

CLEARANCE AND SEPARATION CONSIDERATIONS
 IN LONG SPAN JOINT USE CONSTRUCTION

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APPENDIX 1 - ILLUSTRATIVE PROBLEM

1. GENERAL

- 1.01 This section discusses the separation and clearance considerations involved in long span joint use construction. The term "long span" as used in this practice refers to spans greater than about 150 feet in length.
- 1.02 Information on the sag characteristics of power and telephone conductors is contained in other sections of the AG series of Bell System Practices.
- 1.03 The clearance and separation requirements specified herein are based on Part 5 of Joint Pole Practices for Supply and Communication Circuits dated May, 1946, prepared by the Joint Committee on Plant Coordination of the Edison Electric Institute and the Bell Telephone System. A copy of this report is attached to another section of the AG series of the Bell System Practices. The lawful requirements of state or local authorities govern, of course, where they exceed those specified in this section.
- 1.04 The fundamental purpose for establishing minimum requirements of clearances and separations is to ensure the safety of the public and the workmen of the Telephone Company and the power organization, and to provide for protection of the plant. In the interest of the workmen's safety, the provision of adequate working space on the pole is a major factor in the minimum separation requirements.

2. CLEARANCES ABOVE GROUND OR RAILS

- 2.01 MINIMUM vertical clearances of communication conductors or cables are specified in Table 1. The clearances in Table 1 apply under the following conditions:
- (a) Temperature of 60° F, no wind, and the conductor at its stringing sag or the cable at its "in place" sag.
 - (b) Span lengths not greater than 175, 250, and 350 feet in the heavy, medium, and light loading areas, respectively.
 - (c) Fixed supports for the conductor, i.e., insulator pin or dead-end bracket.
- 2.02 For aerial wire spans exceeding the lengths specified in Paragraph 2.01(b) the minimum clearances specified for all conditions except railroad crossings shall be increased by 0.1 foot for each 10 feet of excess of span length over these limits. This increase does not apply to guys or cables supported on strand.
- 2.03 Details of railroad crossing construction, including the incremental increases in clearance applicable to spans exceeding the lengths specified in Paragraph 2.01(b), are covered in another section of the AGL7 division of the Bell System Practices.
- 2.04 Good judgment should be exercised in applying the rules for minimum clearances to specific cases. It must be recognized that conditions peculiar to a particular situation may make it desirable to increase the clearances specified in Table 1. The clearances in Table 1 should be considered as minimum values and should be increased as necessary to ensure safety to personnel and plant based upon the knowledge of the abnormal conditions that apply to the pole line under consideration. Careful consideration should be given to the matter of classifying roads as urban or rural for the purpose of determining the clearance required. The differential between urban and rural roads should be made on the basis of the type and density of traffic carried. A highway, even though in the country, on which the traffic is

TABLE 1

<u>Nature of Ground or Rails Underneath Wires</u>	<u>Communication Cables or Conductors (Feet)</u>
<u>Crossing over Railroad Tracks</u>	
ON RAILROADS HANDLING FREIGHT CARS ON TOP OF WHICH MEN ARE PERMITTED:	
In General	27 Note (a)
Where the Joint Line is Paralleled by Trolley Contact Conductors on Same Street or Highway	25
OF OTHER RAILROADS	18
<u>Crossing over Other Traveled Ways</u>	
STREETS OR ROADS	18 (1)
ALLEYS	15
DRIVEWAYS TO RESIDENCE GARAGES	10
SPACES OR WAYS ACCESSIBLE TO PEDESTRIANS ONLY:	
In General	10 Note (b)
<u>Running along Streets, Alleys, or Roads</u>	
IN URBAN DISTRICTS:	
In General	18
Alleys	15
IN RURAL DISTRICTS:	
In General	14
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	13
IN URBAN OR RURAL DISTRICTS:	
Spaces or Ways Accessible to Pedestrians Only:	
In General	10 Note (b)

- (1) If a communication service drop, or a telephone guy that is effectively grounded or effectively insulated against the highest voltage to which it is exposed, up to 8700 volts, crosses a street or road, the clearance may be reduced to 16 feet at the side of the traveled way, provided standard or better clearance is obtained at the center of the street or road. A discussion of grounding or insulating guys is contained in a section of the AG20 division of the Bell System Practices.

Note (a): Guys and cables on messengers may have a clearance above railroad tracks of not less than 25 feet.

Note (b): Conductors limited to 160 volts to ground and cables may have a clearance of not less than 8 feet above ground.

often very heavy or which may be classified as a "high speed" road should, for the purpose of determining clearance requirements, be considered as an urban road.

3. VERTICAL SEPARATIONS

3.01 In the shorter joint use spans, when the minimum separations are provided at the pole, adequate separations will usually be obtained between the conductors in the span. However, in the longer spans, adequate separations may not obtain in the span if only the minimum separations are provided at the pole. This is because of the differences in the characteristics of communication wire and cable and supply conductors. The sags of supply conductors generally increase more rapidly with increased span lengths than do the sags of communication conductors. Therefore, with the same separations at the pole the separations between the conductors in the span will tend to decrease as the span lengths increase. For this reason it is necessary to be concerned

with separation in the span as well as at the pole in the longer joint use spans.

3.02 The minimum separations required for joint use construction are shown in Table 2. As stated in Paragraph 3.01, the requirement applicable to separations between conductors in the span shown in the right-hand portion of Table 2 becomes increasingly important as the span lengths increase. It should be noted that some of the span separations are with reference to the "line-of-sight" (L/S) of the communication conductor. The line-of-sight of the communication conductor is the straight line joining the two points of support of the conductor at either end of the span. Figs. 1 and 2 illustrate the separation requirements shown in Table 2 applicable to a joint use route supporting a crossarm of telephone wire and an 0-8700-volt, single-phase multigrounded neutral supply line. Fig. 1 illustrates the separations required when no secondaries are present and Fig. 2 illustrates the separations required when secondaries are present.

TABLE 2

Required Separations in Inches between Telephone and Supply Crossarms, Telephone, and Supply Conductors

Voltage (Between Conductors)	At the Pole		In the Span
	Between Crossarms	Between Conductors	Between Conductors
0-750	48	40	30 or L/S if greater
750-8700	48	40	L/S + 30
8700-15,000	72	60	L/S + 30
Neutrals (MG) of systems up to 15,000	48	40	30
15,000-50,000	72	60	45 or L/S + 30 if greater
Neutrals (MG) of systems 15,000 to 50,000	72	60	45

Note: "L/S" indicates that the supply conductor must be above the line of sight of the telephone conductor. "L/S + 30" indicates that the supply conductor must be 30 inches above the line of sight of the telephone conductor.

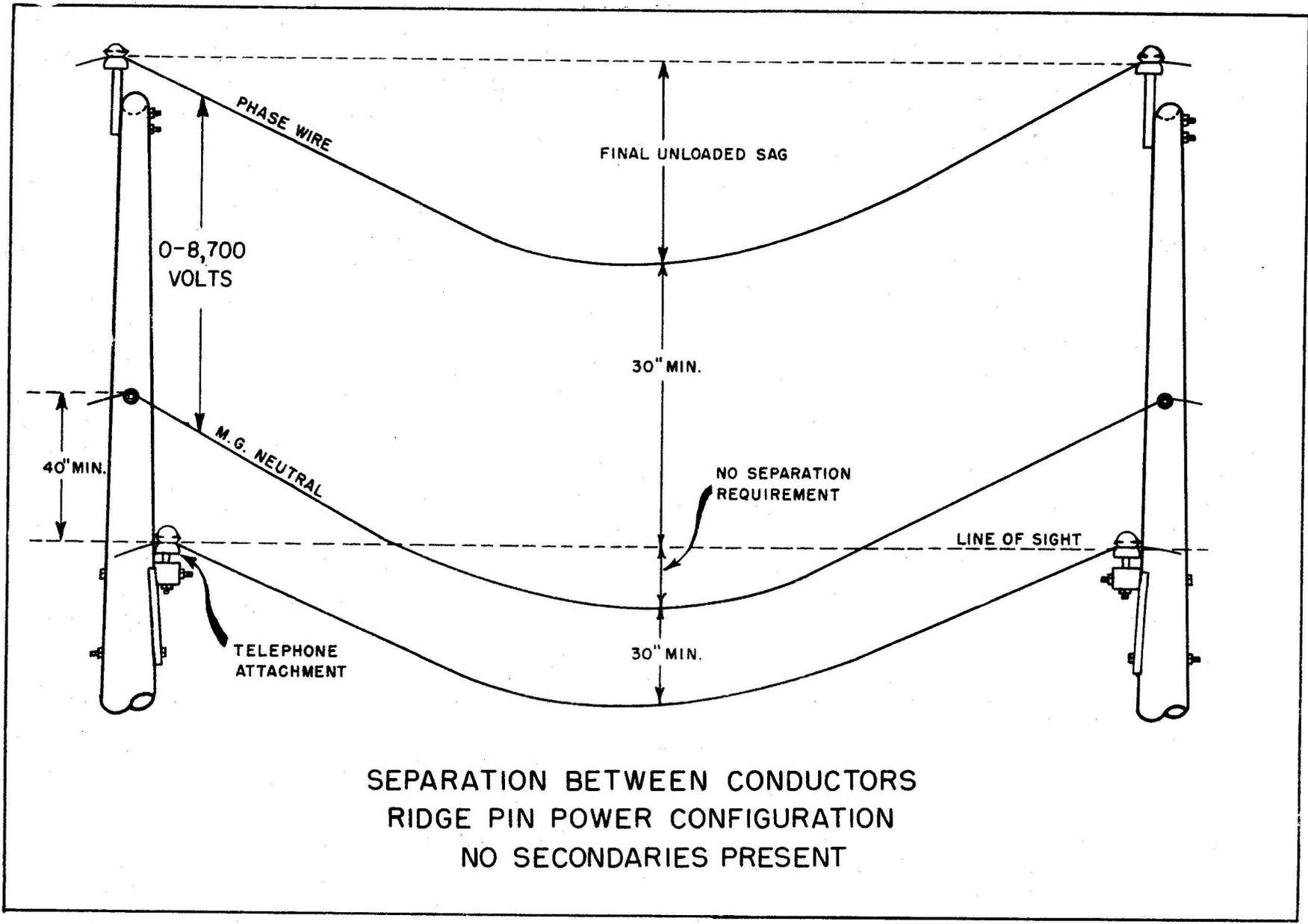
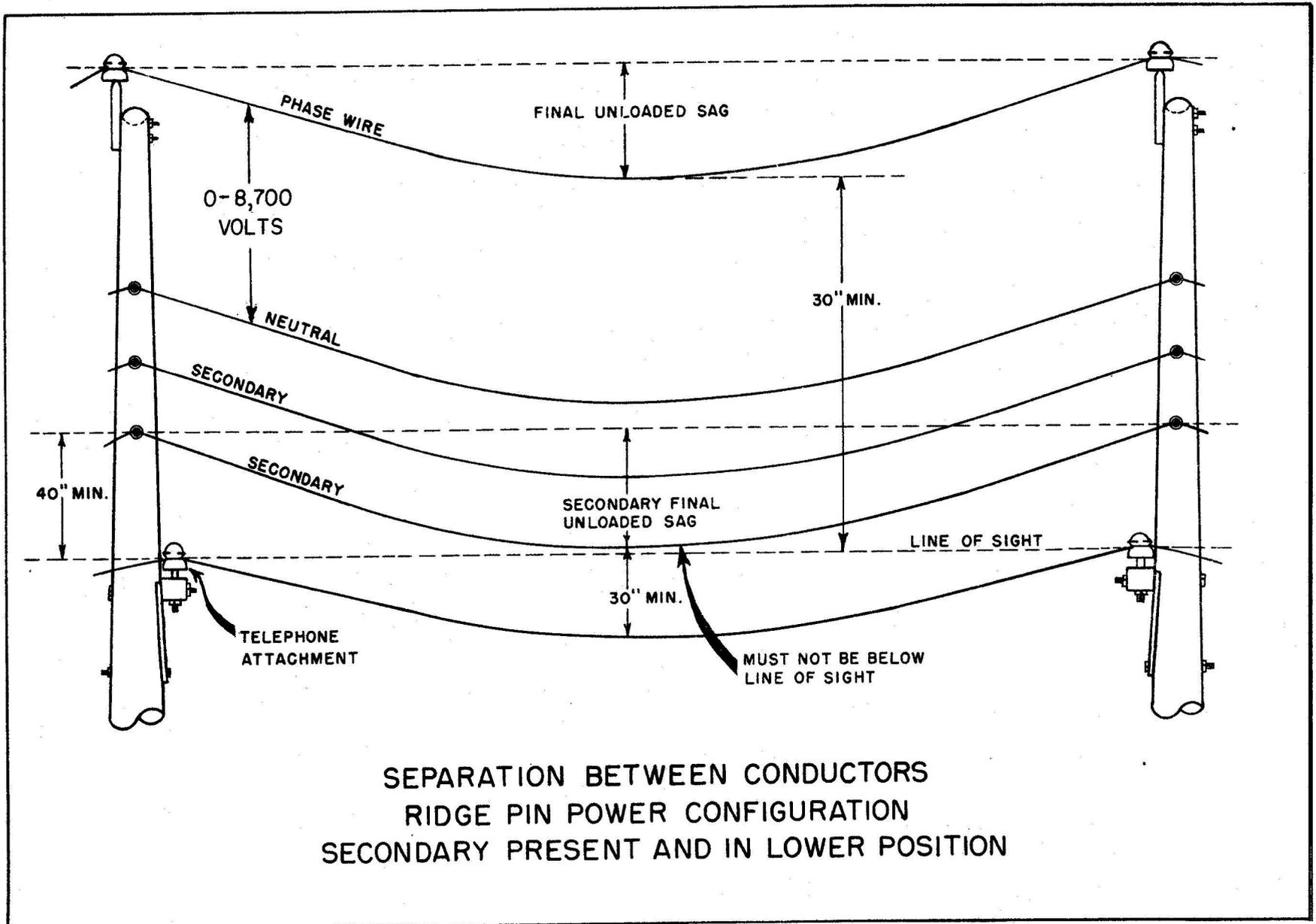


Fig. 1



SEPARATION BETWEEN CONDUCTORS
 RIDGE PIN POWER CONFIGURATION
 SECONDARY PRESENT AND IN LOWER POSITION

Fig. 2

3.03 The separations shown in Table 2 assume the supply conductor to be in its final unloaded sag position and the communication conductor in its basic sag position, both at 60° F and no wind. The separations must be adjusted, of course, for conditions other than those assumed.

3.04 It should be pointed out that either the separation requirement at the pole or in the span will determine the location of the telephone attachment on the pole. The minimum separations at the pole will apply even though the separation in the span could be obtained with less separation at the pole and, if the separation in the span can not be met with the minimum separation required at the pole, the separation at the pole must be increased until, at least, the minimum separation requirement in the span is satisfied.

4. PLANNING LONG SPAN JOINT USE CONSTRUCTION

4.01 As stated in Paragraph 3.04, the separation requirements shown in Table 2 are based on the position of the supply conductor at 60° F, no wind, after being subjected to either the maximum storm load of the loading area in which it is located or the equivalent loading. A physical inspection, therefore, will not generally be sufficient to verify the adequacy of existing separations nor to determine the locations of proposed telephone attachments. The amount of sag that a supply conductor will have after it has been subjected to the maximum storm load or equivalent depends upon the design factors used in placing the conductor.

4.02 To determine the position of the supply conductor at its final unloaded condition the telephone engineer must have available the sag and tension data for the particular type wire being used by the power organization. A discussion of sag and tension data is covered in another section of the AG series of the Bell System Practices.

4.03 For the purpose of determining separations, each long span joint use proposal should be considered separately because of the variable factors which affect the locations of the telephone and supply attachments on the pole. It is believed that the general approach covered in the following paragraphs will be applicable to most situations which will be encountered.

4.04 Where joint use is planned on an existing supply line, certain information regarding the line should be obtained from the power organization. This information should include the following items:

- (a) Phase-to-phase and phase-to-ground voltage of the supply line.
- (b) Type, gauge, and breaking strength of supply conductors.
- (c) Tension of the conductors under full storm loading conditions expressed in terms of per cent of ultimate conductor strength.
- (d) Ruling span or spans.
- (e) Basic pole height.
- (f) Specifications for all types of pole head configurations used in the proposed joint use section, showing the positions of phase, neutral and secondary wires and transformers, or other supply line pole attachments.
- (g) Staking sheets or other pole records showing span length and pole data, if available. These sheets or records, however, should not be considered as a substitute for a field survey.
- (h) Future plans in this section, such as proposed primary or secondary extensions, voltage changes and reroutes.

It is recommended that the basic information outlined above be secured before detailed field notes are obtained because of the possible effect this information may have on the final plans. A preliminary inspection of these data might reveal that certain design characteristics of the supply line, not apparent from a field inspection, are such that joint use could not be accomplished without major pole line rearrangements. Since the associated additional costs for joint use rearrangements may affect the basic decision for joint use of the

pole line, it may be desirable to re-examine the cost comparison of a separate route as opposed to joint use construction. The design of the telephone plant should be coordinated with the future plans of the power organization to obviate or minimize future rearrangements.

4.05 Field notes of the supply routes on which joint use is proposed should include:

- (a) Individual span measurements.
- (b) Pole heights and classes.
- (c) Designation of poles at which the supply neutral is grounded.
- (d) Location of transformers, circuit breakers or similar power pole attachments.
- (e) Indication of pole head configuration.
- (f) Indication of depth of pole setting if other than normal depth.
- (g) Indication of whether the supply line guys are insulated or grounded.
- (h) Notation of topographical conditions in spans which will determine the basic clearance required and notations of special conditions such as depressions or ridges which might affect the basic clearance.

As a practical matter, the calculations necessary to determine the telephone attachment locations can usually be performed more conveniently in the office rather than in the field, and the details of the supply lines as outlined above will be required for this determination. In addition to determining the location of the telephone attachments, the items from the field notes will permit verification of pole strengths and heights, selection of locations of any protectors or drainage coils required and call attention to locations which should be rechecked in the field

to ensure that the proper ground clearance will be obtained with the separation required at the pole.

4.06 The first step in determining the required separation between the supply and telephone attachments on the poles is to calculate the final unloaded sag in the supply conductors at 60° F, no wind since this is the basis of all separation requirements. The final unloaded sag of the supply wires must be calculated because it is not usually known whether the wire has been subjected to the maximum loading applicable to the loading area in which it is constructed. Since the sag depends upon the design factors which controlled the initial sags in the wire, it is important to secure as much information as possible from the power organization relative to the design factors used. The design factors which are most important in determining the sag are the type, gauge, and breaking strength of the wire, the ruling span for the proposed joint use section or sections, and the maximum stress of the wire under storm loading. If the ruling span can not be obtained from the power organization, it usually can be approximated quite closely by the formula:

$$\text{Ruling Span} = \text{Average Span} + \frac{2}{3} (\text{Maximum Span} - \text{Average Span})$$

4.07 After the ruling span has been determined the final unloaded sag in the ruling span can be obtained by referring to published data on sags and tensions generally available from manufacturer's catalogs. Fig. 3 illustrates a typical sag and tension curve reproduced from the Edison Electric Institute Publication, F9, "Conductor Sags and Tensions for Rural Lines." It should be noted that the limiting conditions specified on the sag and tension chart illustrated in Fig. 3 are slightly different from the minimum requirements as specified in the Fifth Edition of the National Electrical Safety Code. Condition 1 is the loading assumption of the Fourth Edition of the Code which is substantially the same as that of the Fifth Edition as explained elsewhere in the AG series of the Bell System Practices. Conditions 2 and 3 are slightly more stringent than the Code requirements in that the tension limitations are specified for 15° F instead of 60° F. These are the limits which have been recommended

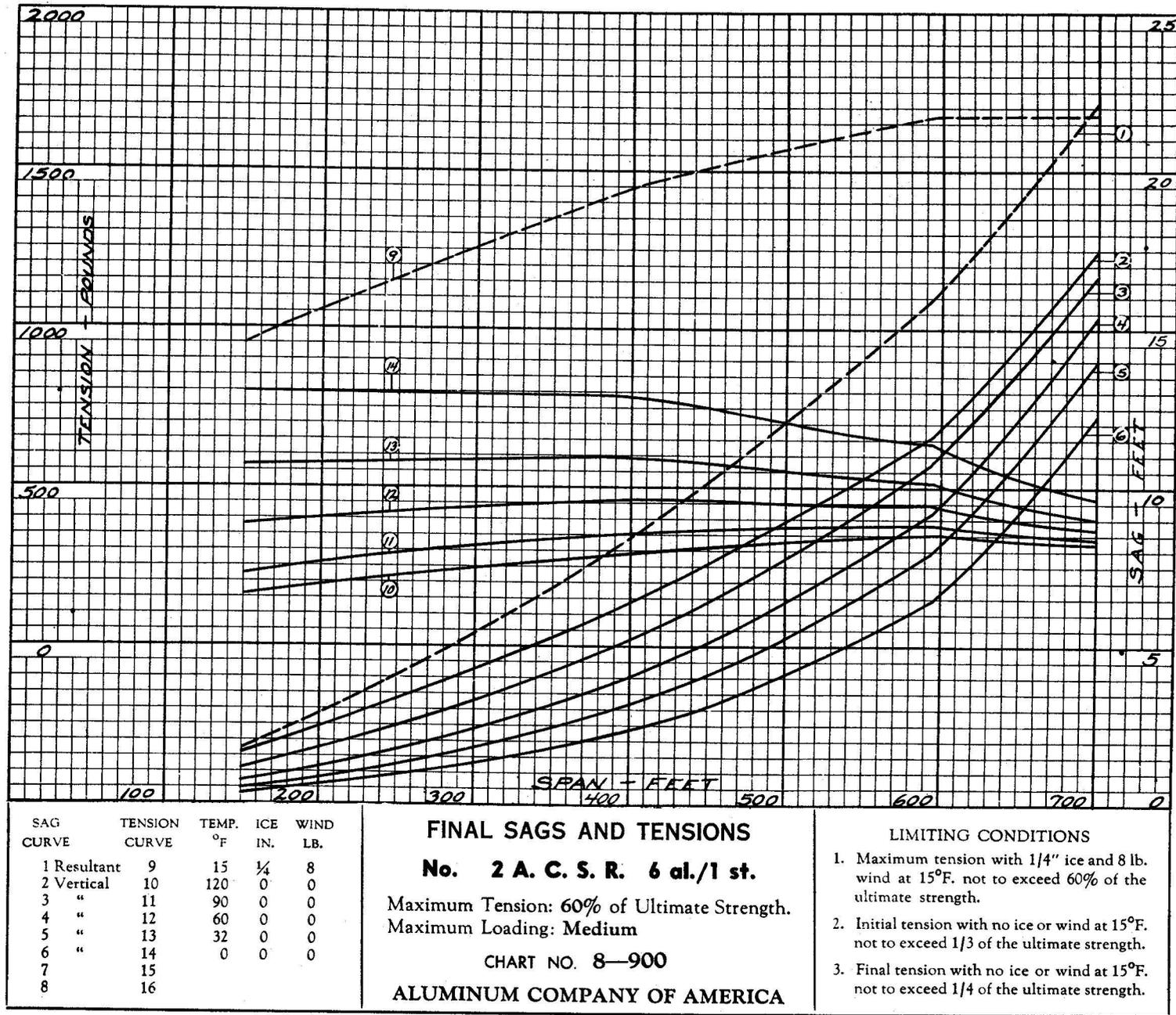


Fig. 3

by the manufacturer to produce the optimum balance of strength and economy for this type of conductor. As stated previously, the design limitations actually used by the power organization must be ascertained and the same limitations used by the telephone engineer in calculating separation requirements.

4.08 Having determined the sag of the supply conductor in the ruling span, the sag of the conductor in any given span in the section can be determined by the formula covered in Paragraph 5.03. Knowing the sags of the telephone and supply conductors it can now be determined what separation will be required at the pole to obtain the minimum separation required in the span.

5. FORM FOR CALCULATING SEPARATION REQUIREMENTS

5.01 To facilitate calculating the maximum height of telephone attachments on joint use poles and to provide a formalized procedure for tabulating the data, it is suggested that a locally prepared form similar to that shown in Fig. 4 be used. The form illustrated was prepared on the basis of the separations required between telephone conductors and supply conductors of 8700 volts or less between conductors. However, the same general type of form may be used for any voltage of supply line.

5.02 The span lengths to be investigated are entered in column A. These span lengths should range from the longest to the shortest span in a particular section. The number and length of intermediate spans should be selected to generally agree with the variation in span lengths of the section. Intermediate span lengths in multiples of 10 feet will generally be adequate for the purpose of determining separation requirements. In addition to simplifying the calculations, the use of 10-foot multiples will permit determination of the telephone conductor sag values from most of the open wire sag tables in the Bell System Practices without interpolation.

5.03 The squares of the span lengths are entered in column B for use in the formula:

$$S = \frac{L^2}{L_{RS}^2} \times S_{RS}$$

Where S = Sag of other span
 S_{RS} = Sag of ruling span
 L = Length of other span
 L_{RS} = Length of ruling span

5.04 The sag of the telephone conductor is secured from the appropriate sag tables in the Bell System Practices and entered in column E. The sag of telephone wire in spans not covered in the particular table may be determined in the same manner as that specified in Paragraph 5.03 for power conductors. The basic span applicable to the particular table for telephone conductors is used in the formula instead of the ruling span.

5.05 Columns F, G, and H provide for the minimum separations required at the pole to meet the separations required in the span between the telephone conductor and the supply conductors. The separations are entered in these columns in terms of feet and inches. The term "Lowest Power Conductor" is used to make the form applicable to all types of power configurations. A minimum separation of 40 inches between telephone and supply conductors or 48 inches between telephone and supply cross-arms, depending upon the configuration of the supply line, must be obtained at the pole even though the separations in the span could be obtained with less than these separations at the pole. If the computation indicates that the separation at the pole required for the separation from the lowest power conductor in the span is less than the applicable minimum separation requirement at the pole, the minimum pole separation should be entered in column H. This is covered by a footnote on the form.

5.06 Columns I, J, K, and L convert the separations required from the supply conductors to the maximum height above ground which the telephone conductors can be placed on the pole by subtracting the separations from the height above ground of the corresponding supply conductor. The calculations should be made on the basic pole height of the joint use section. The maximum height above ground of the telephone conductor on poles of heights different from the basic pole can be readily determined by inspection based on pole heights and depths of setting. The heights above ground of the supply conductors are calculated by subtracting the depth of setting and the distance of the supply conductor below the top of the pole from the nominal height of the pole. To obtain the height above ground of a conductor on a ridge pin, the depth at which the pole is set is subtracted from the sum of the distance between the conductor and the top of the pole and the nominal height of the pole.

5.07 When the maximum heights of the telephone conductor are listed in columns I, J, K, and L, the limiting height for each span length is readily apparent. When secondaries are present, the smallest value in columns I, J, and K is the limiting height. When no secondaries are present, the smaller value in columns I and L is the limiting height.

5.08 In some instances the type and gauge of conductor used in the phase circuit may differ from that used in the neutral or secondary in the same section of line. This, of course, will require the preparation of a separate form for each different type and gauge of wire involved; on each form filling in only the data applicable to the particular circuit being considered.

5.09 The data on maximum height of telephone conductors on joint use poles can be more readily used by the construction forces if it is furnished to them in terms of height above ground of cable or crossarm through bolt locations. The figures in columns I through L will be the locations of the cable suspension clamp through bolt, however, 6 inches must be subtracted from these figures to obtain the locations of crossarm through bolts.

5.10 A space is provided on the form for a sketch of the pole head configuration. The data for this sketch should be obtained from the power organization.

5.11 The use of this form is illustrated in the example contained in the attached Appendix 1.

Attached:
Appendix 1

ILLUSTRATIVE PROBLEM

The following example illustrates the principles of determining the proper height of telephone attachments on poles in a rural supply line in order to meet required clearances and separations for joint use.

Example: A crossarm and two circuits of 109H wire are proposed in the medium loading area on the section of supply route shown in Exhibit 1.

The following information with respect to the supply line was secured from the power organization:

Voltage - 6900 volts to ground

Conductors - No. 2 ACSR (6A/1St)

Conductor Tension Limitations - The following recommendations of the manufacturer were observed.

- (1) Maximum tension with 1/4-inch ice and 8-pound wind at 15° F not to exceed 60 per cent of the ultimate strength.
- (2) Initial tension with no ice or wind at 15° F not to exceed one third of the ultimate strength.
- (3) Final tension with no ice or wind at 15° F not to exceed one fourth of the ultimate strength.

Configuration - Ridge Pin, Single Phase

Ruling Span - Not Available

The length of the section is 14,358 feet and consists of 41 spans.

To determine the final unloaded sag in the power conductors, it is first necessary to compute the length of the ruling span as follows:

$$\text{Ruling Span} = \text{Avg. Span} + \frac{2}{3} (\text{Max. Span} - \text{Avg. Span})$$

$$\text{Avg. Span} = \frac{14,358}{41} = 350 \text{ ft.}$$

$$\text{Max. Span} = 395 \text{ ft. (From Field Notes)}$$

$$\text{R.S.} = 350 + \frac{2}{3} (395 - 350) = 380 \text{ ft.}$$

In a 380-foot span the final unloaded sag of No. 2 ACSR (6A/1St) at 60° F, no wind is found to be 3.7 feet (or 44 inches) from Chart 8-900 (See Fig. 3 in body of section).

The height of the telephone attachments for various span lengths can now be determined by completing the form as shown in Exhibit 2. The range of span lengths involved in the supply line is from 130 feet to 395 feet. It will be noted from the data in Exhibit 2 that when no secondaries are present the 40-inch minimum separation is controlling up to a 350-foot span and the 30-inch separation in the span is controlling for spans of 360 feet and longer. When secondaries are present, the 40-inch minimum separation is controlling up to 350-foot spans, the 30-inch separation in the span for 360- and 370-foot spans, and the line-of-sight requirement controls for 370-foot and longer spans.

From notes taken in the field and a knowledge of the terrain it is now possible to specify the height at which the telephone crossarms should be placed to obtain the proper separation and clearance. It must be remembered that in order to determine the height above ground of the crossarm through bolt, six inches must be subtracted from the conductor heights in columns I through L of the form. The reason for this is that the height of the telephone conductor exceeds the height above ground of the crossarm through bolt by about six inches.

The section of line from pole B/1 to B/4 is a sufficient distance from the highway so that the crossarm will not overhang the traveled portion and since this is a rural district a minimum basic clearance of 13 feet is required. Highway No. 63 is on a 2-foot fill at the point where the power line crosses it between poles B/5 and B/6. The minimum basic clearance of 18 feet over the road can not be obtained with the existing poles since the maximum height of the telephone conductor on a 35-foot pole with a secondary is 19 feet and the conductor will have a sag of 14 inches in a 250-foot span. Since pole B/5 is only 40 feet from the center line of the highway, the clearance can be obtained by replacing this pole with a 40-foot pole and attaching the crossarms at the maximum heights on the crossing poles. The maximum height of the crossarm through bolt on a 35-foot pole is 18 feet 6 inches, therefore, the maximum height on a 40-foot pole which

is set at the same depth as a 35-foot pole is 5 feet more or 23 feet 6 inches. The section of the route between poles B/6 and B/8 crosses a field and is only accessible to pedestrians, therefore, a basic clearance of 8 feet is acceptable. The highway is in a 2-foot cut at the point it is crossed by the route between pole B/8 and B/9, therefore, the required clearance of 18 feet can be obtained over the highway by attaching the crossarm at a height of 18 feet 6 inches which is the maximum height for a 237-foot span as indicated on the form (19 feet 0 inches less 6 inches for distance from open wire level to through bolt level).

It is noted that the maximum span length in the section between poles B/1 and B/9 is 395 feet. The maximum height which the crossarm can be placed on a 400-foot span length when secondaries are present is 17 feet 11 inches (18 feet 5 inches less 6 inches). Rounding this height to 17 feet 6 inches, this figure will provide satisfactory clearance in all spans between poles B/1 and B/9 with the exception of the highway crossing spans and is the recommended attachment level shown. This will provide a minimum ground clearance of about 15 feet.

The section of the route between poles B/9 and B/23 traverses a hay field and is subject to loaded hay wagons passing under the line; it is desirable, therefore, to obtain the maximum clearance in this section. There is

very little possibility of a secondary extension in this section. The longest span in the section between poles B/9 and B/22 is 391 feet and the maximum height of crossarm attachment for this length span when no secondary is present is 21 feet 4 inches. This limiting height rounded to 21 feet is specified for the entire section between poles B/9 and B/22.

The crossarms in the section of the line between poles B/23 and B/41 along the rural road will overhang the traveled portion of the road. Therefore, a minimum basic clearance of 14 feet is required. Although there is no existing secondary between poles B/30 and B/41 there is a good possibility of a secondary extension in this section. Therefore, this section should be treated as though a secondary were already existing to obviate future rearrangements. The crossarm attachment height of 18 feet 0 inches is based on the worst condition of clearance which in this instance would be in the 390-foot span. As stated in Paragraph 2.02 the basic clearance of 14 feet is based upon a span of 250 feet in the medium loading district and this basic clearance should be increased by 0.1 foot for each 10 feet of excess span length over the basic span length. The actual clearance requirement for a 390-foot span, therefore, is 15 feet 5 inches. A clearance of 15 feet 8 inches will be obtained in the 390-foot span when the telephone wire which will have a sag of 2 feet 10 inches is placed at a height of 18 feet 6 inches on the pole.

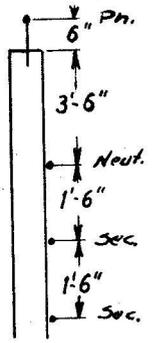
POWER ORGANIZATION Milton Co. Electric Co-op
 LOCATION OF JOINT USE SECTION Fernwood Area - Milton Co.
 LOADING AREA Medium

AUTHORIZATION M-2392
 EXCHANGE Clifton
 DATE 6/7/54
 PREPARED BY RIP

VOLTAGE: BETWEEN CONDUCTORS _____; TO GROUND 6900 (single ϕ - MG Neut.)
 TYPE AND GAUGE OF POWER CONDUCTOR #2 ACSE
 MAXIMUM TENSION 60 % OF BREAKING STRENGTH
 RULING SPAN 380 FT.
 FINAL UNLOADED SAG IN RULING SPAN (RS) 44 IN (CHART 8-900)
 (RULING SPAN)² (RS)² 144,400

POWER POLE-HEAD CONFIGURATION

TYPE TELEPHONE PLANT PROPOSED 109H
 SAGS IN COL. E FROM BSP G31.116.4 Table 14



SPAN FT.	POWER CONDUCTOR			TEL. COND	SEPARATIONS AT POLE FOR REQUIRED SPAN SEPARATION			MAXIMUM HEIGHT OF * TELEPHONE CONDUCTORS				
	(Col.A) ²	Col.B (RS) ²	SAG (RS SAG X Col.C)		SAG IN.	Phase 750-8700V (L/S+30 in.) Col.D+30	Sec 0-750V (L/S) Col.D	Lowest Power Cond. (30 in.) Col.E+30 #	35 FT POLE			
									Ph - Col.F	Sh - Col.G	Sh - Col.H	NSh - Col.H
A	B	C	D	E	F	G	H	I	J	K	L	
130	16,900	.12	5	3	2'-11"	0'-5"	3'-4" #	26'-7"	22'-1"	19'-2"	22'-2"	
230	52,900	.37	16	11	3'-10"	1'-4"	3'-4" #	25'-8"	21'-2"	19'-2"	22'-2"	
250	62,500	.43	19	14	4'-1"	1'-7"	3'-4" #	25'-5"	20'-11"	19'-2"	22'-2"	
270	72,900	.50	22	16	4'-4"	1'-10"	3'-4" #	25'-2"	20'-8"	19'-2"	22'-2"	
300	90,000	.62	27	20	4'-9"	2'-3"	3'-4" #	24'-9"	20'-3"	19'-2"	22'-2"	
330	108,900	.75	33	24	5'-3"	2'-9"	3'-4" #	24'-3"	19'-9"	19'-2"	22'-2"	
350	122,500	.85	37	27	5'-7"	3'-1"	3'-4"	23'-11"	19'-5"	19'-2"	22'-2"	
360	129,600	.90	40	28	5'-10"	3'-4"	3'-6"	23'-8"	19'-2"	19'-0"	22'-0"	
370	136,900	.95	42	30	6'-0"	3'-6"	3'-6"	23'-6"	19'-0"	19'-0"	22'-0"	
380	144,400	1.00	44	32	6'-2"	3'-8"	3'-6"	23'-4"	18'-10"	19'-0"	22'-0"	
390	152,100	1.05	46	34	6'-4"	3'-10"	3'-6"	23'-2"	18'-8"	19'-0"	22'-0"	
400	160,000	1.11	49	35	6'-7"	4'-1"	3'-8"	22'-11"	18'-5"	18'-10"	21'-10"	

35' Pole
 $P_h = 35'-0" - 6'-0" + 6" = 29'-6"$
 $S_h = 35'-0" - 6'-0" - 6'-6" = 22'-6"$
 $NS_h = 35'-0" - 6'-0" - 3'-6" = 25'-6"$

* To Obtain Height of Crossarm Through-Bolt, Subtract 6 In. from Heights in Cols. I through L.
 # A Minimum Separation of 48 In. is Required if Lowest Conductor is on a Crossarm and 40 In. if on a Bracket.