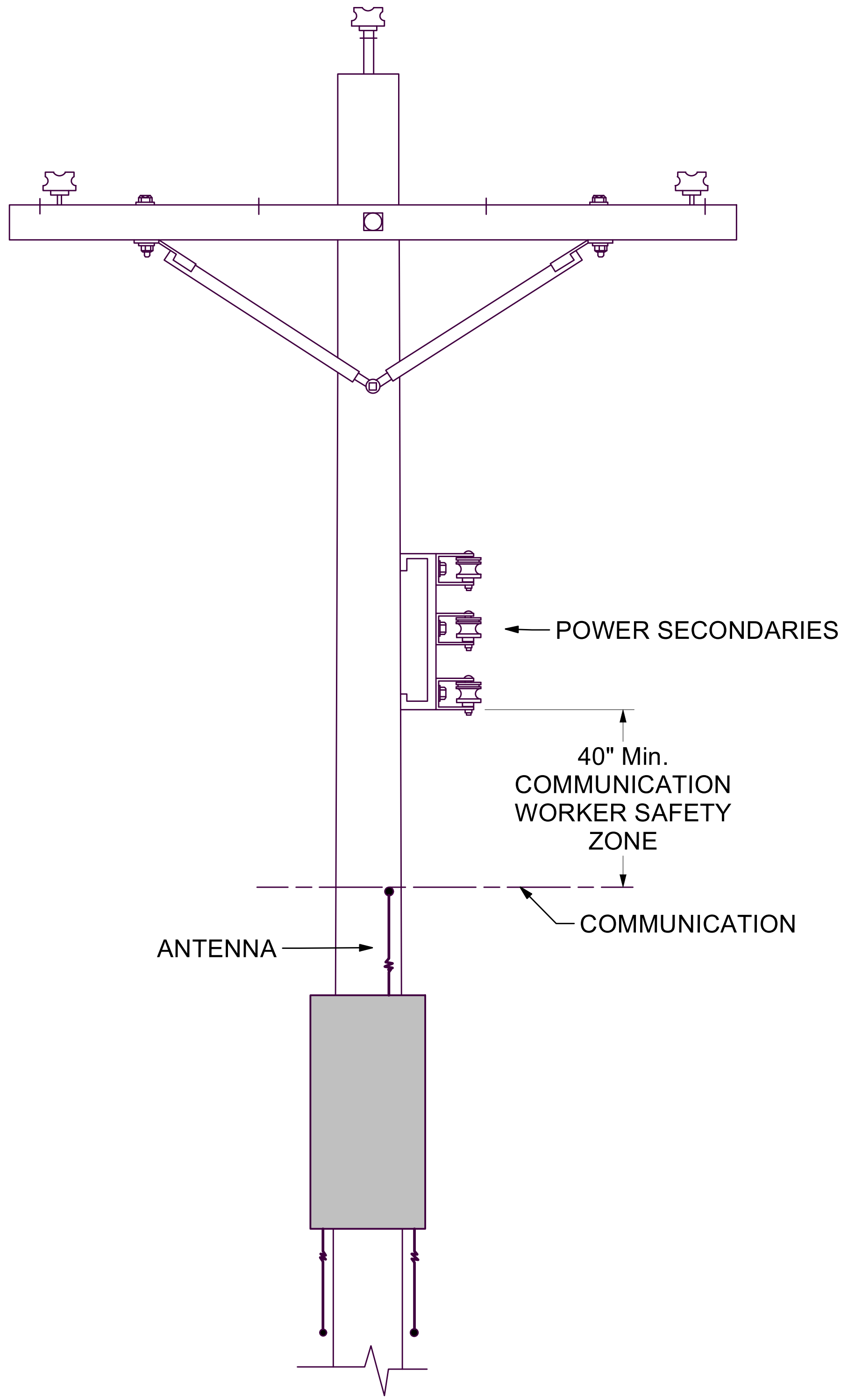

Figure 8 - Antenna Clearance in Communication Space

CONSTRUCTION NOTE(s):

22. Refer to sections 2G, 2J, 2Ja, 2Jc, and 3 for specific requirements.

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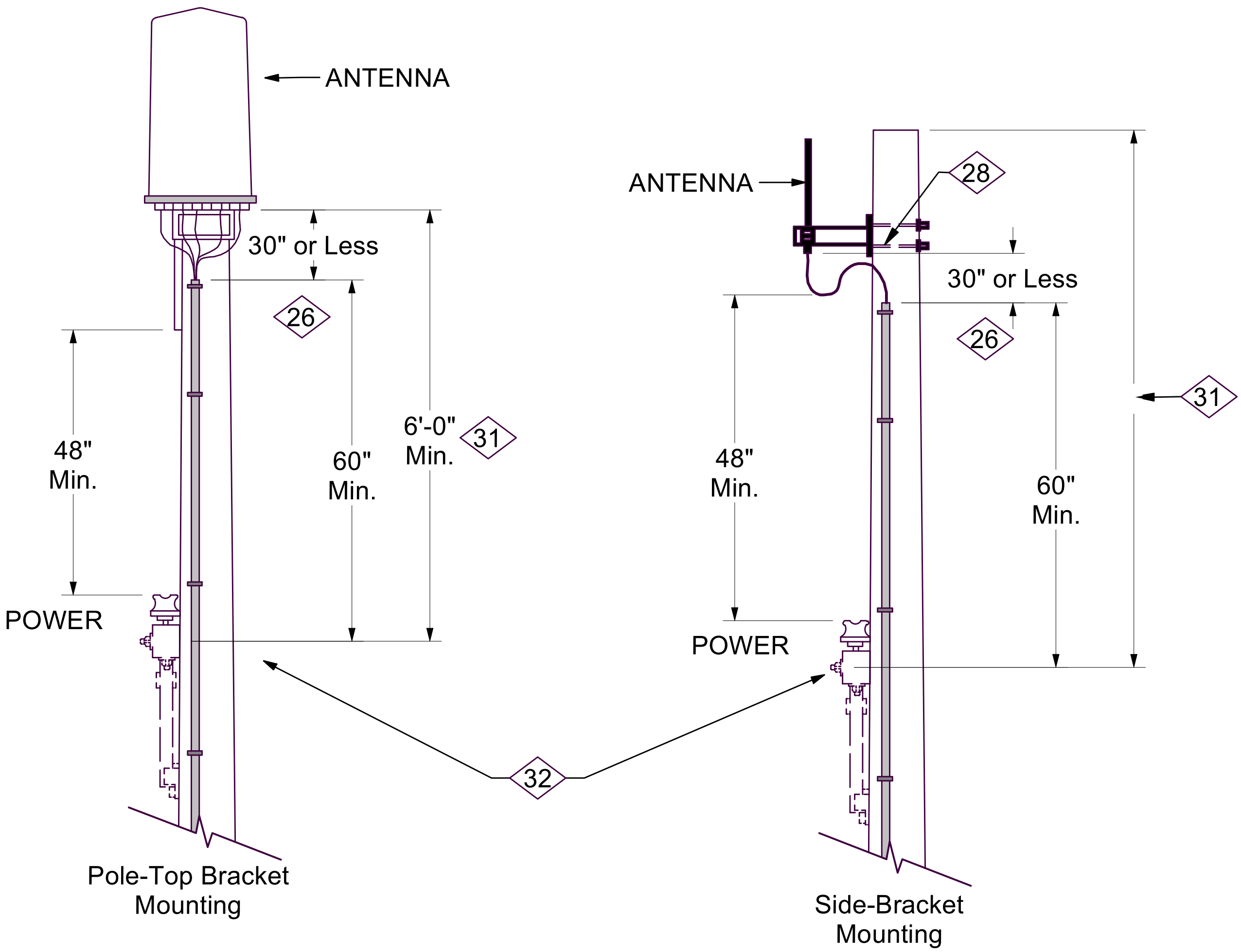

Figure 9 - Antenna Clearance Above Ameren Conductors

CONSTRUCTION NOTE(s):

23. Pole-top antennas shall only be allowed on poles that are truck accessible. Refer to sections 2G, 2J, 2Jb, 2Jc, and 3 for other specific requirements.

24. Communication Co. antenna and antenna cable must be installed and maintained by Ameren approved persons qualified to work in the electric supply space.

25. Pole top extensions are not permitted for providing antenna clearance above Ameren conductors.

26. Communication Co. antenna cable must extend down the pole in non-metallic conduit or U-guard from the antenna to below the communication worker safety zone. Length of antenna cable from the antenna to top of conduit or U-guard opening, must be 30” or less.

27. All Communication Co. wiring must be covered or insulated.

28. Antenna brackets must be non-metallic or ungrounded.

29. Ameren configuration changes required to accommodate the Communication Co. antenna must meet Ameren avian design standard requirements. Conductor cover must be installed on center phase.

30. Ameren configuration changes required to accommodate the Communication Co. antenna may require modification to adjacent poles to prevent conductor contact during galloping conditions.

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31. 6'-0" minimum from the crossarm mounting bolt (or center of the crossarm) to the top of the pole is required for antennas mounted on the pole top. For antennas mounted on side-brackets as shown in this drawing, the top of the pole must extend above the top of the antenna.

32. Tangent cross-arm construction is shown. For other single- or three-phase configurations, a minimum of 48” must be maintained from the lowest portion of the Communication Co. antenna mounting bracket or antenna cable drip-loop to the highest Ameren power conductor.

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This standard and the Clearance Standards that follow cover minimum clearances to be used in the design and construction of overhead lines on the Ameren System. The clearances specified meet or exceed the NESC requirements as required by the amended 83 IL. Admin. Code 305 and the MO 4CSR 240-18.010 Safety Standards. These clearances also meet the requirements of the 2017 Edition of the NESC.

1. Horizontal Clearances of Supporting Structures

Supporting structures, support arms, anchor guys, and attached equipment shall have the following minimum clearances, measured between the nearest parts of the objects concerned:

Clearances of Supporting Structures from Other Objects (feet)		
OBJECTS	MINIMUM	RECOMMENDED
A. Fire Hydrants	3 ⟨3⟩	4
B. Streets, Roads, & Highways ⟨4⟩ 1. With street curbs (clearance measured from street side of the curb).	Horizontal Clearance for First 15 Ft. Above Ground ⟨5⟩	
	⟨1⟩⟨4⟩	2 ⟨1⟩⟨4⟩
2. With no curbs	-	As close as practical to R.O.W. Line ⟨4⟩
C. All Railroad Tracks	Horizontal Clearance for First 22 Feet Above the Nearest Track Rail	
	12 ⟨2⟩	12

DESIGN NOTE(s):

Reference: 2017 NESC, Rule 231.

⟨1.⟩ Supporting structures should be placed as far as practical behind the curb within the road right-of-way and shall be located a sufficient distance behind the curb to avoid contact by ordinary vehicles using and located on the traveled way. Some ordinary trucks and delivery vehicles overhang the curb by more than 6 in. Superelevated curves and heavily crowned roads further increase this overhang.

⟨2.⟩ This may be reduced to 7 feet where the supporting structure is not the controlling obstruction, provided sufficient space for a driveway is left where the cars are loaded and unloaded.

⟨3.⟩ 3 feet is allowed only if conditions do not allow 4 feet clearance.

⟨4.⟩ For Illinois and Missouri State and Federal highways, location of structures shall be as required by each individual permit. In Illinois, 92 IL Admin. Code 530 provides requirements for location of support structures. In Missouri, MO 7CSR 10-3.010 provides requirements for location of support structures.

⟨5.⟩ Specified clearance is to the support structure or the closest support arm, anchor guy, or attached equipment on that structure up to 15 feet above the road surface.

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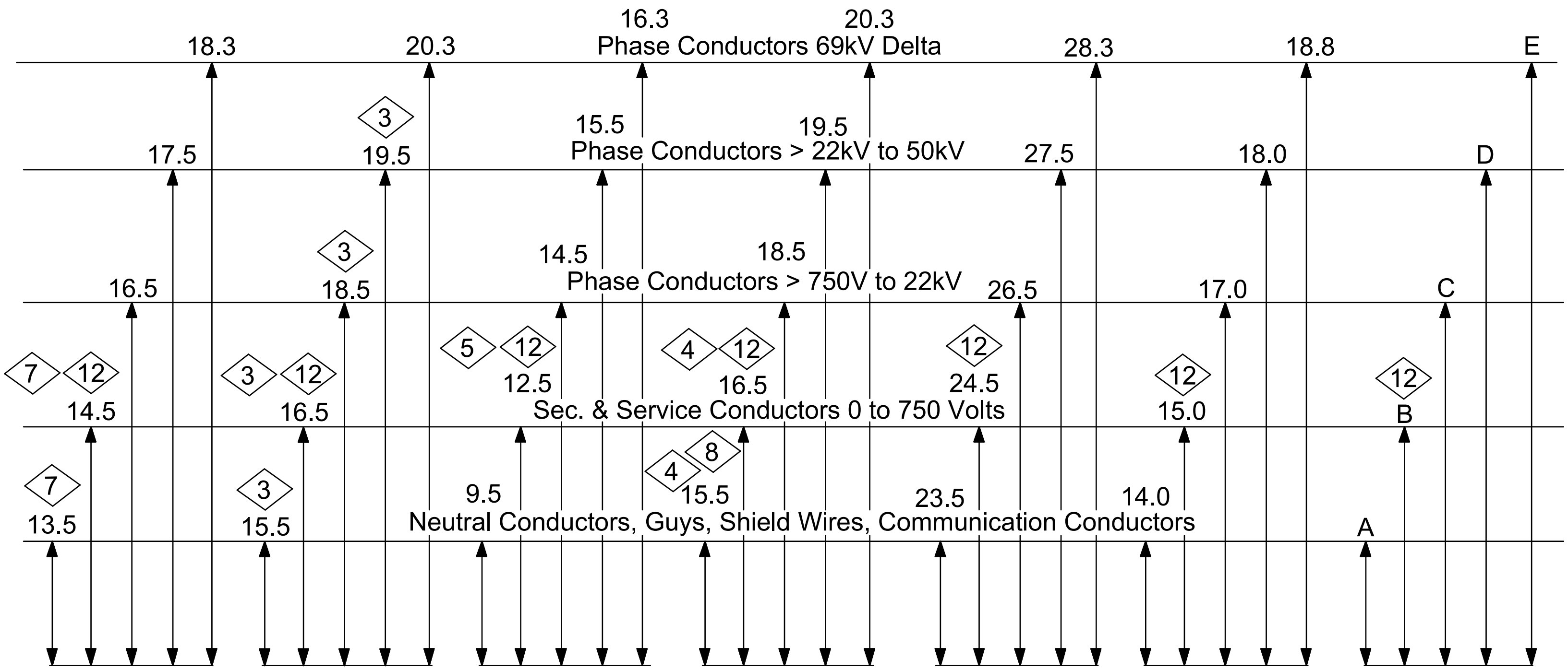

Along roads in rural areas where conductors run within the limits of road ROW, but DO NOT overhang the roadway and where it is unlikely that vehicles will be crossing under the line.

Along or across streets, subject to truck traffic. Other land traversed by vehicles such as cultivated, grazing forest and orchard lands, industrial areas, commercial areas, etc. 13

Spaces or ways accessible to pedestrians only 6

Across driveways, alleys and parking lots

Track rails of railroads

Water areas not suitable for sail boating or where sail boating is prohibited 11

Water areas suitable for sail boating. Including lakes, ponds, reservoirs, rivers, streams and canals with unobstructed surface areas.

		Reference Height 10	A	B 12	C	D	E
9 10 11 14 Water Areas	less than 20 acres	16	17.5	18.5	20.5	21.5	22.3
	20 to 200 acres	24	25.5	26.5	28.5	29.5	30.3
	200 to 2000 acres	30	31.5	32.5	34.5	35.5	36.3
	over 2000 acres	36	37.5	38.5	40.5	41.5	42.3

All Distance in Feet

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DESIGN NOTE(s):

Reference: 2017 NESC, Rule 232, Table 232-1

1. All voltages are phase-to-ground unless otherwise indicated.

2. The vertical clearances apply under the following conductor temperature and loading conditions, whichever produces the largest final sag.

   a. 120°F (50°C), no wind displacement.

   b. The maximum conductor temperature for which the line is designed to operate, if greater than 120°F (50°C), with no wind displacement.

   c. 32°F (0°C), no wind displacement with 1/2 in of ice.

3. Where this construction crosses over state and federal commercial highways, this clearance shall be no less than 18 ft. per MO Title 7 CSR 10-3.010 and 92 Il. Admin. Code 530. For Illinois limited access highway crossings, this clearance shall be no less than 20 ft.

4. Where vehicles exceeding 8 ft in height are not normally encountered nor reasonably anticipated, service drop(s) clearances over residential driveways only may be reduced to the following:

a. Insulated supply service drops limited to 300 V to ground	12.5 ft
b. Insulated drip loops of supply service drops limited to 300 V to ground	10.5 ft
c. Triplex supply service drops limited to 150 V to ground	12.0 ft
d. Drip loops only of triplex service drops limited to 150 V to ground	10.0 ft
e. Insulated communication service drops	11.5 ft

5. Clearance values for service drops to residential buildings only may be reduced to the following:

a. Insulated supply service drops limited to 300 V to ground	10.5 ft
b. Insulated drip loops of supply service drops limited to 300 V to ground	10.5 ft
c. Triplex supply service drops limited to 150 V to ground	10.0 ft
d. Drip loops only of triplex supply service drops limited to 150 V to ground	10.0 ft

6. Spaces and ways subject to pedestrians or restricted traffic only are those areas where riders on horseback or other large animals, vehicles, or other mobile units exceeding 8 ft in height, are prohibited by regulation or permanent terrain configurations or are otherwise not normally encountered nor reasonably anticipated.

7. Where a line along a road is located relative to fences, ditches, embankments, etc. so that the ground under the line would not be expected to be traveled except by pedestrians, this clearance may be reduced to the following values:

a. Triplex and quadruplex 120 V to ground	10.0 ft
b. Insulated conductors 0 to 300 V to ground	12.5 ft
c. Guys, neutrals, insulated communication cables	9.5 ft

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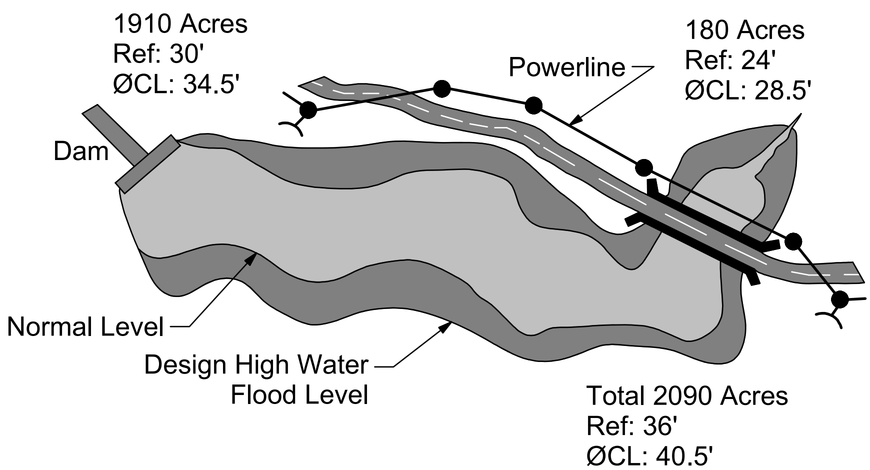
8. Where this construction crosses over and runs along alleys, driveways, or parking lots not subject to truck traffic, this clearance may be reduced to 15 ft.

9. The surface area and corresponding clearance shall be based upon the normal flood level or, for controlled impoundments, upon the design high water level. The clearance over rivers, streams, and canals shall be based upon the largest surface of any onemile long segment which includes the crossing. The clearance over a canal or similar waterway providing access for sailboats to a larger body of water shall be the same as that required for the larger body of water.

10. Where an over water obstruction restricts vessel height, the required clearance may be reduced by the difference between the Reference Height from the 'Water Areas' table above (for the overall area of the body of water that the line crosses), and the over water obstruction height. Exception: The reduced clearance shall not be less than that required for the water surface area on the linecrossing side of the obstruction.

Example: A 12.47 kV line will cross over a portion of a 2090 acre lake adjacent to a bridge. For this size lake, the normally required clearance for a 12.47 kV line is 40.5 ft (the Reference Height = 36 ft). The area of the lake on one side of the bridge is 1910 acres. For a 1910 acre lake, the normally required clearance for a 12.47 kV line is 34.5 ft The area of the lake on the other side of the bridge is 180 acres. For a 180 acre lake, the normally required clearance for a 12.47 kV line is 28.5 ft. The height of the bridge above the water is 25 ft. The Reference Height for the overall area of the lake minus the bridge height is 11 ft (36 ft - 25 ft).



If the 12.47 kV line is installed on the 1910 acre side of the bridge, an 11 ft reduction in the clearance over the 2090 acre lake would be 29.5 ft (40.5 ft − 11 ft). However, 29.5 ft is less than the 34.5 ft required for a 12.47 kV line over a 1910 acre lake. Therefore, if the 12.47 kV line crossing is done over the 1910 acre side of the bridge, the full 34.5 ft clearance of the 12.47 kV line over the lake must be maintained.

If the 12.47 kV line is installed on the 180 acre side of the bridge, an 11 ft reduction in the clearance over the 2090 acre lake would be 29.5 ft (40.5 ft − 11 ft). 29.5 ft is more than the 28.5 ft required for a 12.47 kV line over a 180 acre lake. Therefore, if the 12.47 kV line crossing is done over the 180 acre side of the bridge, the clearance of the 12.47 kV line over the lake can be reduced to 29.5 ft.

11. Where the US Army Corps of Engineers, or the State, or surrogate thereof has issued a crossing permit, clearances of that permit shall govern.

12. Clearance can be reduced by 6 in for triplex and quadruplex conductor.

13. When designing to accommodate oversized vehicles, these clearance values shall be increased by the difference in the known height of the oversized vehicle and 14 ft.

14. Add 5 ft to the water area clearance values for ground clearance at established boat ramp and rigging areas, or areas posted with sign(s) for rigging or launching sail boats.

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These vertical clearances above ground are for unguarded rigid live parts such as potheads, transformer bushings, lightning arresters, short lengths of connecting supply conductors which are not subject to variations in sag, and effectively grounded equipment cases.

Minimum Vertical Clearance in Feet (All voltages are phase-to-ground unless otherwise indicated)					
Nature of Surface Below Live Parts	Effectively Grounded Cases	0 to 750 Volts	Over 750V to 22kV	Over 22kV to 50kV	69kV Delta
1. Where live parts overhang:	-	-	-	-	-
a. Roads, streets, alleys; nonresidential driveways; parking lots and other areas subject to truck traffic ◇3	15.0	16.0	18.0	19.0	19.8
b. Residential driveways; commercial areas not subject to truck traffic.	15.0	16.0 ◇1	18.0	19.0	19.8
c. Other land traversed by oversized vehicles such as cultivated land, grazing land, forest, orchard, industrial commercial etc. ◇7	15.0 ◇5	16.0	18.0	19.0	19.8
d. Spaces and ways accessible to pedestrians only. ◇4	9.0 ◇5	12.0 ◇1b	14.0	15.0	15.8
2. Where live parts are along and within the limits of highways or other road rights−of−way but do not overhang the roadway:	-	-	-	-	-
a. Roads, streets, and alleys.	15.0 ◇5	16.0	18.0	19.0	19.8
b. Roads where it is unlikely that vehicles will be crossing under the line.	13.0 ◇5	14.0 ◇2	16.0	17.0	17.8
3. Water areas not suitable for sailboating or where sailboating is prohibited. ◇6	13.5	14.5	16.5	17.5	18.3
4. Water areas suitable for sailboating including lakes, ponds, reservoirs, tidal waters, rivers, streams, and canals with an unobstructed surface area.	Use clearances over Water Areas in DCS 29 00 17 02 reduced by 6 inches.				

Reference: NESC, 2017 Edition, Rule 232, Table 232-2

DESIGN NOTE(s):

◇1. This clearance may be reduced to the following values (feet):

a. Insulated live parts limited to 300 V to ground 12 ft

b. Insulated live parts limited to 150 V to ground 10 ft

◇2. Where a supply line along a road is limited to 300V to ground and is located relative to fences, ditches, embankments, etc., so that the ground under the line would not be expected to be traveled except by pedestrians, this clearance may be reduced to 12 ft.

◇3. For the purpose of this rule, trucks are defined as any vehicle exceeding 8 ft in height. Areas not subject to truck traffic are areas where truck traffic is not normally encountered nor reasonably anticipated.

◇4. Spaces and ways subject to pedestrians or restricted traffic only are those areas where riders on horseback, vehicles, or other mobile units exceeding 8 ft in height, are prohibited by regulation, or permanent terrain configurations, or are otherwise not normally encountered nor reasonably anticipated.

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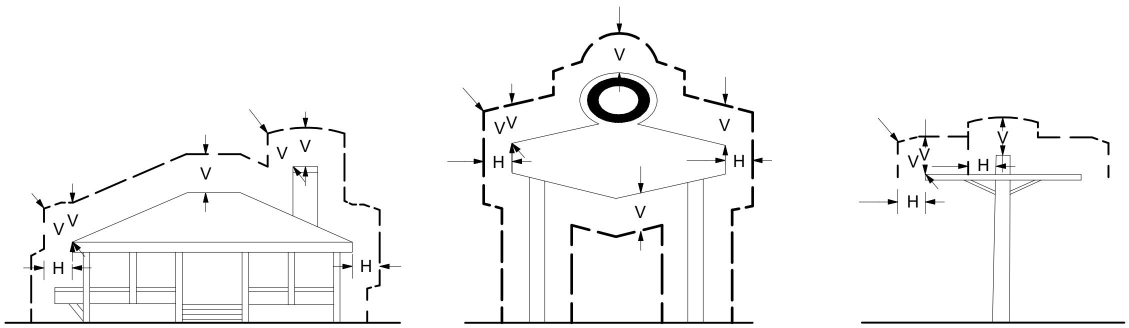
4	04/05/18	DG	

5. Effectively grounded switch handles and supply or communication equipment cases (such as fire alarm boxes, control boxes, communication terminals, meters, or similar equipment cases) may be mounted at a lower level for accessibility, provided such cases do not unduly obstruct a walkway.

6. Where the US Army Corps of Engineers, or the State, or surrogate thereof has issued a crossing permit, clearances of that permit shall govern.

7. These clearances shall be increased by the difference between the known height of the oversized vehicle and 14 ft.

REV	DATE	ENG	DESCRIPTION
5	04/01/22	DG	Converted to new format
4	04/05/18	DG	



STRUCTURES	SHIELD WIRES; NEUTRAL CONDUCTORS; GUYS [10]	TRIPLEX OR QUAD CABLES	UNGUARDED RIGID LIVE PARTS 0 TO 750V	PHASE CONDUCTORS 0 TO 750V; SHIELDED & NON- SHIELDED CABLES W/ MESSENGER OVER 750V [18]	UNGUARDED RIGID LIVE PARTS OVER 750VTO 22kV	PHASE CONDUCTORS AT XX kV (PHASE TO PHASE)			
						2.4 12	34	69Y	69Δ
Buildings [2][3][19]	-	-	-	-	-	-	-	-	-
1. Horizontal Clearances, with wind [20]	-	-	-	3.5	-	4.5	5.0	5.2	6.2
2. Horizontal Clearances, no wind [20]	-	-	-	-	-	-	-	-	-
a. To walls, projections and guarded windows	4.5 [5][11]	5.0 [5]	5.0 [5]	5.5 [5]	7.0 [5]	7.5 [5]	8.0 [5]	8.2	9.2
b. To unguarded windows [13]	4.5	5.0	5.0	5.5	7.0	7.5	8.0	8.2	9.2
c. To balconies and areas accessible to pedestrians [7]	4.5	5.0	5.0	5.5	7.0	7.5	8.0	8.2	9.2
3. Vertical Clearances [8]	-	-	-	-	-	-	-	-	-
a. Above or below roofs or projections NOT accessible to pedestrians	3.0	3.5 [12]	10.0	10.5 [12]	12.0	12.5	13.0	13.2	14.2
b. Above or below balconies or roofs accessible to pedestrians [7]	10.5	11.0 [12]	11.0	11.5 [12]	13.0	13.5	14.0	14.2	15.2
c. Above roofs accessible to vehicles but NOT subject to truck traffic [16]	10.5	11.0	11.0	11.5	13.0	13.5	14.0	14.2	15.2
d. Above roofs accessible to truck traffic [16]	15.5	16.0	16.0	16.5	18.0	18.5	19.0	19.2	20.2
Signs, chimneys, radio and T.V. antennas, tanks and other installations NOT classified as buildings or bridges [6][9][19]	-	-	-	-	-	-	-	-	-
1. Horizontal clearances, with wind [20]	-	-	-	3.5	-	4.5	5.0	5.2	6.2
2. Horizontal clearances, no wind [20]	-	-	-	-	-	-	-	-	-
a. To portions that are NOT readily accessible to pedestrians	3.0	3.5	5.0 [5]	5.5 [5]	7.0 [5]	7.5 [5]	8.0	8.2	9.2
b. To portions that ARE readily accessible to pedestrians [7]	4.5	5.0	5.0 [5]	5.5	7.0 [5]	7.5	8.0	8.2	9.2
3. Vertical Clearances	-	-	-	-	-	-	-	-	-
a. Over or under catwalks and other surfaces upon which personnel walk	10.5	11.0	11.0	11.5	13.0	13.5	14.0	14.2	15.2
b. Over or under other portions of such installations	3.0	3.5	5.5	6.0	7.5	8.0	8.5	8.7	9.7
Support Structures [14][19]	Guys, messengers, neutrals, triplex 0- 300V	-	-	Phase conductors & cables 0- 750V	-	-	-	-	-
1. Horizontal clearances, with wind [20]	-	-	-	3.5	-	4.5	5.0	5.2	6.2
2. Horizontal clearances, no wind [20]	3.0	3.0	-	5.0	-	5.0	5.5	5.7	6.7
3. Vertical Clearances [15]	2.0	2.0	-	4.5	-	4.5	5.0	5.2	6.2
Crane, derricks, etc. [17]	-	-	-	-	-	-	-	-	-
1. Vertical Clearances	10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0	15.0
Storage facilities for hazardous materials (oxygen, hydrogen, gasoline, etc.)	Contact the Electric Distribution Standards group before locating any electric line within 50 feet of such a storage facility (Reference is OSHA, 1910 Subpart H)								

Table 1 - Clearances of Wires from Buildings and Other Installations [1]

REV	DATE	ENG	DESCRIPTION
11	04/01/22	DG	Converted to new format
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DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rules 234 A,B,C, and G.

1. Clearances are in feet. Voltages are phase-to-ground unless otherwise indicated.

2. The construction of electric distribution primary lines over buildings is to be avoided whenever possible. When avoidance is not practical, these clearances shall be provided.

3. Where buildings or other installations exceed three stories (or 50 feet) in height, overhead lines should be arranged, where practical, so that a clear space or zone at least 6 feet wide will be left either adjacent to the building or beginning not over 8 feet from the building, to facilitate the raising of ladders where necessary for fire fighting.

4. Not used in this revision.

5. Where available space will not permit this value, it may be reduced by 2 feet if the conductors, including splices and taps, have covering which provides sufficient insulation to prevent a short circuit in case of a momentary contact with a structure or building.

6. Clearance to flags and banners shall assume no deflection of the flag pole but maximum displacement of the flag or banner towards the at rest (no displacement) utility facility.

7. A roof, balcony, or similar structure is considered readily accessible to pedestrians if it can be casually accessed through a doorway, window, ramp, stairway, or permanently mounted ladder by a person on foot who neither exerts extra ordinary physical effort nor employs tools or devices to gain entry. A permanently mounted ladder is not considered a means of access if its bottom rung is 8 feet or more from the ground or other permanently installed accessible surface, or is otherwise equipped with barriers to inhibit climbing by unauthorized persons.

8. For clearances above railings, walls, or parapets around balconies, decks, or roofs, use the clearances required for roofs not accessible to pedestrians.

9. The required clearance shall be increased to allow for the movement of motorized signs and other moveable attachments to any installation covered by this table.

10. Ungrounded guys and ungrounded portion of guys between guy insulators shall have clearances based on the highest voltage to which they may be exposed to a slack conductor or guy.

11. This clearance may be reduced to 3 inches for the effectively grounded portion of guys.

12. Service Conductors Attached to Installation for Service Entrance:

    a. Service drop conductors including drip loops not in excess of 750 volts, shall have a clearance of not less than 10 feet from the highest point of roofs over which they pass with the following exceptions.

       Exception 1: Where the voltage between open- wire conductors does not exceed 300 volts or the voltage between triplex or quadruplex conductors does not exceed 750 volts and the roof or balcony is not readily accessible, the clearance may be not less than 3 feet.

       Exception 2: Where service-drop conductors of 0 to 300 volts, or triplex or quadruplex cable 0 to 750 volts pass over a roof or a balcony that is not readily accessible to terminate at a (through the roof) raceway or approved support located not more than 4 feet horizontally from the nearest edge of the roof, it may be maintained at a minimum of 18 inches for a horizontal distance of 6 feet from the raceway or support, and may be maintained at a minimum of 3 feet for the remainder of the horizontal distance that the conductor or cable passes over the roof.

    b. Service drop conductors not in excess of 750 volts shall have a clearance of not less than 3 feet in any direction from windows designed to open.

Exception 1: This does not apply to triplex or quadruplex conductors above the top level of a window.

c. Service drop conductors of 300 volts or less may be run along side the installation provided the clearance from the surface of the installation is not less than 3 inches.

d. Service drop conductors not in excess of 750 volts shall have a clearance of not less than 5 feet horizontally from porches, decks, fire escapes, or other similarly attached structures.

e. Service drop conductors not in excess of 750 volts shall have a clearance of not less than 3 feet vertically below porches, decks, fire escapes, or other similarly attached structures.

13. Windows not designed to open may have the clearance permitted for walls and projections.

14. Support structures include those to which the conductor is not attached, such as a lighting support, a traffic signal support, and a supporting structure of another line.

15. These clearances may be reduced by 2 feet (with 2 feet as minimum) if both of the following conditions are met:

a. The wires, conductors, or cables above and the supporting structure of another line below are operated and maintained by the same utility.

b. Employees do not work above the top of the supporting structure unless:

1. The upper circuit is de-energized and grounded, or temporarily insulated or repositioned, or

2. Other equivalent measures are taken.

16. For purpose of these clearances, trucks are defined as any vehicle exceeding 8.0 feet in height. When designing for oversized vehicles, increase clearances by the difference between the known height of the oversized vehicle and 14 feet

17. The clearances specified in the table are minimum clearances allowed between any part of the equipment, load line, or load and the energized conductors if the 20 feet zone of clearance cannot be maintained. THE CRANE, DERRICK, ETC. OPERATOR MUST COMPLY WITH OSHA 1926.1408 WHICH SPECIFIES SAFETY REQUIREMENTS IF ANY PART OF THE EQUIPMENT, LOAD LINE, OR LOAD COULD GET CLOSER THAN 20 FEET TO A POWER LINE.

18. “Shielded & Non- Shielded Cables w/Messenger Over 750 V” does NOT include spacer type cable. Spacer cable clearances are the same as open phase conductors in this DCS.

19. The clearances specified in the table are NESC minimum clearances. If workers must access these structures for installation or maintenance when the conductors are energized, then minimum approach distances (MAD) for unqualified workers as specified by OSHA in section 1910.333 (c) (3) (i) must be maintained (10 feet for 69 kVY and below and 11 feet for 69 kV△). These MADs are to the longest conductive tool or object the worker may contact.

20. The following Table 2 lists NESC wind displacement for some of Ameren’s higher use conductors. These values are added to the ’Horizontal Clearances with wind’ values in the clearance table. If this sum is greater than the ’no wind’ clearance, the ’no wind’ clearance must be increased to this value.

Example: 12kV, 1/0 AAAC Long Span - Wind displacement is 3.9 feet The ’with wind’ value from clearance table is 4.5 feet The sum of the two is 8.4 feet The ’no wind’ value from clearance table is 7.5 feet which is less than the ’with wind’ sum. Therefore, the ’no wind’ clearance must be increased to 8.4 feet

CAUTION - Table 2 is based on the DCS **07 00 07 03** Ruling Spans. Longer spans within the span category have greater sags and therefore the wind displacement must be claculated. Example: 1/0 AAAC Long Span Ruling Span sag is 46 inches. The sag of a 300 foot span in this category is 67 inches and the calculated wind displacement is 4.8 feet. Therefore the 'no wind' clearance would need to be increased to 9.3 feet.

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Table 2 - Horizontal Line Displacement (Sag Table)*				
Conductor	Short Span	Medium Span	Long Span	Extra Long Span
1/0 AAAC	2.2	3.2	3.9	4.8
110.8 (12/7) ACSR	2.5	3.0	3.3	3.5
336.4 (18/1) ACSR	2.9	3.7	4.5	5.0
556.5 (19) AAC	2.7	3.2	4.2	5.1
954 (45/7) ACSR	3.1	4.1	5.0	5.9
1272 (45/7) ACSR	3.5	4.3	5.0	5.8
4/0 (6/1) ACSR T2	3.2	3.6	4.0	4.1
336.4 (18/1) ACSR T2	2.8	3.5	4.1	4.6
556.5 (19) AAC T2	2.8	3.8	4.8	5.7
954 (45/7) ACSR T2	3.6	4.7	5.8	6.6

*60F, 6psf of WIND, FINAL SAG (In Feet)
*Per NESC Rule 234 A2

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11	04/01/22	DG	Converted to new format
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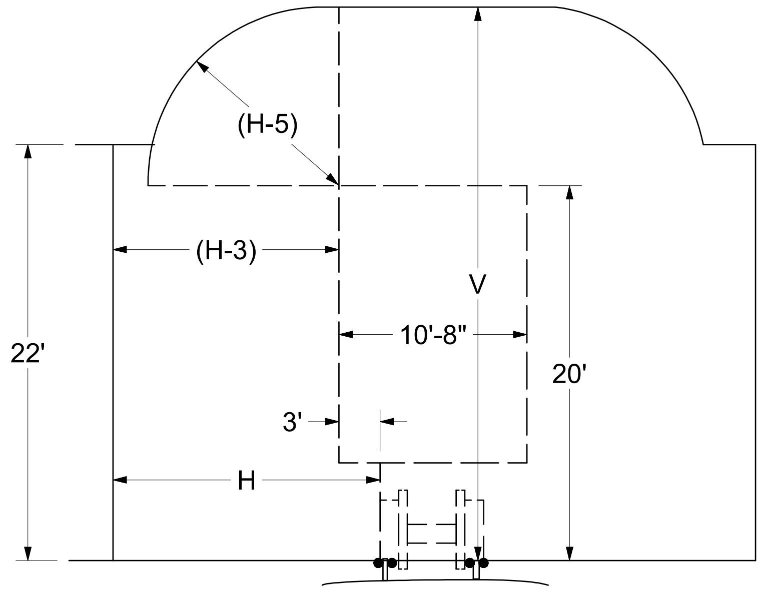

Clearance of Wires from Rail Cars (feet) 1		
Overhead Wires, Conductors, or Cables	V	H
Phase Conductors 69 kV 2	28.3 4	13.3 3
Phase Conductors > 22 kV to 50 kV	27.5	12.5
Phase Conductors 751 V to 22 kV	26.5	11.5
Phase Conductors 0- 750 V, Unshielded Cables with messenger over 750 V	24.5	9.5
Triplex, Quad, Unshielded Cable with Messenger 0- 750 V	24.0	9.0
Grounded Guys, Neutrals, Shielded Cables With Messenger	23.5	8.5

DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rules 234A and I.

1. Clearances shown are NESC minimums. Where the railroad authority issues a crossing permit, clearances of that permit shall govern.

2. This voltage is phase-to-phase. All others are phase-to-ground.

3. Where conductors run along mine, logging, and similar railways that handle only cars smaller than standard freight cars, the value of H may be reduced by one-half the difference between the width of a standard rail car (10 ft 8 in) and the width of the narrower car.

4. The vertical clearance V is per DCS **29 00 17 02** (NESC Rule 232).

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P = Probe clearance (18 ft) 1
H = Horizontal clearance (15 ft) 1
T = Transition clearance
V1 = Vertical clearance above a building, see DCS **29 00 17 04**
V2 = Vertical clearance above land, see DCS **29 00 17 02**

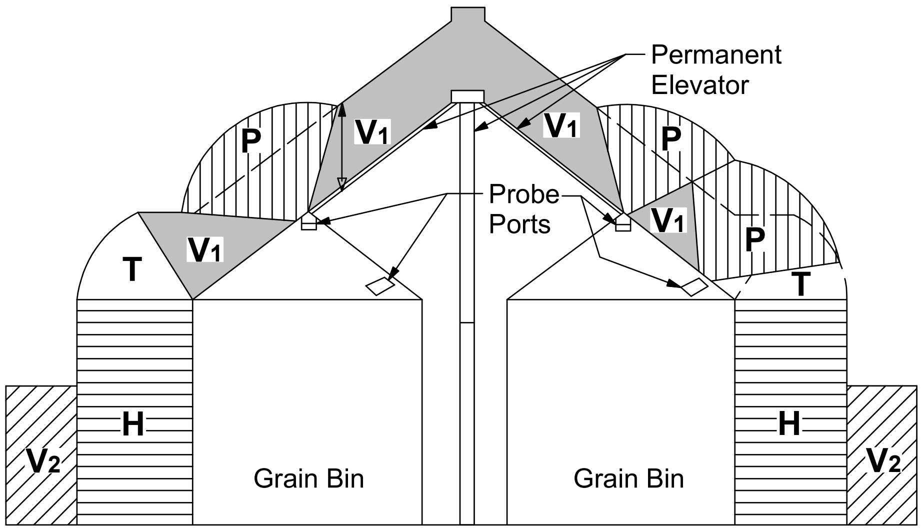

Figure 1 - Clearance Envelope for Grain Bins Filled by Permanently Installed Augers, Conveyors or Elevators

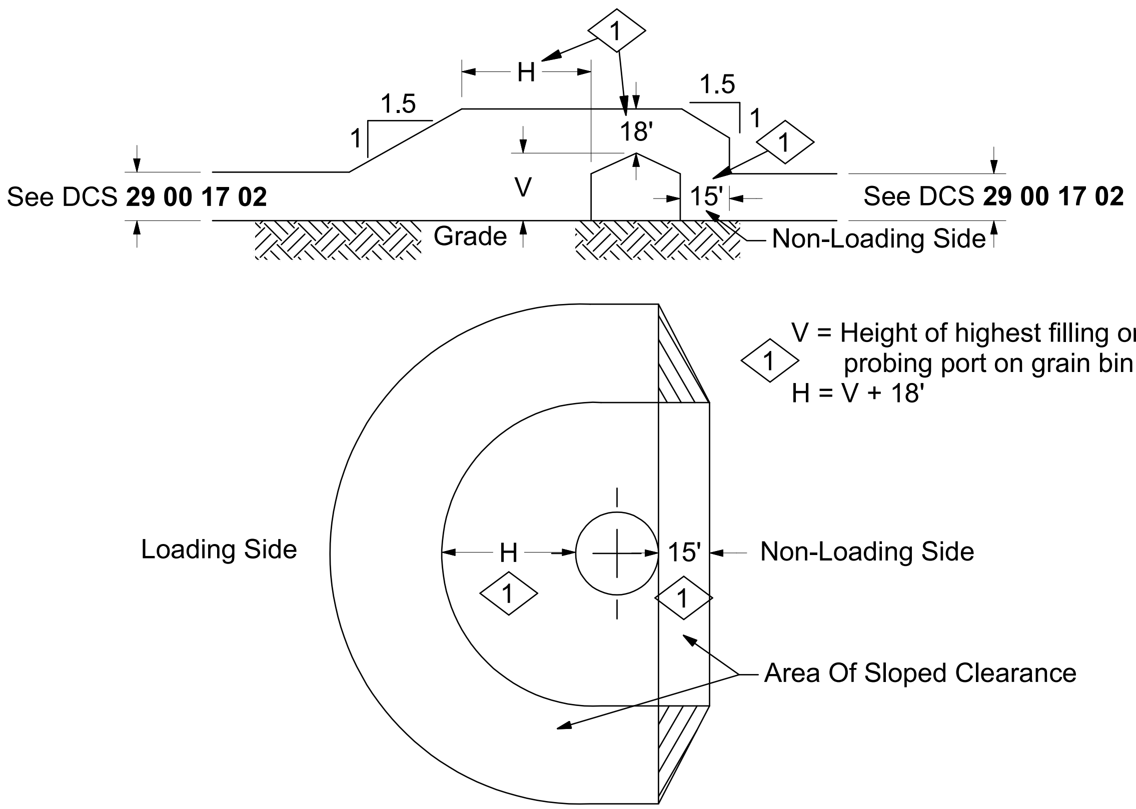

Figure 2 - Clearance Envelope for Grain Bins Filled by Portable Augers, Conveyors, or Elevators

DESIGN NOTE(s):

References: NESC 2017 Edition, Rules 234A, F, and G.

1. The clearances on this page are the minimums permitted for up to 34.5 kV-Y. Increase dimensions by 6 inches for 34.5 kV-Delta, 9 inches for 69 kV-Y, and 21 inches for 69 kV-Delta.

2. All portions of grain bins that are expected to be loaded by use of a permanently installed auger, conveyer, or elevator system shall be considered as a building or other installation for the purpose of determining clearances, except that for voltages of 0 to 34.5 kV-Y a radial clearance above the bin of not less than 18 feet shall be maintained above each port and a horizontal clearance of not less than 15 feet shall be maintained between an open supply conductor and a grain bin.

3. The clearance on the non-loading side of grain bins may be reduced to those required for buildings (see DCS **29 00 17 04**) if the cable or equipment is in one of the following categories:

    (a) Support arms and effectively grounded equipment cases
    (b) Messengers, guys, neutrals, and shielded cables
    (c) Triplex and quadruplex unshielded cable with messenger 0-750 volts

4. Any side of a grain bin is considered to be a non-loading side if it is so designated, or if it is so closely abutting another structure or obstruction, or so close to a public road or other right of way that a portable auger, conveyer, or elevator is not reasonably anticipated to be used over that side or portion to fill the grain bin.

5. Where an agreement excludes the use of portable augers, conveyers, or elevators from a designated portion of a grain bin, such portion is considered to be a non-loading side.

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Clearance of Wires to Bridges 1							
	Unguarded rigid live parts and ungrounded equipment cases 0-750V, triplex, quad, shielded & non-shielded cables with messenger 0-750V; ungrounded guys	Unshielded Cable with Messenger Over 750V Phase Conductors 0-750V	Unguarded rigid live parts and ungrounded equipment cases over 750V to 22kV	Phase Conductors at XX kV (Phase-to-Phase)			
				2.4 12	34	69Y	69Δ
1. Over Bridges 3 5	-	-	-	-	-	-	-
a. Attached 4	3.0	3.5	5.0	5.5	6.0	6.2	7.2
b. Not attached	10.0	10.5	12.0	12.5	13.0	13.2	14.2
2. Clearance beside, under or within bridge structure 5	-	-	-	-	-	-	-
a. Readily accessible portions of any bridge including wing wall and bridge attachments 3	-	-	-	-	-	-	-
1. Attached 4	3.0	3.5	5.0	5.5	6.0	6.2	7.2
2. Not attached, no wind	5.0	5.5	7.0	7.5	8.0	8.2	9.2
3. Not attached, with wind 8	--	3.5	--	4.5	5.0	5.2	6.2
b. Ordinarily inaccessible portions of bridges (other than brick, concrete or masonry) and from abuments 6	-	-	-	-	-	-	-
1. Attached 4 7	3.0	3.5	5.0	5.5	6.0	6.2	7.2
2. Not attached, no wind 7 9	4.0	4.5	6.0	6.5	7.0	7.2	8.2
3. Not attached, with wind 7 8 9	--	3.5	--	4.5	5.0	5.2	6.2

DESIGN NOTE(s):

Reference: NESC 2017 Edition, Rules 234A, D, and G.

1. Clearances are in feet. Voltages are phase-to-ground unless otherwise indicated.

2. The clearances on this page are the minimums permitted. No clearances are specified for effectively grounded neutral conductors.

3. Where over traveled ways on or near bridges, the clearances specified in DCS **29 00 17 02** also apply.

4. Clearances from supply conductors to supporting arms and brackets attached to bridges shall be the same as specified in DCS **29 00 17 09** if the supporting arms and brackets are owned, operated, or maintained by the same utility.

5. Where the bridge has moving parts, such as a lift bridge, the required clearances shall be maintained throughout the full range of movement of the bridge or its attachments.

6. Bridge seats of steel bridges carried on masonry, brick, or concrete abutments that require frequent access for inspection shall be considered as readily accessible portions.

7. Where conductors passing under bridges are adequately guarded against contact by unauthorized persons and can be de-energized and grounded for maintenance of the bridge, clearances of the conductor from the bridge at any point may have clearances specified in DCS **29 00 17 09** for clearances from surfaces of support arms plus one-half the final sag at 60 degrees F no wind of the conductor at that point.

8. Clearances with wind shall be determined with the conductor or cable displaced by a 6 lb per sq ft wind at final sag at 60 degrees F. The wind may be reduced to 4 lbs per sq ft in areas sheltered by buildings, terrain or other obstacles. The displacement shall include the deflection of suspension insulators and flexible structures.

9. Ungrounded guys and ungrounded portions of guys between guy insulators shall have clearances based on the highest voltage to which they may be exposed due to a slack conductor or guy.

10. Where permitted by the bridge owner, supply cables may be run in rigid conduit attached directly to the bridge.

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4	10/01/18	DG	

Clearance Over Swimming Pools ◇2 ◇3 And Waterways Restricted to Swimming ◇2 ◇4

◇1

Open Supply Conductors 69 kVΔ

Open Supply Conductors > 22 kV - 50 kV

Open Supply Conductors > 750 V - 22 kV, Unguarded rigid live parts (>750 V - 22 kV)

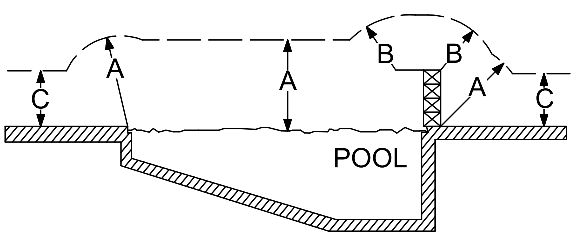
Open Supply Conductors 0-750 V

Triplex, Quadruplex, Ungaurded Rigid Live Parts (0-750 V), Guys Exposed to >300 V - 750 V

Neutral Conductors, Guys Exposed to 0-300 V

A =	22.0	22.5	23.0	25.0	26.0	26.7
B =	14.0	14.5	15.0	17.0	18.0	18.7
C =	See DCS **29 00 17 02**					

◇5 ◇6 ◇7 ◇8

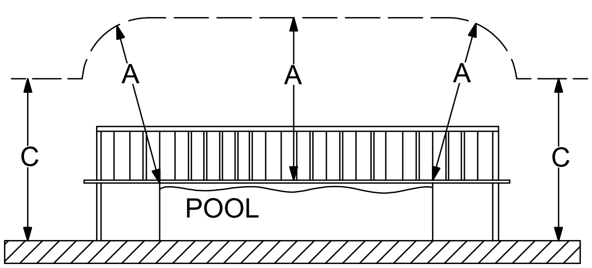


In-Ground Swimming Pool

A = Clearance in any direction to the water level, edge of water surface, base of diving platform or permanently anchored raft.

B = Clearance in any direction to the diving platform, tower, slide, or other fixed pool structure.

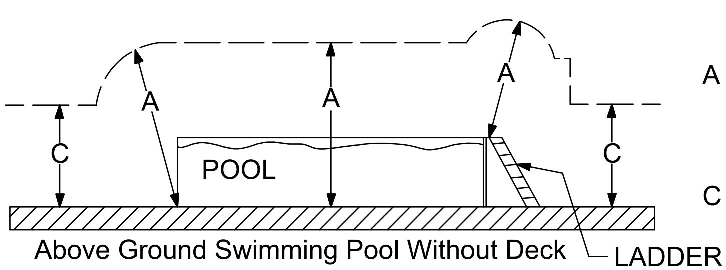
C = Vertical clearance over adjacent land as specified by DCS **29 00 17 02.**



Above Ground Swimming Pool

A = Clearance in any direction from the highest point of the installation upon which people can stand (typically the pool deck).

C = Vertical clearance over adjacent land as specified by DCS **29 00 17 02.**



Above Ground Swimming Pool Without Deck

A = Clearance in any direction from the highest point of the installation upon which people can stand.

C = Vertical clearance over adjacent land as specified by DCS **29 00 17 02**.

REV	DATE	ENG	DESCRIPTION
5	04/01/22	DG	
4	10/01/18	DG	

DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rule 234A, E, and G.

1. Clearances are in feet. Voltages are phase-to-ground unless otherwise indicated.

2. Although the NESC allows conductors to be installed over swimming areas, this practice is discouraged and should only be done if there is no other practical alternative.

3. Where wires conductors or cables cross over a swimming pool or the surrounding area, the clearances in any direction shall be as shown in the diagrams above. This rule does not apply to a pool fully enclosed by a solid or screened permanent structure.

4. If rescue poles are not used by lifeguards in supervised swimming beaches, the clearances specified in DCS **29 00 17 02** for the appropriate water body shall be used.

5. Vertical clearances are determined with conductor at final sag, maximum design operating temperature, no wind.

6. This rule does not apply to neutrals, guys, triplex, and quadruplex (0 to 750 V) when these are 10 feet or more horizontally from the edge of the pool, diving platform, diving tower, slide, or other fixed pool related structures.

7. For hot-tubs, jacuzzis, spas, etc. not suitable for swimming, vertical clearance is from the highest point of the installation upon which a person can stand. See DCS **29 00 17 04** for this clearance.

8. For wading pools, see DCS **29 00 17 02**, “space or ways accessible to pedestrians only”.

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1. Minimum Vertical Clearance Between Line Conductors

Table 1 - Minimum Vertical Clearance Between Line Conductors (Inches) <1>
(All voltages are phase-to-ground unless otherwise indicated)

Conductors Usually at Lower Levels \ Conductors Usually at Upper Levels	Neutral Conductors; Triplex & Quadruplex		Open Supply Line Conductors: 0 to 8.7 kV		> 8.7 to 22 kV		>22 to 50 kV		69 kV Δ	
	At Pole	Mid Span	At Pole	Mid Span	At Pole	Mid Span	At Pole	Mid Span	At Pole	Mid Span
Communication Condutors	40<6>	30	40	30	46	35	57	43	66	52
Neutral Conductors; Phase Conductors 0- 750 Volts; Triplex & Quadruplex	16<7>	12<7>	16<4><9>	12<4><9>	22<8>	17<8>	33<8>	25<8>	42<8>	34<8>
> 750 V to 8.7 kV	-	-	16<4>	12<4>	25<8>	19<8>	36<8>	27<8>	45<8>	37<8>
> 8.7 to 22 kV	-	-	-	-	31<8>	24<8>	42<8>	32<8>	51<8>	43<8>
> 22 to 50 kV	-	-	-	-	-	-	53<8>	53<8>	62<8>	54<8>

DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rule 235 A, C, and G

<1.> **In Illinois, where conductors are mounted on crossarms, IL Adm Code 305 Table A takes precedent (See Table 2 of this DCS).**

2. The minimum vertical clearance at any point in the span shall be not less than the mid-span values in the table above with the upper conductor at its maximum design operating temperature or 32°F with 1/2 inch of ice (whichever produces the greatest final sag) and the lower conductor at its final sag at the same ambient temperature. The clearance "At Pole" means the clearance at the support on the supporting structure.

3. Communication service drops, crossing under neutral conductors on a common crossing structure, may have a minimum clearance of 4 inches to the neutral conductor.

<4.> Where conductors are operated by different utilities, the minimum vertical clearance of 40 inches at the pole and 30 inches mid-span are recommended.

5. Triplex and quadruplex cables, 0-480 volts, running above and parallel to communication service drops, may have a minimum spacing of 12 inches at any point in the span, including at their attachment to a building, provided that a clearance of 40 inches is maintained between the two services at the pole.

<6.> May be reduced to 30 inches for effectively grounded supply neutrals where the communication messenger is bonded to the neutral.

<7.> No clearance is required between neutral conductors and triplex or quadruplex cables if owned by the same utility.

<8.> Where conductors are operated by different utilities, add 24 inches to the "At Pole" clearance. The new "Mid Span" clearance is then 75% of this new “At Pole” clearance.

<9.> Secondary conductors (0-750 volts) on vertical racks are allowed to have only 8 inches separation at the pole for span lengths up to 250 feet and 12 inches separation up to 300 feet.

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2. Vertical Separation Between Crossarms - **Applicable only to Ameren Illinois**

Table 2 - Vertical Separation Between Crossarms (Inches)
(All voltages are nominal circuit voltages)

Conductors Usually at Upper Levels / Conductors Usually at Lower Levels	Neutral Conductors; Phase Conductors 0 to 480 Volts; Shielded & Non-Shielded Cables With Messenger	Phase Conductors				
		2.4 to 4 Kv	7.2 to 13.8 kV	14.4 to 34 kV	69 kV Y	69 kV Δ
Communication Conductors	48	48	48	72	72	81
Communication Conductors Used in Operation of Power Lines	24	24	24	48 ◇10	48 ◇10	57 ◇10
Neutral Conductors; Phase Conductors 0 to 480 Volts; Shielded & Non-Shielded Cables with Messenger	24	24 ◇10	24 ◇10	48 ◇10	48 ◇10	57 ◇10
Phase Conductors	-	-	-	-	-	-
2.4 to 4 kV	-	24 ◇10	24 ◇10	48 ◇10	48 ◇10	57 ◇10
7.2 to 13.8 kV	-	-	24 ◇10	48 ◇10	48 ◇10	57 ◇10
14.4 to 34 kV	-	-	-	48 ◇10 ◇11	48 ◇10 ◇11	57 ◇10 ◇11
69 kV Y	-	-	-	-	48 ◇10 ◇11	62 ◇10 ◇11 ◇12
69 kV Δ	-	-	-	-	-	71 ◇10 ◇11 ◇12

DESIGN NOTE(s):

Reference: 83 Il. Adm. Code 305 Table A

◇10 Where conductors are operated by different utilities, the minimum vertical clearance shall be increased by 24 inches.

◇11 These values do not apply to adjacent crossarms carrying phases of the same circuit or circuits.

◇12 These values are calculated from the NESC. They exceed the 83 IL. Adm. Code 305 Table A values.

3. Horizontal Clearance Between Line Conductors

Line conductors attached to fixed supports shall have horizontal clearances from each other not less than the larger value required by Table 3 or as calculated based on the sag of the conductors. **For long spans, horizontal clearance requirements will in most cases be driven by the conductor sag calculation method.**

Horizontal clearance based on conductor sag is calculated as follows:

A. For line conductors smaller than #2 -
Clearance (inches) = 0.3 x kV + 4.04 x sq rt (S-24)

B. For #2 or larger line conductors -
Clearance (inches) = 0.3 x kV + 8 x sq rt (S/12)

S = the sag in inches of the conductor having the greater sag (60 degree F, final sag, no wind)

kV = the voltage between the conductors

Example: 69 kV, 954 ACSR, 260 foot spans.
S = 64 inches per DCS **07 00 07 03**
kV = 69 x 1.05 = 72.45 kV
(Switching surge factor of 1.05 is applied because above 50 kV, the maximum possible operating voltage must be used instead of the nominal voltage)

Clearance = 0.3 x 72.45 + 8 x sq rt (64/12)
= 41 inches

Therefore; for this example, 41 inches of horizontal spacing at the support is required instead of the 38 inches as indicated in Table 3.

Table 3 - Horizontal Clearance Between Line Conductors
(Voltage is between the two conductors for which the clearance is being determined)

Class of Circuit	Clearance (inches) 13 14 15					
	0 to 8.7 kV	> 8.7 to 14.4 kV	> 14.4 to 22 kV	> 22 to 34.5 kV	> 34.5 to 50 kV	69 kV 16
Supply Conductors of the Same or Different Circuit	12	15	18	23	29	38

DESIGN NOTE(s):

References: NESC, 2017 Edition, Rule 235 A and B

13 The pin spacing on buck-arm construction may be reduced to 7.25 inches for conductors 15 kV line-to-line and below provided that the span lengths do not exceed 150 feet; the 60 degree F sag does not exceed 15 inches (#2 or larger), or 30 inches (smaller than #2); each conductor on the end of every arm is tied to the same side of its insulator; and spacing on the next pole is not less than 14.5 inches.

14 These clearances do not apply to covered or insulated cables.

15 Where suspension insulators are used and not restrained from movement, the horizontal spacing shall be increased so that the clearances above will be maintained with one string of insulators at maximum swing angle with 6 lb/sq ft wind at 60 degree F final sag. This may be reduced to 4 lb/sq ft wind in sheltered areas.

16 For 69 kV conductors of the same circuit, no horizontal clearance is specified in the NESC.

4. Diagonal Clearance Between Line Wires, Conductors, and Cables Located at Different Levels on the Same Supporting Structure

No wire, conductor, or cable may be closer to any other wire, conductor, or cable than defined by the dashed line in the figure below. V is determined by section 1 of this DCS and H is determined by section 3 of this DCS.

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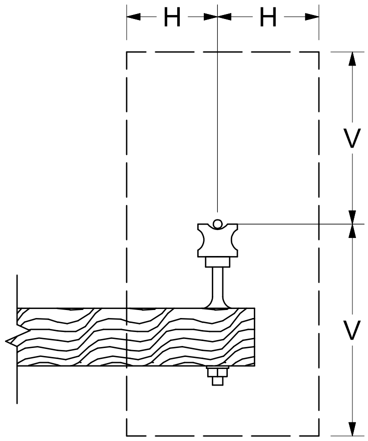

V = Vertical Clearance
H = Horizontal Clearance

5. Clearances in Any Direction From Line Conductors to Supports, and to Vertical or Lateral Conductors, Span or Guy Wires Attached to Same Support

A. Fixed Supports
Clearances shall not be less than those in Table 4.

B. Suspension Insulators
Where suspension insulators are used and are not restrained from movement, the clearance shall be increased so that the clearances in Table 4 are maintained with the string of insulators at maximum design swing angle with 6 lb/sq ft wind at 60 degree F final sag. This may be reduced to a 4 lb/sq ft wind in sheltered areas. The displacement of wires, conductors, and cables shall include deflections of flexible structures and fittings where such deflection would reduce the clearances.

Table 4 - Clearances in any Direction from Line Conductors to Supports, and to Vertical or Lateral Conductors, Span or Guy Wires Attached to Same Support
(Clearances are in inches, All voltages are phase-to-phase)

Clearance of Line Conductors From 17	0 to 4.16 kV	> 4.16 kV - 14.4 kV	>14.4 kV - 34.5 kV	69 kV
Vertical and lateral conductors: 18 19	-	-	-	-
Of the same ckt.	3	5	10	19
Of other ckts. 27	6 23	9	17	32
Span or guy wires attached to same structure: 25	-	-	-	-
Span guy parallel to line	12 21 24	15	30 26	38
All other	6 21	9 21	30 26	32
Surface of support arms	3 20 22	5	9	16
Surface of structures	5 20 22	7	11	18

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DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rule 235E

17. A line conductor is a wire or cable intended to carry electric currents between structures along the route of the line.

18. A lateral conductor is a wire or cable entirely supported on one structure and extending in a general horizontal, vertical, or diagonal direction to make connections to line conductors, service drops, equipment, or other facilities on the same structure. Lateral conductors may be attached directly to the structure or supported away from the structure.

19. A vertical conductor is either a wire or cable riser (not in non-metallic conduit or u-guard) attached to a pole, or the vertical portion of a lateral conductor.

20. A neutral conductor which is effectively grounded throughout its length and associated with circuits 0 to 22 kV to ground may be attached directly to the structure surface.

21. If a guy passes within 12 inches of Ameren's conductors and also passes within 12 inches of communication cables, the guy must be insulated with a strain insulator at a point below the lowest supply conductor and above the highest communication cable.

22. For supply circuits of 0 to 750 V, this clearance may be reduced to 1 inch.

23. For neutrals and supply circuits of 0 to 750 V, this clearance may be reduced to 3 inches.

24. For neutrals, this clearance may be reduced to 6 inches.

25. "Parallel" means in the same general direction as the line conductors. "All other" includes down guys and span guys that cross over or under line conductors. See DCS **11 00 02 03** for reduced clearances allowed to guy insulators.

26. 30" is based on Ameren's use of 500 kV BIL and is greater than NESC requirements.

27. These dimensions are based on the voltage of the vertical or lateral conductor being 8.7 kV or less. If voltage of vertical or lateral conductor is greater than 8.7 kV, then these dimensions need to be increased based on assumption that line and vertical or lateral conductor voltages are 180° out of phase.

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Equipment here means non-current-carrying metal parts of equipment mounted on the same structure. Non-current-carrying metal parts of equipment include metal supports for cables or conductors, metal support braces which are attached to metal supports or are less than 1 inch from transformer cases or hangers which are not effectively grounded, and metal or non-metallic supports or braces associated with communication cables or conductors. Antennas, solar panels, power supplies, etc., are considered equipment for applying these clearances.

Vertical Clearance Between Communications and Supply Facilities Located on the Same Structure (All voltages are phase-to-ground unless otherwise indicated)				
Vertical Clearance of Conductors to Non-Current-Carrying Metal Parts of Equipment ◇1		Vertical Clearance of Span Wires and Luminaire Brackets from Communication Lines		
Supply Voltage	Vertical Clearance (in)	Location of Span Wires and Luminaire Brackets	Not Effectively Grounded (in)	Effectively Grounded (in)
Grounded conductor and messenger hardware and supports	30	Above communication support arms	40	20 ◇2
0 to 8.7 kV	40	Above messengers carrying communication cables	40	4
>8.7 to 22 kV	46	From terminal box of communication cable	40	4
>22 to 50 kV	57	From communication brackets, bridle wire rings, or drive hooks	40 ◇3	4 ◇3
69 kV DELTA	66	Drip loop of conductor entering luminaire bracket above communication cable, throughbolt, or other equipment	12	12

DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rule 238

◇1. For vertical clearances which are between supply conductors and communication equipment, communication conductors and supply equipment, and supply and communication equipment.

◇2. Clearance may be reduced to 12 inches for span wires or metal parts of brackets which are 40 inches or more from the structure surface.

◇3. May be reduced to 3 inches if the loop is covered by a suitable non-metallic covering that extends at least 2 inches beyond the loop.

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Table 1 - Clearances of Open Vertical and Lateral Conductors (in) <1><2>			
Phase-to-Phase Voltages (kV)	From Surfaces of Supports <4>	From Span Guy and Messenger Wires	Anchor Guys
0 to 8.7 kV	3 <3>	6 <7>	6 <7>
>8.7 to 22 kV	6	12	10
>22 to 50 kV	12	23	17
69 kV Δ	16	32	29

Table 2 - Clearances Between Open Vertical Conductors and Pole Surface (Fig.1,2) <4>		
Phase-to-Ground Voltage Unless Otherwise Indicated	A. Zones Above and Below Conductor Where Clearances Apply (ft) <5>	B. Min. Clearance Between Vertical Cond. & Pole Surface (in)
0 to 22 kV	6	19
>22 to 30 kV	6	22
>30 to 50 kV	6	30
69 kV Δ	<6>	<6>

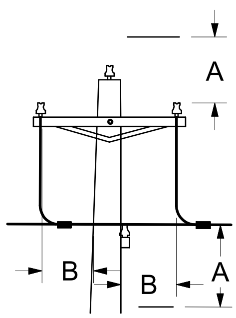

FIG. 1

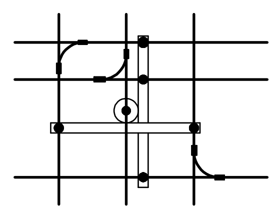

FIG. 2

DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rule 239E.

<1.> A lateral conductor is a wire or cable entirely supported on one structure and extending in a general horizontal, vertical, or diagonal direction to make connections to line conductors, service drops, equipment, or other facilities on the same structure. Lateral conductors may be attached directly to the structure or supported away from the structure.

<2.> A vertical conductor is either a wire or cable riser (not in non-metallic conduit or u-guard) attached to a pole, or the vertical portion of a lateral conductor.

<3.> Clearance may be reduced to 1 inch for supply circuits of 0 to 750 V. A neutral conductor may be attached directly to the structure surface.

<4.> If open wire conductors are within 4 feet of the pole, vertical conductors must conform to the zones and clearances in Table 2.

<5.> Within this zone above and below open supply conductors, vertical and lateral conductors may be enclosed in non-metallic conduit or protected by a non-metallic covering and may be run on the pole surface.

<6.> These distances are not specified in the NESC for voltages above 50 kV phase-to-ground.

<7.> For effectively grounded neutrals, this clearance can be reduced to 3 inches.

Additional Requirements (per NESC, 2017 Edition, Rule 239)

1. CONDUCTORS ATTACHED DIRECTLY TO SUPPORTING STRUCTURES.
   Grounding and neutral conductors or conductors physically protected by conduit may be run directly on the support.

2. CLIMBING SPACE
   Location of vertical or lateral conductors shall not obstruct climbing spaces or lateral working spaces between line conductors at different levels.

3. CONDUCTORS NOT IN CONDUIT
   All conductors which are not enclosed in a conduit must maintain the same clearances from conduits as from other structure surfaces.

4. MECHANICAL PROTECTION NEAR GROUND
   All vertical conductors, cables, and grounding wires shall have a suitable mechanical protective covering when within 8 feet of the ground. This protective covering may be omitted from grounding conductors used to ground multi-grounded circuits.

5. SUPPLY GROUNDING CONDUCTORS
   Supply grounding conductors may be run bare through communication spaces provided no supply equipment is located between the ground rod and the neutral and the grounding conductor is bonded to grounded communication facilities at that structure. All other grounding conductors must be protected by a non-metallic covering for a distance of 40 inches above the highest communication attachment and 6 feet below the lowest communication attachment.

6. CLEARANCE FROM METAL PARTS
   Vertical runs of supply cables must have a clearance of at least 2 inches from through bolts or other metal parts associated with communication line equipment. Exception: Vertical runs of effectively grounded supply conductors may have a clearance of 1 inch.

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Crossings should be made on a common supporting structure, where practical. When this is not practical, the clearance between any two crossing or adjacent wires, conductors, or cables carried on different supporting structures shall be not less than that required in this DCS.

1. Conductor Movement Envelope

The relevent positions of the conductors or cables on or within their respective conductor movement envelopes must be considered. The conductor movement envelope for each must be determined under the following general conditions, See Figure 1.

A. Both are simultaneously subjected to the same ambient air temperature and wind loading conditions, and

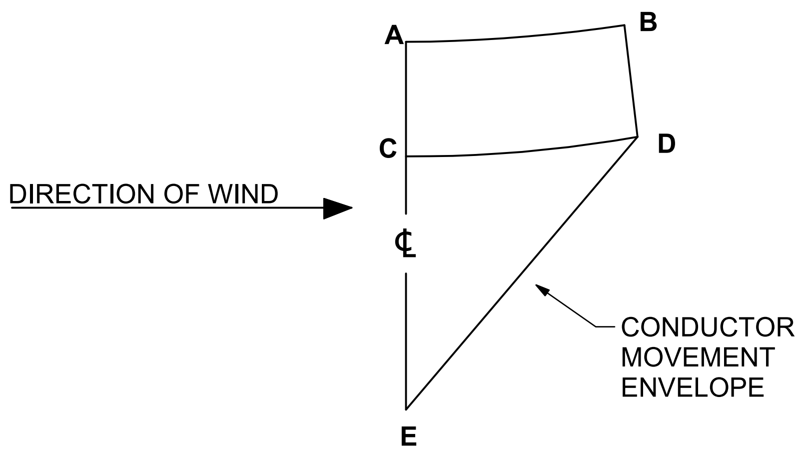
B. Each is subjected individually to the full range of its icing conditions and applicable design electrical loading.

2. Conductor Clearance Envelope

The vertical Table 1 and horizontal Table 2 clearances are used to define a clearance envelope as shown in Figure 2. The clearance envelope defines the minimum required clearance to any other conductor or cable.

3. Use of the Conductor Clearance and Conductor Movement Envelopes

The “conductor 1” clearance envelope is drawn with its center located at any point on the “conductor 1” movement envelope. At any point on its movement envelope, the “conductor 1” clearance envelope shall not contact “conductor 2” within its movement envelope with the same horizontal displacement. See Figure 3.



Point	Conductor Temperature	Sag	Ice Loading	Wind Displacment ⟨1⟩
A	60° F ⟨3⟩	Initial	None	None
B	60° F ⟨3⟩	Initial	None	6 psf
C	60° F ⟨3⟩	Final	None	None
D	60° F ⟨3⟩	Final	None	6 psf
E1 ⟨2⟩	The greater of 120° F or maximum operating temperature	Final	None	None
E2 ⟨2⟩	32° F	Final	1/2 in	None

Figure 1 - Conductor Movement Envelope

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DESIGN NOTE(s):

1. The direction of the wind shall be that which produces the minimum distance between conductors including the deflection of suspension insulators and flexible structures.

2. Point E shall be determined by whichever of the conditions described under E1 and E2 produces the greater sag.

3. When one conductor movement envelope is lower than that of the other conductor, the lower conductor envelope shall be developed with points A, B, C, and D at a conductor temperature equal to the ambient temperature used in determining E of the upper conductor movement envelope.

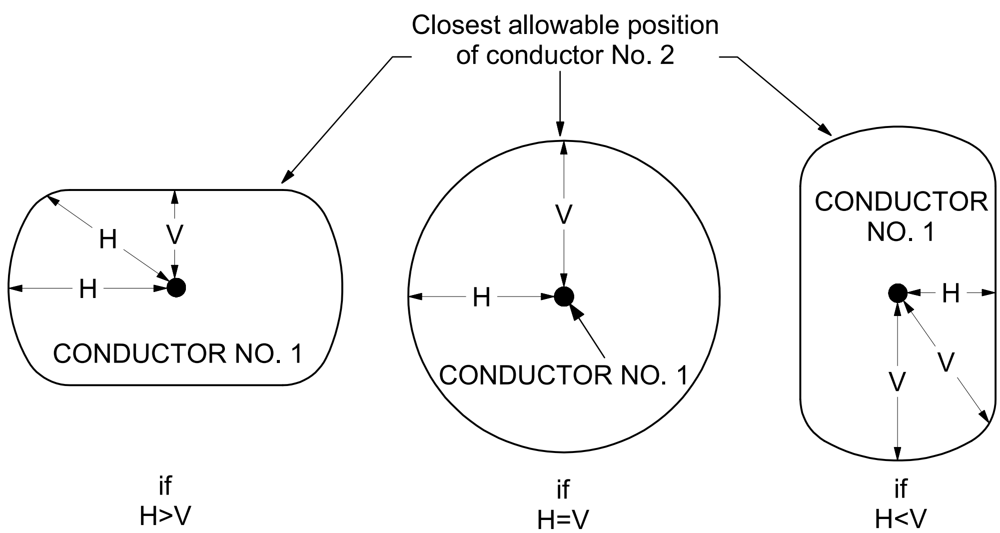

Figure 2 - Conductor Clearance Envelope

Table 1 - Vertical Clearances for Clearance Envelope V in Feet (All voltages are phase-to-ground unless otherwise indicated)							
Conductors at Upper Levels / Conductors at Lower Levels	Shield/Static Wire, Neutral, Guys ◇6	Shielded Cables with Messenger; Triplex & Quadruplex	Phase Conductors				
			0 to 750 V	>750 V to 22 kV	>22 kV to 50 kV	69 kVΔ
Shield/Static Wire, Neutral, Guys ◇6	2.0 ◇4	2.0	2.0	2.0	3.0	3.7
Communication Conductors	2.0	2.0	4.0 ◇7	5.0 ◇5	6.0	6.7
Shielded Cables with Messenger; Triplex & Quadruplex	2.0	2.0	2.0	2.0	3.0	3.7
Phase Conductors 0 to 750 V	2.0	2.0	2.0	2.0	3.0	3.7
Phase Conductors > 750 V to 22 kV	2.0	-	-	3.0	3.7	5.0
Phase conductors > 22 kV to 50 kV	3.0	-	-	-	4.6	5.4
Phase Conductors 69 kV Δ	4.0	-	-	-	-	6.1

Table 2 - Horizontal Clearance H Used for Drawing the Clearance Envelope	
Vector Difference Between Voltage of Wires 8	Horizontal Clearance H (ft)
0 to 22 kV	5.0 9
Over 22 kV	5.0 plus 0.4 inches / kV over 22 kV

DESIGN NOTE(s):

Reference: NESC, 2017 Edition, Rule 233

4. No clearance is specified between guys or span wires that are electrically interconnected.

5. This clearance may be reduced to 4 feet where supply conductors of 750 V to 8.7 kV cross a communication line more than 6 feet horizontally from a communication structure.

6. These clearances may be reduced by not more than 25% to a guy insulator, provided that full clearance is maintained to its metallic end fittings and the guy wires. The clearance to an insulated section of a guy between two insulators may be reduced by not more than 25% provided that full clearance is maintained to the uninsulated portion of the guy.

7. This clearance may be reduced to 2 feet for supply service drops.

8. Vector Difference Between Voltage of Wires is equal to:
1.05 X (kV phase-to-phase (Line1)) /sq rt of 3 + 1.05 X (kV phase-to-phase (Line 2)) /sq rt of 3
The Factor of 1.05 is only applied if the kV phase-to-phase is greater than 50kV.

9. The horizontal clearance H between anchor guys of different supporting structures may be reduced to 6 inches and may be reduced to 2 feet between other guys and neutral conductors.

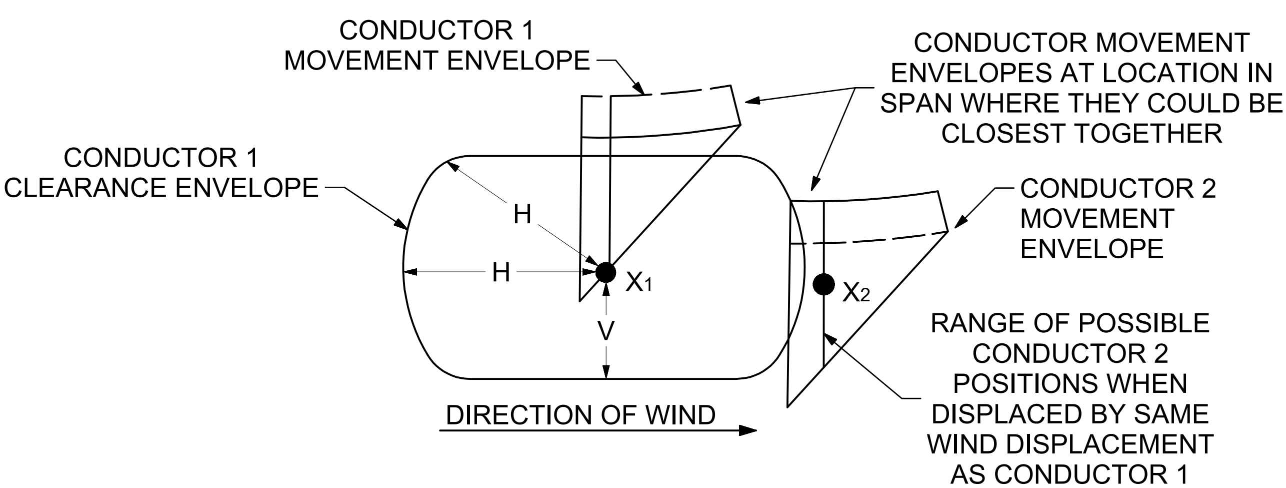

Figure 3 - Use of Conductor Movement and Clearance Envelopes

DESIGN NOTE(s):

10. In this illustration, Conductor 2 is closest at position X2 to Conductor 1 when Conductor 1 is at position X1.

11. Vertical lines intersecting X1 and X2 represent the equivalent horizontal wind displacements.

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Climbing space shall be provided on poles past any conductors, crossarms, equipment or other parts. In addition, working space shall be provided on the climbing face of the pole at each side of the climbing space.

1. Climbing Space − Location and Dimensions (Reference NESC, 2017 Edition, Rule 236)

The climbing space need only be provided on one side or corner of the pole and shall extend vertically not less than 40 inches above or below the limiting conductors or other part, but may otherwise be shifted from any side or corner of the pole to any other side or corner per Figure 1.

Table 1 - Minimum Horizontal Dimensions of Climbing Space
(All voltages are phase-to-phase)

Type of Conductors Adjacent to Climbing Space	Horizontal Dimension of Climbing Space
Communications Conductors	30” x 30”
Ameren Circuits	40” x 40” preferred generally but in no case less than 30” x 30” for 4.16 kV; in no case less than 36” x 36” for 15 kV; in no case less than 40” x 40” for 34.5 kV; and in no case less than 54” x 54” for 69 kV

A. Portions of Pole and Equipment in Climbing space

Portions of the pole or structure, including crossarms, when included in one side or corner of the climbing space, are not considered to obstruct the climbing space.

Longitudinal runs, such as secondaries on racks or brackets, are not considered as obstructing the climbing space if all wires concerned are covered by rubber protective equipment or otherwise guarded.

Where longitudinal runs such as secondaries on racks or brackets are not covered up, the climbing space shall be measured from the longitudinal run concerned and shall extend 40 inches above and below the limiting conductors. The normal method of meeting this requirement where there is less than 40 inches between limiting conductors and conductors are carried on arms, is to eliminate the conductor from the pole pin on the opposite side of the pole to which the longitudinal run is attached. This also includes buckarm construction.

Vertical runs encased in suitable conduit or other protective covering and securely attached to the pole surface are not considered to obstruct the climbing space.

With pole top pin construction, the climbing space shall be provided above the top crossarm to the pole top pin conductor but need not be carried past it.

Supply and communication apparatus including but not limited to transformers, regulators, capacitors, cable terminals (potheads), lightning arresters, antennas, and switches when located below conductors or other attachments shall be mounted outside the climbing space.

2. Working Space − Dimensions (Reference NESC, 2017 Edition, Rule 237)

The working space shall extend along the crossarm on each side of the climbing space to the outmost pin position on the crossarm.

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At right angles to the crossarm, the working space shall preferably extend 40 inches but in no case less than the distances shown in Table 1 when measured from the face of the crossarm.

Vertically the working space shall have a height not less than shown in Table 2.

The working space shall not be obstructed by vertical or lateral conductors. Such conductors shall be located on the opposite side of the pole from the climbing side or on the climbing side of the pole at a distance from the crossarms at least as great as the width of the climbing space required for the highest voltage conductor concerned. See Table 1.

Table 2 - Minimum Vertical Height of Working Space Between Conductors on Different Levels on The Same Pole or Structure in inches

Voltage of Wire, Cable, or Conductor Concerned	Other Wire, Cable, or Conductor Concerned		
	A	B	C
	Secondaries 0−750 V Between Phases and Multi−Grounded Neutral	2.4 kV to 4.16 kV Circuits	7.2 kV to 34.5 kV Circuits
Secondaries 0−750 V Between Phases and Multi−Grounded Neutral	16 ◇1	24 ◇2	60 ◇2
2.4 kV to 4.16 kV Circuits	-	24 ◇2	60 ◇2
7.2 kV to 34.5 kV Circuits	-	-	60 ◇2

DESIGN NOTE(s):

◇1. This applies to secondaries on crossarms. The clearance between secondary conductors on racks or clevises are allowed to have 8 inches separation for span lengths up to 250 feet and 12 inches up to 300 feet.

◇2. These clearances exceed NESC required minimums. For reduced clearances refer to NESC Table 235-5.

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Climbing space shaft may be shifted from one side or corner of pole to another side or corner as required but shall in such instances provide the minimum vertical overlap shown by dimension ”B”.

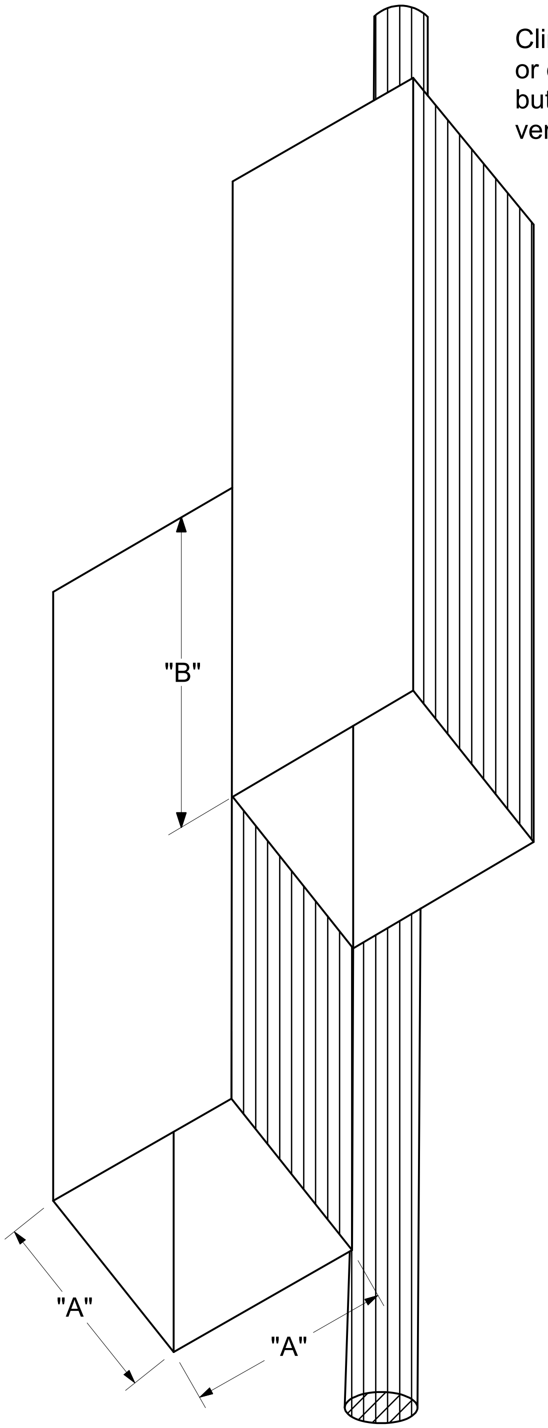

Figure 1 - Climbing Space

Table 3 - Climbing Space Dimensions (inches)						
	Dimension ”A”					Dimension "B"
	Ameren Ciruit Voltage					
	0 to 600V	2.4 kV to 4.16 kV	7.2 kV to 14.4 kV	25 kV to 34.5kV	69kV	
Min. Climbing Space	30	30	36	40	54	40

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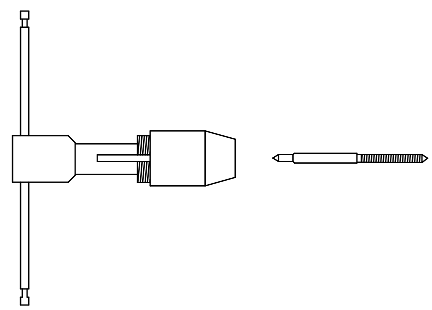
ILLINOIS ONLY

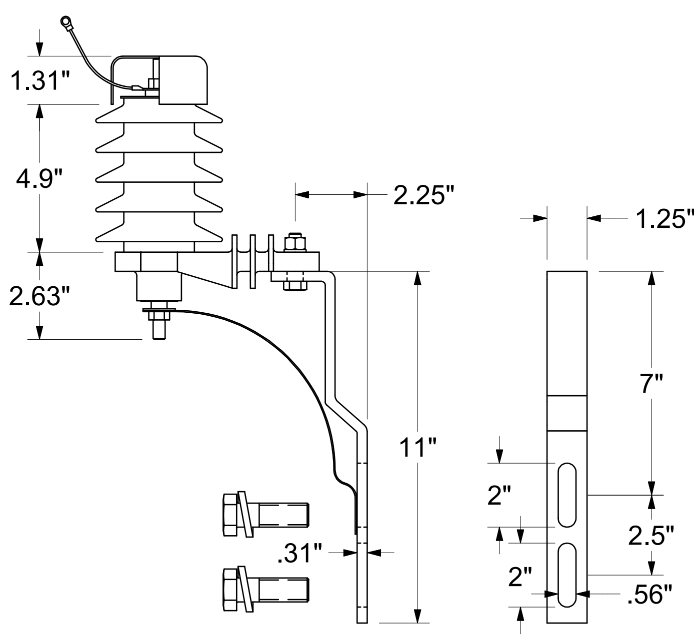
This DCS is for use by Ameren Illinois for EZRR corrective action projects. This DCS provides materials for:
1) Moving the arrester from the energized zone above the transformer to the transformer tank
2) Replacing porcelain cutout with polymer cutout
3) Lowering cutout from phase conductor crossarm to FG cutout bracket (refer to DCS **13 12 00 01**)
4) Conforming the transformer H2 grounding to current Ameren Standards (refer to DCS **13 00 06 02**)

INSTRUCTIONS - IF TRANSFORMER HAS EXISTING LUGS FOR MOUNTING ARRESTER ADJACENT TO THE H1 BUSHINGS:

1. **Clean the threads in the arrester mounting lugs.** Thread Tap (Stock #85 37 166) with T-Wrench (Stock #85 41 336) can be used to 'chase' the threads.



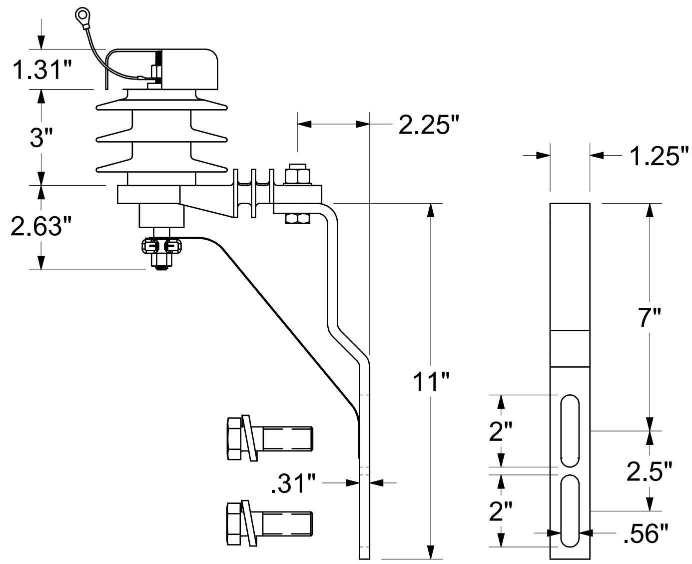
2. **Install arrester on transformer tank.**
   A. If transformer is rated 7.2 kV thru 7.97 kV use DCS **29 12 00 01.**
   Use arrester kit Stock #10 01 145. This kit includes a 10 kV arrester with cap, 600 V insulated arrester lead-wire, L-shaped mounting bracket, copper ground strap, and two 1/2" bolts for mounting to the transformer tank.



29 12 00 01

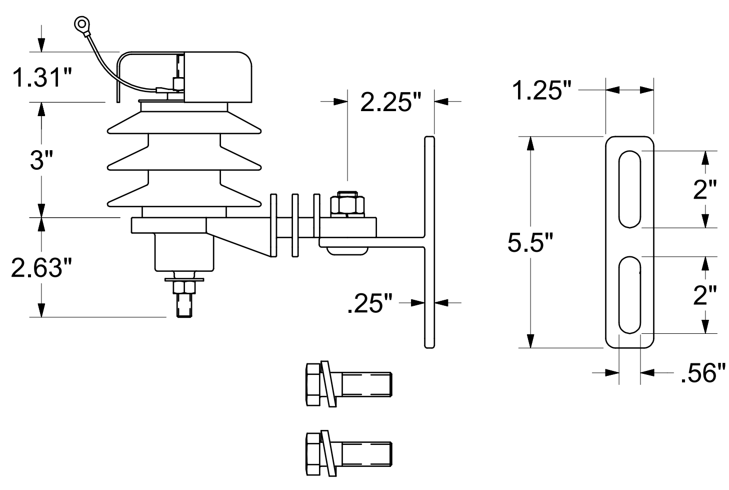
ILLINOIS ONLY

B. If transformer is rated 2.4 kV with cover mounted bushings use DCS **29 12 00 02.**
Use arrester kit Stock #10 01 256. This kit includes a 3 kV arrester with cap, 600 V insulated arrester lead-wire, L-shaped mounting bracket, copper ground strap, and two 1/2" bolts for mounting to the transformer tank.



29 12 00 02

C. If transformer is rated 2.4 kV with side-wall mounted primary bushings use DCS **29 12 00 03.**
Use arrester kit Stock #10 01 122. This kit includes a 3 kV arrester with cap, 600 V insulated arrester lead-wire, T-shaped mounting bracket, copper ground strap, and two 1/2" bolts for mounting to the transformer tank.



29 12 00 03

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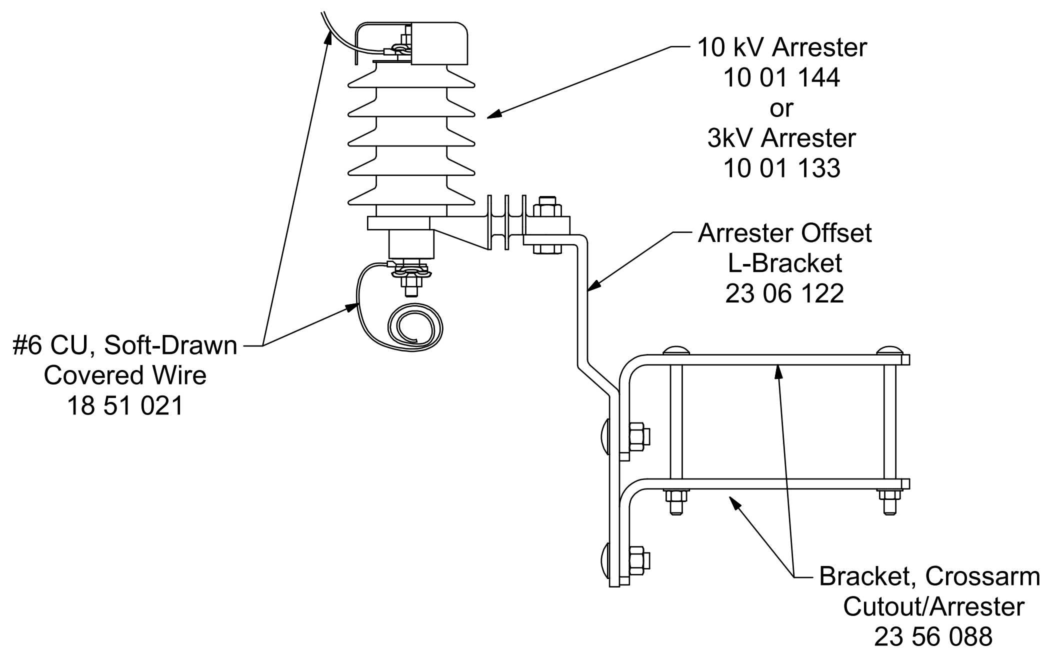
INSTRUCTIONS - IF TRANSFORMER DOES NOT HAVE EXISTING LUGS FOR MOUNTING ARRESTER TO THE H1 BUSHING:

1. **Transformer with Cover Mounted Primary Bushings -**

   Mount hardware and arrester to upper transformer hanger bracket as per DCS **12 12 05 ****. DCS **12 12 05 **** contains the following materials needed for a transformer with cover mounted primary bushings:



29 12 00 04

29 12 00 05

2. **2.4 kV Transformer with Side-Wall Mounted Primary Bushings -**
   Replace with new transformer that is pre-kitted with tank mounted arrester.

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DCS #	DESCRIPTION
29 12 00 01	Tank Mounting of Arrester, 7.2 kV thru 7.97 kV Transformer
29 12 00 02	Tank Mounting of Arrester, 2.4 kV Transformer w/ Cover Mounted Primary Bushings
29 12 00 03	Tank Mounting of Arrester, 2.4 kV Transformer w/ Side-Wall Mounted Primary Bushings
29 12 00 04	Hanger Bracket Mounting of Arrester, 7.2 kV thru 7.97 kV Transformer
29 12 00 05	Hanger Bracket Mounting of Arrester, 2.4 kV Transformer w/ Cover Mounted Primary Bushings

	ITEM	STK / DCS #	DESCRIPTION 29 12 00 **	01	02	03	04	05
	A	23 06 127	Bracket, Cutout	1	1	1	1	1
	B	23 52 065	Bolt, Mach, 5/8” x 12”	2	2	2	2	2
	C	23 66 027	Washer, Square, 5/8”	2	2	2	2	2
	D	54 07 208	Switch, Fused, Open Type	1	1	1	1	1
	E	18 51 025	Wire, Trans. Riser, #4, S.D. Poly covered (FT.)	15	15	15	15	15
	F	23 17 411	Cover-Cutout	1	1	1	1	1
	G	10 01 145	Arrester Kit, 10kV, w/ “L” Transformer Mtg. Brkt.	1	-	-	-	-
		10 01 256	Arrester Kit, 3kV, w/ “L” Transformer Mtg. Brkt.	-	1	-	-	-
		10 01 122	Arrester Kit, 3kV, w/ “T” Transformer Mtg. Brkt.	-	-	1	-	-
	H	12 12 05 01	Arrester, 10kV	-	-	-	1	-
		12 12 05 02	Arrester, 3kV	-	-	-	-	1
	I	23 64 001	Staple, Ground Wire, Serrated, CU Clad	-	-	-	3	3
	J	17 51 032	Clamp, PG. #6-1/0	1	1	1	2	2
	K	69 58 296	Guard, Wildlife, Clam-Shell, Short	1	1	1	1	1
	L	69 58 121	Ground, Transformer Tank, #8 Sol. To #2 Str. Cu.	1	1	1	1	1
	M	23 66 134	Washer, Dble Coil, 5/8"	2	2	2	2	2
	N	23 65 043	Nut, Lock, 5/8"	2	2	2	2	2
@	O	10 00 01 01	Link, Fuse	1	1	1	1	1

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0	05/21/18	DG	

NOTES