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Revised Section per Sixth Edition of NESC

Rural Electrification Administration
Telephone Engineering and Construction Manual

Section 602
Issue No. 4
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CLEARANCES

CONTENTS

1. GENERAL

1.01 This section is intended to provide REA borrowers, consulting engineers, contractors, and other interested parties with technical information for use in the design and construction of telephone systems of REA borrowers. It furnishes information regarding clearances between telephone facilities and conductors of other systems and structures, as well as separations and climbing spaces involving poles, wires, cables and guys except in connection with joint use of poles, which is covered by REA TE & CM-690, "Joint Use of Poles."

1.02 This section replaces Section 602, Issue No. 3, dated December 1960 and is revised to include revisions in information regarding clearances permitted by the 6th edition of the National Electrical Safety Code between communication facilities and ground or rails and to amplify the tabulated information on clearance between communication and power conductors.

1.03 In those states where local requirements are more stringent than the NESC, local requirements must be met.

1.04 At crossings over navigable waterways and in the vicinity of airports, certain additional precautions with respect to clearances and separations are necessary. Rules covering navigable waterways should be determined for the particular waterway involved. The Department of Commerce and the Federal Aviation Agency may have certain requirements covering construction in vicinity of airports which must be met.

1.05 All clearances specified herein are based on a temperature of 60°F. and no wind.

2. HORIZONTAL CLEARANCES OF SUPPORTING STRUCTURES FROM OTHER OBJECTS (NESC Rule 231)

2.01 Poles and their guys and braces shall have the clearances shown in Table 1, measured between the nearest parts of the objects concerned.

3. VERTICAL CLEARANCES OF WIRES ABOVE GROUND OR RAILS (NESC Rule 232)

3.01 The provision of proper vertical clearances of wires above ground is a major factor in the design of pole lines.

The ground clearances required directly determine the necessary pole heights. Poles are a major item in the cost of a pole line. The provision of ground clearances greater than required means excessive pole lengths with associated increased costs. The provision of ground clearance less than required will result in hazards to individuals or equipment traveling under the line and possible damage to line wire or cable.

3.02 In view of the importance of vertical clearances above ground in the cost of pole line construction, and the reduction of hazards, the engineer should give special study to this factor when selecting routes for pole lines. In this way, the general routes that are chosen can be such that the lowest permissible basic ground clearances can be used to the greatest possible extent. In addition, careful study of terrain and other factors should be made prior to staking the line so that the minimum clearances applicable can be utilized.

3.03 In studying the possibility of joint use of poles on an existing electric supply system pole line, ground clearances will have a major effect on the number of poles requiring replacement because of inadequate pole height. Careful study of all factors affecting required ground clearances is especially important in such situations. This is discussed in detail in REA TE & CM-690.

3.04 The National Electrical Safety Code in Rule 232A contains provisions relating to vertical clearances above ground and rails applicable to crossings, and running along and within the limits of public roads. These provisions are shown in Tables 2 to 4 inclusive for all anticipated span lengths and for three span crossing points. Vertical clearances above ground for other situations (primarily private right-of-way) are not specifically covered by the National Electrical Safety Code. This is primarily because the wide variety of conditions encountered make it impracticable to specify rigid values of clearances applicable to all situations. In these situations, the clearances provided should be based on consideration of expected conditions under the line.

3.05 Table 5 contains recommendations of REA for situations not covered by the National Electrical Safety Code. It may be noted that eight feet is the minimum basic ground clearance recommended where the terrain involved is likely to be traveled only by pedestrians. Where travel other than by pedestrians is likely under the line, ground clearances that should be provided will depend upon the nature of equipment or vehicles that normally would travel under the line. Local engineering judgment, considering economic and safety factors, based on type and use of terrain under or near a pole line is the best solution to obtaining proper ground clearances. In many cases, it will be desirable to work out clearance requirements with the owner of the land over which the line is to be constructed. This is particularly important where joint pole lines are being considered and where lower clearance requirements (but in no cases less than basic 8 feet) may be preferable to separate pole lines with higher clearances.

4. WIRE CROSSING CLEARANCES (NESC Rule 233)

4.01 In crossings with electric distribution lines and with transmission lines up to 25,000 volts, joint pole crossings should be utilized wherever possible. This may require that a pole be set in an existing electric supply line but this will often be more economical than making the line changes required in the electric supply line for an in-span crossing. Joint pole crossings are desirable in that they reduce the chance of accidental contact.

4.02 NESC requirements with respect to grade of construction and separation of attachments on the pole must be met at joint pole crossings. (See REA TE & CM-690).

4.03 Electric supply lines crossing over telephone lines pose one of the most difficult and hazardous problems in the construction and operation of telephone plant. For this reason it is extremely important that the Engineer become familiar with the requirements of the NESC for electric supply lines involved and that all such crossings be checked to be certain that these requirements are met at the crossing span. The clearances between communication wires and overhead crossing power conductors for various span lengths and crossing points required by the NESC are given in Tables 6 to 8 inclusive.

4.04 Communication lines should always cross under electric supply lines if possible. Telephone lines in the upper position at crossings with electric supply services may be unavoidable under certain circumstances. The vertical clearances which must be obtained for telephone plant in the upper position at crossings are shown in Table 9.

5. CLEARANCES FROM CONFLICTING STRUCTURES AND CONDUCTORS OTHER THAN AT CROSSINGS (NESC Rule 234)

5.01 Clearance in any direction from telephone wires to conflicting conductors is a function of the sag and voltages of the conductors involved. Observance of the rules for vertical and horizontal separations and clearances usually will result in clearances which meet this requirement.

5.02 Telephone poles located so that the telephone lines pass near but are not to be attached to the electric supply pole must be so placed that the telephone wires have the greatest practicable separation from the electric supply pole. This separation must be not less than the larger of (1) or (2); (1) the separation required between the electric supply conductors at their supporting structure plus one inch for each two feet of distance from the telephone pole to the nearest electric pole line; (2) three feet. Also, the climbing space on the telephone pole must not be reduced by the electric supply wires.

5.03 Figure 1 illustrates the application of the above rules to some typical situations.

5.04 Although the standards outlined in paragraph 5.02 may be met, there is an additional condition to be satisfied if the point of crossing of the telephone lines under the electric supply lines falls within 6 feet horizontally of the telephone pole. Note 7, Table 3, Rule 233 of the NESC states that clearance at such crossings is to be increased to a minimum of 6 feet. This rule does not apply for service wires of 0-750 volts.

5.05 Where telephone lines pass near buildings, the lines must be so arranged that firemen and their ladders will have ready access to the buildings.

6. SEPARATION BETWEEN CONDUCTORS ON POLE LINES (NESC Rule 235)

6.01 Telephone lines should have a minimum horizontal separation of 6 inches between telephone conductors except at transposition points. Where pin spacings less than 6 inches have been in regular use, a minimum horizontal spacing of 3 inches is permitted. No minimum horizontal clearance limitation applies to insulated line wire.

6.02 Telephone guys attached to telephone poles must clear telephone wires and cables by at least 3 inches, except that guys and cable messengers may be attached to the same through-bolt.

6.03 Telephone guys attached to electric supply line poles (joint use or pole to pole guys) should clear telephone wires and cables by 6 inches and should clear electric supply wires by 12 inches except that guys and cable messengers may be attached to the same through-bolt. In addition, where guys attached to joint use poles pass within 12 inches of supply conductors, and also pass within 12 inches of communication cables, they shall be protected with a suitable insulating covering where the guy passes the supply conductors, unless the guy is effectively grounded or insulated with a strain insulator at a point below the lowest supply conductor and above the highest communication cable.

6.04 Telephone wires must not be closer than 3 inches to the surface of a telephone pole nor closer than 5 inches to the surface of a joint use pole. Likewise, telephone wires must be 3 inches above the surface of the crossarm. Telephone wires may be attached to supports on the bottom or sides of crossarms or surface of poles with less clearance if at least 40 inches from any supply line conductor of less than 8700 volts and at least 60 inches from any supply line conductor of more than 8700 volts carried on the same pole.

7. CLIMBING SPACE (NESC Rule 236)

7.01 There are no requirements for climbing space except for telephone wires on joint use poles; then it normally is 30 inches. However, if the electric conductors above the telephone wires carry secondary voltage of not greater than 750 volts, the minimum climbing space required is 16 inches.

For detailed requirements, see note 2, Table 10, Rule 236E of the NESC.

8. VERTICAL SEPARATION AT CROSSING POLES (NESC Rule 238D)

8.01 Communication line conductors not carried on crossarms require the same vertical separation as required for conductors on crossarms (usually a minimum of 40 inches from an M.G.N.). A special exception, however, is applied to drop wires crossing under electric supply conductors on a common crossing pole where the electric supply and the communication facilities are carried on separate pole lines. In this instance, the separation from the M.G.N. may be reduced to 4 inches, provided the separation between the drop wires and supply conductors not effectively grounded meet the requirements of the rules stated in paragraph 238B dealing with vertical separations of conductors not carried on crossarms.

8.02 An official interpretation by the "Committee on Interpretations" states this rule is applicable only for a bona-fide crossing of a drop wire under an M.G.N. type power line. This interpretation indicates that the rule was intended to be a concession to make easier road crossings for drop wires. It was reasoned that such attachments would usually not be made on poles that are frequently climbed or at an excessive number of power supply poles such as would be involved on joint use lines. The interpretation does not permit a drop wire to be taken out of a terminal on a joint use pole, run up the pole to within 4 inches of the M.G.N., and then span from that point to a building or another pole.

9. VERTICAL AND LATERAL COMMUNICATION WIRES (NESC Rule 239E)

9.01 Vertical and lateral insulated communication wires (drop and bridle wires), except for those in same ring run, must have 3 inches separation from other conductors, guys and messengers. These wires may be attached directly to the pole or crossarm.

Table 1

HORIZONTAL CLEARANCES INVOLVING TELEPHONE POLES, STUBS, BRACES AND GUYS

	Between Nearest Part of Telephone Poles, Stubs, Braces or Guys and:	Minimum Horizontal Clearance	Remarks
1.	Fire Hydrants	3 feet	Obtain greater separation if practicable.
2.	Nearest rail of main track	12 feet	Applies both to crossings over railroads and to lines running parallel with railroads.
3.	Nearest rail of sidings	7 feet	At sidings where cars are unloaded, leave sufficient space for a driveway.
4.	Curb lines	6 inches	Measured to street side of curb.

Table 2 - Minimum Vertical Clearances of Wires above Ground or Rails 6/ (Feet)
Light Loading District
(Based on 60°F, no wind and initial stringing sag)

Crossing Point	Span Length (Feet) /1	Crossings				
		Public Streets Roads or Alleys Not Meeting /2	Alleys /2	Residence Driveways	Ways for Pedestrians Only	Railroad Tracks
Midspan	350	/4 18.0	15.0	10.0	8.0	/3 27.0
	400	18.5	15.5	10.5	8.5	27.75
	450	19.0	16.0	11.0	9.0	28.5
	500	19.5	16.5	11.5	9.5	29.25
	550	20.0	17.0	12.0	10.0	30.0
	600	20.5	17.5	12.5	10.5	30.75
1/4 span	350	/4 18.0	15.0	10.0	8.0	/3 27.0
	400	18.0	15.0	10.0	8.2	27.0
	450	18.3	15.4	10.5	8.7	27.4
	500	18.7	15.9	11.0	9.2	28.1
	550	19.2	16.3	11.5	9.6	28.3
	600	19.7	16.8	12.0	10.1	29.5
1/10 span	350	/4 18.0	15.0	10.0	8.0	/3 27.0
	400	18.0	15.0	10.0	8.0	27.0
	450	18.0	15.0	10.0	8.0	27.0
	500	18.0	15.0	10.1	8.4	27.0
	550	18.0	15.0	10.6	8.8	27.0
	600	18.0	15.4	11.0	9.3	27.1

Span Length (Feet)	Wire Runs Along and Within Limits of Public Highways			
	Urban Streets or Roads	Alleys /2	Ways for Pedestrians Only	Rural Roads
350	18.0	15.0	8.0	/5 14.0
400	18.5	15.5	8.5	14.5
450	19.0	16.0	9.0	15.0
500	19.5	16.5	9.5	15.5
550	20.0	17.0	10.0	16.0
600	20.5	17.5	10.5	16.5

/1 Increased clearances for greater than minimum span lengths are not required for cable supported by messenger.

/2 An "Alley" in this use is defined as a passage, between buildings, walls or fences, having a width of not more than seven feet.

/3 A clearance of 25 feet is permitted for cable or wire supported by separate messenger.

/4 Drop wires or guys insulated against the highest voltage to which they are exposed (up to 8700 volts) require only a minimum clearance of 16 feet at the side of the traveled way, with corresponding increase for spans longer than 250 feet.

/5 This clearance may be reduced to 13 feet where no part of the line overhangs any part of the highway which is ordinarily traveled and where it is unlikely that loaded vehicles will be crossing under the line into a field.

/6 Maximum span over rails is limited to 150 feet. (See TE&CM-617).

Table 3 - Minimum Vertical Clearances of Wires Above Ground or Rails 6/ (Feet)
Medium Loading District
(Based on 60°F, no wind, and initial stringing sag)

Crossing Point	Span Length (Feet) /1	Crossings				
		Public Streets Roads or Alleys Not Meeting /2	Alleys /2	Residence Driveways	Ways for Pedestrians Only	Railroad Tracks
Midspan	250	/4 18.0	15.0	10.0	8.0	/3 27.0
	300	18.5	15.5	10.5	8.5	28.5
	350	19.0	16.0	11.0	9.0	30.0
	400	19.5	16.5	11.5	9.5	31.5
	450	20.0	17.0	12.0	10.0	33.0
	500	20.5	17.5	12.5	10.5	34.5
	550	21.0	18.0	13.0	11.0	36.0
	600	21.5	18.5	13.5	11.5	37.5
1/4 span	250	/4 18.0	15.0	10.0	8.0	/3 27.0
	300	18.0	15.0	10.0	8.2	27.4
	350	18.3	15.4	10.5	8.7	28.8
	400	18.7	15.9	11.0	9.2	30.3
	450	19.2	16.3	11.5	9.6	31.7
	500	19.7	16.8	12.0	10.1	33.1
	550	20.2	17.3	12.5	10.6	34.6
	600	20.7	17.8	13.0	11.1	36.0
1/10 span	250	/4 18.0	15.0	10.0	8.0	/3 27.0
	300	18.0	15.0	10.0	8.0	27.0
	350	18.0	15.0	10.0	8.0	27.0
	400	18.0	15.0	10.1	8.4	27.7
	450	18.0	15.0	10.6	8.8	29.1
	500	18.0	15.4	11.0	9.3	30.4
	550	18.5	15.9	11.5	9.7	31.7
	600	18.9	16.4	11.9	10.1	33.0

Span Length (Feet)	Wire Runs Along and Within Limits of Public Highways			
	Urban Streets or Roads	Alleys /2	Ways for Pedestrians Only	Rural Roads
250	18.0	15.0	8.0	/5 14.0
300	18.5	15.5	8.5	14.5
350	19.0	16.0	9.0	15.0
400	19.5	16.5	9.5	15.5
450	20.0	17.0	10.0	16.0
500	20.5	17.5	10.5	16.5
550	21.0	18.0	11.0	17.0
600	21.5	18.5	11.5	17.5

/1 Increased clearances for greater than minimum span lengths are not required for cable supported by messenger.

/2 In "Alley" in this use is defined as a passage, between buildings, walls or fences, having a width of not more than seven feet.

/3 A clearance of twenty-five feet is permitted for cable or wire supported by separate messenger.

/4 Drop wires or guys insulated against the highest voltage to which they are exposed (up to 8700 volts) require only a minimum clearance of 16 feet at the side of the traveled way with corresponding increase for spans longer than 250 feet.

/5 This clearance may be reduced to 13 feet where no part of the line overhangs any part of the highway which is ordinarily traveled and where it is unlikely that loaded vehicles will be crossing under the line into a field.

/6 Maximum span over rails is limited to 125 feet. (See TE&CM 617).

Table 4 - Minimum Vertical Clearances of Wires Above Ground or Rails 6/(Feet)
Heavy Loading Districts
(Based on 60°F, no wind and initial stringing sag)

Crossing Point	Span Length (Feet) /1	Crossings				
		Public Streets Roads or Alleys Not Meeting /2	Alleys /2	Residence Driveways	Ways for Pedestrians Only	Railroad Tracks
Midspan	175	/4 18.0	15.0	10.0	8.0	/3 27.0
	200	18.3	15.3	10.3	8.3	27.8
	250	18.8	15.8	10.8	8.8	29.3
	300	19.3	16.3	11.3	9.3	30.8
	350	19.8	16.8	11.8	9.8	32.3
1/4 span	175	/4 18.0	15.0	10.0	8.0	/3 27.0
	200	18.0	15.0	10.0	8.0	27.0
	250	18.1	15.2	10.4	8.5	27.1
	300	18.6	15.7	10.9	8.9	29.6
	350	19.0	16.2	11.4	9.4	31.0
1/10 span	175	/4 18.0	15.0	10.0	8.0	/3 27.0
	200	18.0	15.0	10.0	8.0	27.0
	250	18.0	15.0	10.0	8.0	27.0
	300	18.0	15.0	10.0	8.3	27.1
	350	18.0	15.0	10.4	8.7	28.5

Span Length (Feet)	Wire Runs Along and Within Limits of Public Highways			
	Urban Streets or Roads	Alleys /2	Ways for Pedestrians Only	Rural Roads
175	18.0	15.0	8.0	/5 14.0
200	18.3	15.3	8.3	14.3
250	18.8	15.8	8.8	14.8
300	19.3	16.3	9.3	15.3
350	19.8	16.8	9.8	15.8

/1 Increased clearances for greater than minimum span lengths are not required for cable supported by separate messenger.

/2 An "Alley" in this use is defined as a passage, between buildings, walls or fences, having a width of not more than seven feet.

/3 A clearance of 25 feet is permitted for cable or wire supported by separate messenger.

/4 Drop wires or guys insulated against the highest voltage to which they are exposed (up to 8700 volts) require only a minimum clearance of sixteen feet at the side of the traveled way with corresponding increase for spans longer than 175 feet.

/5 This clearance may be reduced to 13 feet where no part of the line overhangs any part of the highway which is ordinarily traveled and where it is unlikely that loaded vehicles will be crossing under the line into a field.

/6 Maximum span over rails is limited to 100 feet. (See TE&CM-617).

Table 5

MINIMUM VERTICAL CLEARANCES ABOVE GROUND WHERE WIRES ARE NOT WITHIN HIGHWAY LIMITS OR OTHER PUBLIC RIGHT-OF-WAY FOR TRAFFIC OR ARE NOT INVOLVED IN CROSSINGS OF PUBLIC RIGHT-OF-WAY

Nature of ground beneath line[1]	Minimum ground clearances - (feet)
Where ground under line is likely to be traveled by other than pedestrians[2]	18+
Where ground under line is likely to be traveled by pedestrians only[2]	18

1/ The wide variety of conditions encountered make it impracticable to specify clearances applicable to every situation. Ground clearances that should be provided will depend upon the nature of equipment or vehicles that usually would travel under the line (see text).

2/ Clearances in the above table are for span lengths not exceeding 175 feet in the heavy loading zone, 250 feet in the medium loading zone and 350 feet in the light loading zone and are based on a temperature of 60°F., no wind, maintaining approximately initial stringing sags in accordance with recommended wire stringing practices for telephone conductors. For spans greater than these basic lengths, clearances should be increased in accordance with figures shown in tables 2 to 4 for "Ways for Pedestrians Only."

Table 6
Crossings of Wires Carrier on Separate Supports Over Communication Wires
Minimum Vertical Clearances (Feet)
Light Loading District

Upper Span Crossing Point	Upper Span Length (Feet)	Type of Crossing Wires								
		Communication Wires, Cables, and Messengers	Open Supply Wires, 0-750 V; Supply Cables, All Voltages, Having Grounded Metal Sheath; Cable Messengers, Insulated Conductors Supported on and Cabled with an Effectively Grounded Messenger 6/							Guys, Span Wires Lightning Protection Wires
			Line Wires		Service Drops	750 to 8700 V		8700 to 50,000 V		
			#6 Copper	#4 ACSR 6/1 & 7/1 #2 ACSR 6/1 & 7/1 6ACW 8ACW		#6 Copper	#4 ACSR 6/1 & 7/1 #2 ACSR 6/1 & 7/1 6ACW 8ACW	#6 Copper	#4 ACSR 6/1 & 7/1 #2 ACSR 6/1 & 7/1 6ACW 8ACW	
Midspan	350	2/ 2.0	4/ 4.0	4/ 4.0	1/ 2.0	3/ 4.0	3/ 4.0	6.0	6.0	1/ 2.0
	400	2.75	7/ 4.75	7/ 4.75	7/ -	4.75	4.75	6.75	6.75	
	450	3.5	5.50	5.50	-	5.50	5.50	7.5	7.5	
	500	4.25	6.25	6.25	-	6.25	6.25	8.25	8.25	
	550	5.0	7.0	7.0	-	7.0	7.0	9.0	9.0	
	600	5.75	7.5	7.75	-	7.5	7.75	9.5	9.75	
1/4 span	350	2/	4/ 4.0	4/ 4.0	1/ 2.0	3/ 4.0	3/ 4.0	6.0	6.0	1/ 2.0
	400		7/ 4.0	7/ 4.0	7/ -	4.0	4.0	6.0	6.0	
	450		4.5	4.5	-	4.5	4.5	6.15	6.15	
	500		5.1	5.1	-	5.1	5.1	6.75	6.75	
	550		5.75	5.75	-	5.75	5.75	7.4	7.4	
	600		6.15	6.15	-	6.15	6.15	7.75	8.0	
1/10 span	350	2/	4/ 4.0	4/ 4.0	1/ 2.0	3/ 4.0	3/ 4.0	6.0	6.0	1/ 2.0
	400		7/ 4.0	7/ 4.0	7/ -	4.0	4.0	6.0	6.0	
	450		4.0	4.0	-	4.0	4.0	6.0	6.0	
	500		4.0	4.0	-	4.0	4.0	6.0	6.0	
	550		4.0	4.0	-	4.0	4.0	6.0	6.0	
	600		4.0	4.0	-	4.0	4.0	6.0	6.0	

Table 6 - Continued

1/ Crossing of communication conductors by guys, span wires, or lightning protection wires longer than the basic span lengths is not anticipated. If encountered, increased clearances in accordance with Rule 233 B1(a) and 233 B1(b) should be applied.

2/ Clearance of communication conductors from each other in locations where no other classes of conductors are involved may be reduced by mutual consent of the parties involved. Specific reductions in long-span clearances for other than mid-span crossings are not covered by NESC. Guidance information for clearances in such cases may be found in Rule 233 B1(b) of NESC. Recommended minimum under any condition - two feet.

3/ This clearance shall be increased to 6 feet with corresponding increases for longer spans as provided for in NESC 233 B, where the supply wires cross horizontally over a communication line within 6 feet of a communication pole.

4/ A clearance of 2 feet may be permitted where the supply conductor is above the communication conductor, provided the crossing is not within 6 feet of any pole concerned in the crossing and the voltage to ground does not exceed 300 volts.

5/ Clearances of effectively grounded (neutral) conductors may be reduced to minimum 2 feet, with appropriate increases for longer spans (See Rule 233B), where the crossing conductor is associated with a circuit of 0 to 22,000 volts.

6/ Supply cable having effectively grounded metal sheath, or insulated conductors supported on and cabled together with an effectively grounded messenger, of all voltages, and messengers associated with such cable may have a clearance of 2 feet from communication wires, cables and messengers except where they cross under communication cables.

7/ Where a 2 foot clearance is required at 60°F and where conditions are such that the sag in the upper conductor would increase more than 1.5 feet at the crossing point under the applicable loading of NESC rule 251, the 2 foot clearance shall be increased by the amount of sag increase less 1.5 feet.

Table 7
Crossings of Wires Carried on Separate Supports Over Communication Wires
Minimum Vertical Clearances (Feet)
Medium Loading District

Upper Span Crossing Point	Upper Span Length (Feet)	Communication Wires, Cables, and Messengers	Type of Crossing Wires: Open Supply Wires, 0-750 V; Supply Cables, All Voltages, Having Grounded Metal Sheath; Cable Messengers, Insulated Conductors Supported on and Cabled with an Effectively Grounded Messenger 6/							
			Line Wires							Service Drops
			#6 Copper	#4 ACSR 6/1	#4 ACSR 7/1	#2 ACSR 6/1	#2 ACSR 7/1	6 ACW	8 ACW	
Midspan	250	2/ 2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1/ 2.0
	300	2.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	7/ -
	350	3.0	7.0	7.0	7.0	7.0	7.0	7.0	7.0	-
	[illegible]	[illegible]	7.0	8.5	8.5	8.5	8.5	8.5	8.5	-
	450	4.0	7.0	9.5	10.0	9.8	10.8	10.8	10.8	-
	500	4.5	7.0	9.5	10.8	9.8	11.1	11.5	11.5	-
	550	5.0	7.0	9.5	10.8	9.8	11.1	11.8	12.5	-
	600	5.5	7.0	9.5	10.8	9.8	11.1	11.8	12.5	-
1/4 span	250	2/ 2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1/ 2.0
	300	-	4.5	4.5	4.5	4.5	4.5	4.5	4.5	7/ -
	350	-	5.75	5.75	5.75	5.75	5.75	5.75	5.75	-
	400	-	5.75	7.0	7.0	7.0	7.0	7.0	7.0	-
	450	-	5.75	7.8	8.2	8.0	8.2	8.2	8.2	-
	500	-	5.75	7.8	8.9	8.0	9.1	9.5	9.5	-
	550	-	5.75	7.8	8.9	8.0	9.1	9.7	10.3	-
	600	-	5.75	7.8	8.9	8.0	9.1	9.7	10.3	-
1/10 span	250	2/ 2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1/ 2.0
	300	-	4.0	4.0	4.0	4.0	4.0	4.0	4.0	7/ -
	350	-	4.0	4.0	4.0	4.0	4.0	4.0	4.0	-
	400	-	4.0	4.0	4.0	4.0	4.0	4.0	4.0	-
	450	-	4.0	4.5	4.7	4.7	4.7	4.7	4.7	-
	500	-	4.0	4.5	5.1	4.7	5.2	5.4	5.4	-
	550	-	4.0	4.5	5.1	4.7	5.2	5.4	5.9	-
	600	-	4.0	4.5	5.1	4.7	5.2	5.4	5.9	-

Table 7 (Continued)
Crossings of Wires Carried on Separate Supports Over Communication Wires
Minimum Vertical Clearances (Feet)
Medium Loading District

Upper Span Crossing Point	Upper Span Length (Feet)	Type of Crossing Wires						
			4/ 5/ 7/ Open Supply Wires and Service Drops 750 - 8700 V 3/					
		#6 Copper	#4 ACSR 6/1	#4 ACSR 7/1	#2 ACSR 6/1	#2 ACSR 7/1	6 ACW	8 ACW
Midspan	250	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	300	5.5	5.5	5.5	5.5	5.5	5.5	5.5
	350	7.0	7.0	7.0	7.0	7.0	7.0	7.0
	400	7.0	8.5	8.5	8.5	8.5	8.5	8.5
	450	7.0	9.5	10.0	9.8	10.0	10.0	10.0
	500	7.0	9.5	10.8	9.8	11.1	11.5	11.5
	550	7.0	9.5	10.8	9.8	11.1	11.8	12.5
	600	7.0	9.5	10.8	9.8	11.1	11.8	12.5
1/4 span	250	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	300	4.5	4.5	4.5	4.5	4.5	4.5	4.5
	350	5.75	5.75	5.75	5.75	5.75	5.75	5.75
	400	5.75	7.0	7.0	7.0	7.0	7.0	7.0
	450	5.75	7.8	8.2	8.0	8.2	8.2	8.2
	500	5.75	7.8	8.9	8.0	9.1	9.5	9.5
	550	5.75	7.8	8.9	8.0	9.1	9.7	10.3
	600	5.75	7.8	8.9	8.0	9.1	9.7	10.3
1/10 span	250	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	300	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	350	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	400	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	450	4.0	4.5	4.7	4.6	4.7	4.7	4.7
	500	4.0	4.5	5.1	4.6	5.2	5.4	5.4
	550	4.0	4.5	5.1	4.6	5.2	5.6	5.9
	600	4.0	4.5	5.1	4.6	5.2	5.6	5.9

Table 7 (Continued)

Crossings of Wires Carried on Separate Supports Over Communication Wires
Minimum Vertical Clearances (Feet)
Medium Loading District

Upper Span Crossing Point	Upper Span Length (Feet)	Type of Crossing Wires							
		4/ 5/ 7/ Open Supply Wires and Service Drops 8700 to 50,000							Guys, Span Wires, Lightning Protection Wires
		#6 Copper	#4 ACSR 6/1	#4 ACSR 7/1	#2 ACSR 6/1	#2 ACSR 7/1	#6 ACW	8 ACW	
Midspan	250	6.0	6.0	6.0	6.0	6.0	6.0	6.0	1/ 2.0
	300	7.5	7.5	7.5	7.5	7.5	7.5	7.5	-
	350	9.0	9.0	9.0	9.0	9.0	9.0	9.0	-
	400	9.0	10.5	10.5	10.5	10.5	10.5	10.5	-
	450	9.0	11.5	12.0	11.8	12.0	12.0	12.0	-
	500	9.0	11.5	12.8	11.8	13.1	13.5	13.5	-
	550	9.0	11.5	12.8	11.8	13.1	13.8	14.5	-
	600	9.0	11.5	12.8	11.8	13.1	13.8	14.5	-
1/4 span	250	6.0	6.0	6.0	6.0	6.0	6.0	6.0	1/ 2.0
	300	6.4	6.4	6.4	6.4	6.4	6.4	6.4	-
	350	7.7	7.7	7.7	7.7	7.7	7.7	7.7	-
	400	7.7	9.0	9.0	9.0	9.0	9.0	9.0	-
	450	7.7	9.8	10.2	10.0	10.2	10.2	10.2	-
	500	7.7	9.8	10.9	10.0	11.1	11.5	11.5	-
	550	7.7	9.8	10.9	10.0	11.1	11.8	12.3	-
	600	7.7	9.8	10.9	10.0	11.1	11.8	12.3	-
1/10 span	250	6.0	6.0	6.0	6.0	6.0	6.0	6.0	1/ 2.0
	300	6.0	6.0	6.0	6.0	6.0	6.0	6.0	-
	350	6.0	6.0	6.0	6.0	6.0	6.0	6.0	-
	400	6.0	6.0	6.1	6.1	6.1	6.1	6.1	-
	450	6.0	6.7	7.0	6.9	7.0	7.0	7.0	-
	500	6.0	6.7	7.4	6.9	7.6	7.8	7.8	-
	550	6.0	6.7	7.4	6.9	7.6	8.0	8.4	-
	600	6.0	6.7	7.4	6.9	7.6	8.0	8.4	-

Table 7 - Continued

1/ Crossing of communication conductors by guys, span wires, or lightning protection wires longer than the basic span lengths are not anticipated. If encountered, increased clearances in accordane with Rule 233 B1(a) and 233 B1(b) should be applied.

2/ Clearance of communication conductors from each other in locations where no other classes of conductors are involved may be reduced by mutual consent of the parties involved. Specific reductions in long-span clearances for other than mid-span crossings are not covered by NESC. Guidance information for clearances in such cases may be found in Rule 233 B1(b) of NESC. Recommended minimum under any condition - two feet.

3/ This clearance shall be increased to 6 feet with corresponding increases for longer spans as provided for in NESC 233 B, where the supply wires cross horizontally over a communication line within 6 feet of a communication pole.

4/ A clearance of 2 feet may be permitted where the supply conductor is above the communication conductor, provided the crossing is not within 6 feet of any pole concerned in the crossing and the voltage to ground does not exceed 300 volts.

5/ Clearances of effectively grounded (neutral) conductors may be reduced to minimum 2 feet, with appropriate increases for longer spans (See Rule 233B), where the crossing conductor is associated with a circuit of 0 to 22,000 volts.

6/ Supply cable having effectively grounded metal sheath, or insulated conductors supported on and cabled together with an effectively grounded messenger, of all voltages, and messengers associated with such cable may have a clearance of 2 feet from communication wires, cables and messengers except where they cross under communication cables.

7/ Where a 2 foot clearance is required at 60°F and where conditions are such that the sag in the upper conductor would increase more than 1.5 feet at the crossing point under the applicable loading of NESC rule 251, the 2 foot clearance shall be increased by the amount of sag increase less 1.5 feet.

Table 8

Crossings of Wires Carried on Separate Supports Over Communication Wires
Minimum Vertical Clearances (Feet)
Heavy Loading District

Upper Span Crossing Point	Upper Span Length (Feet)	Type of Crossing Wires: Communication Wires, Cables, and Messengers	Type of Crossing Wires: Open Supply Wires, C-750 V; Supply Cables, All Voltages, Having Grounded Metal Sheath; Cable Messengers, Insulated Conductors Supported on and Cabled with an Effectively Grounded Messenger							
			Line Wires							Service Drops
			#6 Copper	#4 ACSR 6/1	#4 ACSR 7/1	#2 ACSR 6/1	#2 ACSR 7/1	6 ACW	8 ACW	
Midspan	175	2/ 2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1/ 2.0
	200	2.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	1/ -
	250	4.25	5.6	6.25	6.25	6.25	6.25	6.25	6.25	-
	300	5.75	5.6	7.3	7.75	7.7	7.75	7.75	7.75	-
	350	7.25	5.6	7.3	8.0	7.7	8.5	8.4	8.7	-
	400	8.75	5.6	7.3	8.0	7.7	8.5	8.4	8.7	-
1/4 span	175	2/ 2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1/ 2.0
	200	-	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1/ -
	250	-	4.6	5.1	5.1	5.1	5.1	5.1	5.1	-
	300	-	4.6	6.0	6.4	6.4	6.4	6.4	6.4	-
	350	-	4.6	6.0	6.6	6.4	7.0	6.9	7.1	-
	400	-	4.6	6.0	6.6	6.4	7.0	6.9	7.1	-
1/10 span	175	2/ 2.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1/ 2.0
	200	-	4.0	4.0	4.0	4.0	4.0	4.0	4.0	1/ -
	250	-	4.0	4.0	4.0	4.0	4.0	4.0	4.0	-
	300	-	4.0	4.0	4.0	4.0	4.0	4.0	4.0	-
	350	-	4.0	4.0	4.0	4.0	4.0	4.0	4.1	-
	400	-	4.0	4.0	4.0	4.0	4.0	4.0	4.1	-

Table 8 (Continued)
Crossings of Wires Carried on Separate Supports Over Communication Wires
Minimum Vertical Clearances (Feet)
Heavy Loading District

Upper Span Crossing Point	Upper Span Length (Feet)	Type of Crossing Wires						
			Open Supply Wires and Service Drops 750 - 8700 V					
			#4 ACSR		#2 ACSR			
		#6 Copper	6/1	7/1	6/1	7/1	6 ACW	8 ACW
Midspan	175	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	200	4.75	4.75	4.75	4.75	4.75	4.75	4.75
	250	5.6	6.25	6.25	6.25	6.25	6.25	6.25
	300	5.6	7.3	7.75	7.7	7.75	7.75	7.75
	350	5.6	7.3	8.0	7.7	8.5	8.4	8.7
	400	5.6	7.3	8.0	7.7	8.5	8.4	8.7
1/4 span	175	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	200	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	250	4.6	5.1	5.1	5.1	5.1	5.1	5.1
	300	4.6	6.0	6.4	6.4	6.4	6.4	6.4
	350	4.6	6.0	6.6	6.4	7.0	7.0	7.1
	400	4.6	6.0	6.6	6.4	7.0	7.0	7.1
1/10 span	175	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	200	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	250	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	300	4.0	4.0	4.0	4.0	4.0	4.0	4.0
	350	4.0	4.0	4.0	4.0	4.0	4.0	4.1
	400	4.0	4.0	4.0	4.0	4.0	4.0	4.1

Table 8 (Continued)
Crossings of Wires Carried on Separate Supports Over Communication Wires
Minimum Vertical Clearances (Feet)
Heavy Loading District

Upper Span Crossing Point	Upper Span Length (Feet)	Type of Crossing Wires							
		Open Supply Wires and Service Drops 8700 to 50,000						Guys, Span Wires, Lightning Protection Wires	
		#6 Copper	#4 ACSR 6/1	#4 ACSR 7/1	#2 ACSR 6/1	#2 ACSR 7/1	6 ACW	8 ACW	
Midspan	175	6.0	6.0	6.0	6.0	6.0	6.0	6.0	1/ 2.0
	200	6.75	6.75	6.75	6.75	6.75	6.75	6.75	-
	250	7.6	8.25	8.25	8.25	8.25	8.25	8.25	-
	300	7.6	9.3	9.75	9.7	9.75	9.75	9.75	-
	350	7.6	9.3	10.0	9.7	10.5	10.4	10.7	-
	400	7.6	9.3	10.0	9.7	10.5	10.4	10.7	-
1/4 span	175	6.0	6.0	6.0	6.0	6.0	6.0	6.0	1/ 2.0
	200	6.0	6.0	6.0	6.0	6.0	6.0	6.0	-
	250	6.5	7.0	7.0	7.0	7.0	7.0	7.0	-
	300	6.5	7.9	8.2	8.2	8.3	8.3	8.3	-
	350	6.5	7.9	8.5	8.2	8.9	8.9	9.1	-
	400	6.5	7.9	8.5	8.2	8.9	8.9	9.1	-
1/10 span	175	6.0	6.0	6.0	6.0	6.0	6.0	6.0	1/ 2.0
	200	6.0	6.0	6.0	6.0	6.0	6.0	6.0	-
	250	6.0	6.0	6.0	6.0	6.0	6.0	6.0	-
	300	6.0	6.0	6.0	6.0	6.0	6.0	6.0	-
	350	6.0	6.0	6.0	6.0	6.1	6.1	6.2	-
	400	6.0	6.0	6.0	6.0	6.1	6.1	6.2	-

Table 8 - Continued

1/ Crossing of communication conductors by guys, span wires, or lightning protection wires longer than the basic span lengths are not anticipated. If encountered, increased clearances in accordance with Rule 233 B1(a) and 233 B1 (b) should be applied.

2/ Clearance of communication conductors from each other in locations where no other classes of conductors are involved may be reduced by mutual consent of the parties involved. Specific reductions in long-span clearances for other than mid-span crossings are not covered by NESC. Guidance information for clearances in such cases may be found in Rule 233 B1(b) of NESC. Recommended minimum under any condition - two feet.

3/ This clearance shall be increased to 6 feet with corresponding increases for longer spans as provided for in NESC 233 B, where the supply wires cross horizontally over a communication line within 6 feet of a communication pole.

4/ A clearance of 2 feet may be permitted where the supply conductor is above the communication conductor, provided the crossing is not within 6 feet of any pole concerned in the crossing and the voltage to ground does not exceed 300 volts.

5/ Clearances of effectively grounded (neutral) conductors may be reduced to minimum 2 feet, with appropriate increases for longer spans (See Rule 233 B), where the crossing conductor is associated with a circuit of 0 to 22,000 volts.

6/ Supply cable having effectively grounded metal sheath, or insulated conductors supported on and cabled together with an effectively grounded messenger, of all voltages, and messengers associated with such cable may have a clearance of 2 feet from communication wires, cables and messengers except where they cross under communication cables.

7/ Where a 2 foot clearance is required at 60°F and where conditions are such that the sag in the upper conductor would increase more than 1.5 feet at the crossing point under the applicable loading of NESC rule 251, the 2 foot clearance shall be increased by the amount of sag increase less 1.5 feet.

Table 9

CLEARANCE BETWEEN TELEPHONE GUYS, CABLES AND COMMUNICATION WIRES IN THE UPPER POSITION AT CROSSINGS

Type of Wires Crossed	Minimum Vertical Clearance (feet)
1. Other Communication Wires and Cables	2
2. Guys, Span Wires, Lightning Protection Wires, Service Drops, 0-750 Volts (Notes 1 and 2)	2

Note 1. When telephone cables cross over electric supply service wires, this clearance must be increased to four feet.

Note 2. Completely insulated sections of guys attached to structures having no conductor of more than 8700 volts may have less than this clearance from each other.

Note 3. These crossing clearances are based on a temperature of 60°F. and no wind for the following span length:

a. In heavy loading district	175 feet
b. In medium loading district	250 "
c. In light loading district	350 "

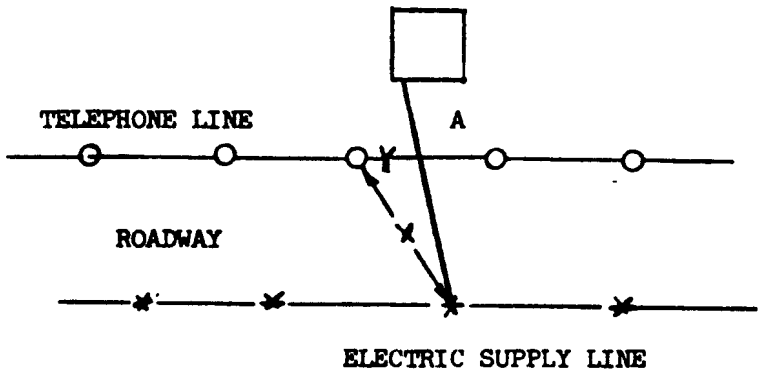
Clearances must be increased .3 foot per 10 feet of excess span length in the heavy and medium loading districts and a .15 foot per 10 feet of excess span length in the light loading districts. When the crossing point is located elsewhere than at the point of maximum sag, certain reductions in the clearances are permitted by the NESC. This is usually of minor importance in those situations where communication conductors are in the upper position.

The clearance required (Distance Y) between the telephone pole and the electric supply wires (NESC Rule 234B) is 12 inches plus one inch for each 2 feet of distance X.

X.

Distance Y must be not less than 3 feet.

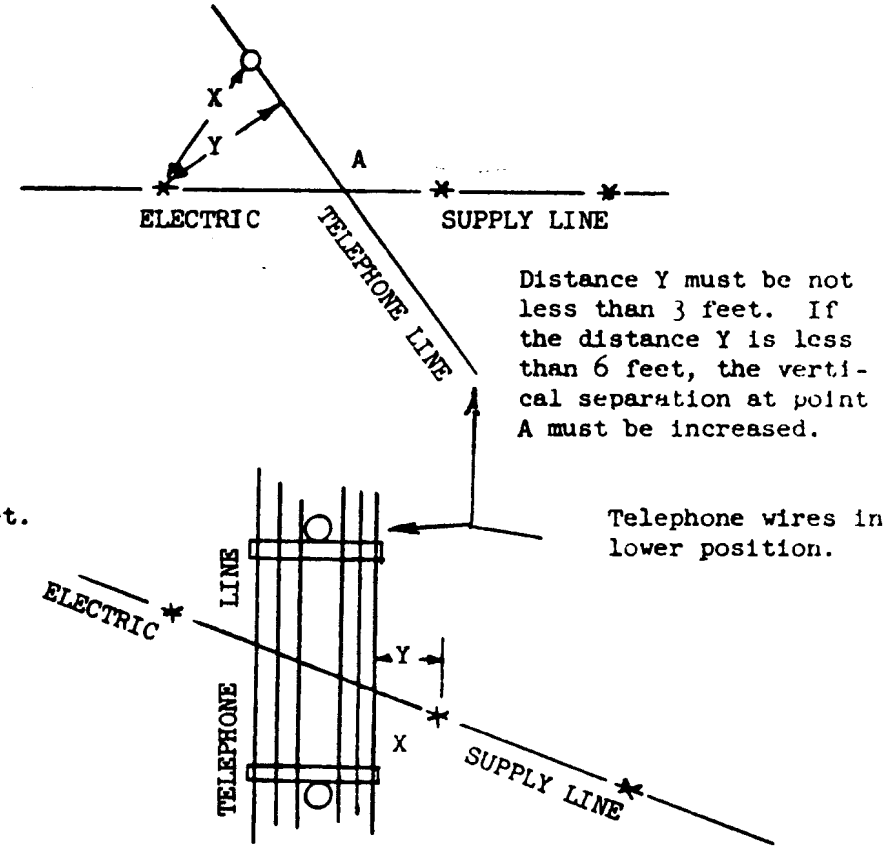
The correct vertical separation must be obtained at point A.



The clearance required (Distance Y) between the telephone wires and the electric supply pole is equal to the separation required between the telephone wires at the telephone pole plus one inch for each 2 feet of distance X.

The correct vertical separation must be obtained at point A.

Distancy Y must be not less than 3 feet. If distance X exceeds 60 feet, Y must be increased one inch for each 2 inches in excess of 60 feet.



Note: Joint pole crossings are preferred in all these situations; the above rules apply when joint crossings are not practicable.

Figure 1 Clearances Between Telephone Wires and Conflicting Structures - Typical Situations