DIVISION OF COST METHODS IN FORMULATING JOINT USE AGREEMENTS

CONTENTS PAGE

1. GENERAL

1.01 This section discusses various methods of developing the division of costs for use in formulating joint pole agreements with power companies. It is intended to serve as a supplement to Section 937-217-125--Joint Use of Wood Poles, General Agreements With Power Companies. It is not intended that the methods discussed in the paragraphs that follow be used in connection with authorized license agreements such as CATV, ETV, etc.

1.02 Reaching agreement on the division of costs is usually one of the more difficult areas to resolve in joint use negotiations. The task requires skilled, knowledgeable persons if satisfactory results are to be obtained. A number of different approaches to the problem are discussed in this section. The negotiating team should be reasonably familiar with all of these methods as well as their merits and shortcomings. Certain methods discussed here are perhaps significant only to develop contrast.

1.03 The negotiating team should be familiar with the broad characteristics of pole line construction and its influence on pole line costs in the joint service area. In general, pole lines designed to support telephone facilities only utilize poles which are shorter and of less strength than poles used in nonjoint electric power lines. In many cases, it will be found that pole lines constructed by electric utilities provide greater strength and clearances than the minimums prescribed by the National Electrical Safety Code. Frequently, this will allow the attachment of telephone facilities with little or no rearrangements or pole replacements. On the other hand, it is usually necessary to completely rebuild a typical nonjoint telephone line in order to accommodate electric power facilities. Detailed knowledge in these areas will be useful.

1.04 In many cases it will be recognized that the concept of separate pole lines for power and telephone facilities is unrealistic. Local ordinances, for example, may essentially preclude such construction. Public dislike of separate lines may have much the same effect. New pole lines of any kind may be flatly prohibited in some areas. These factors will generally operate to make it difficult to obtain reliable cost data that is needed for some calculations. This, in turn, tends to limit the choice of methods of calculation.

1.05 Among other considerations, pole line design contemplates providing sufficient vertical space to support some ultimate number of cables or strands. Although it is perhaps an artificial concept, it may be enlightening to consider the cost per foot of useful space. This would be simply the in-place cost divided by the number of feet of useful space. Assuming the same ground clearance, a 30-foot pole provides about five times as much useful space as a 25-foot pole, and a 35-foot pole provides ten times the useful space of a 25-foot (see Fig. 1). However, the cost of a 30-foot pole is far less than five times the cost of a 25-foot pole, and a 35-foot pole costs far less than twice as much as a 30-foot pole. Therefore, over at least a limited range of pole heights, it is to be expected that the cost per foot of useful pole space tends to decrease as the amount of space provided is increased. Since nonjoint poles used to support power facilities normally must provide more useful space than nonjoint poles used to support telephone facilities, it is to be expected that the unit cost of useful space on the latter will be greater.

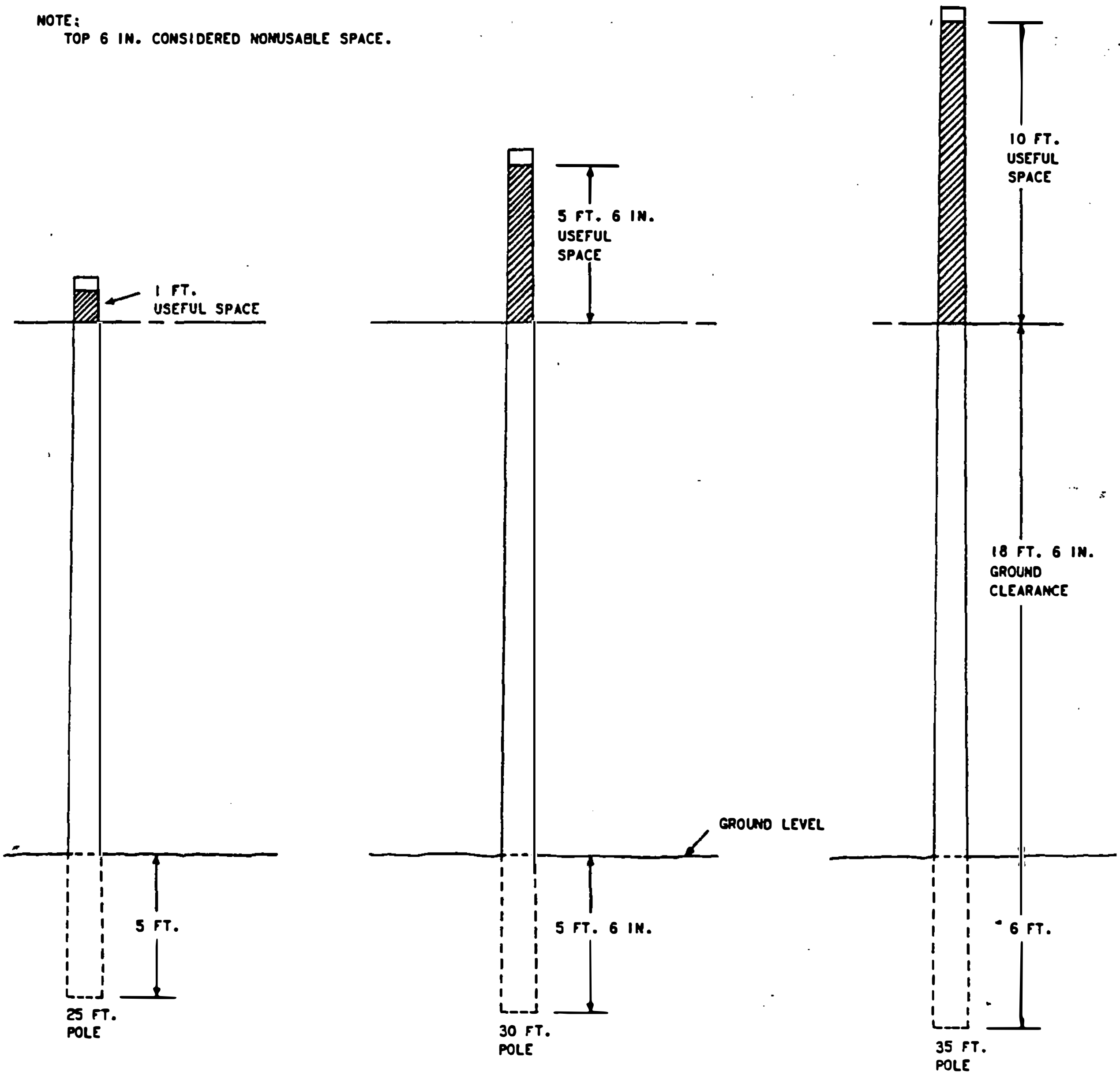


Fig. 1—Useful Space on Nonjoint Poles

1.06 The strength of wood poles is designated by pole class numbers as discussed in Section 919-120-200. It will be recognized that to withstand a given horizontal (or vertical) load, the installed cost per 100 pounds of capacity tends to decrease as the total available capacity is increased. For example, although a Class 4 pole has twice the rated strength of a Class 7 pole, the cost of the larger pole is far less than twice the cost of the smaller pole. Although a precise relationship probably does not exist, it appears that the cost of increasing pole strength is roughly proportional to the cube root, or in some cases, the square root of the rated breaking strength. That is, since a Class 4 pole is rated to carry twice the load of a Class 7 pole, the former would probably cost 26 to 41 percent more: ($\sqrt[3]{2} = 1.26, \sqrt{2} = 1.41$). Obviously, it is more economical to use a single Class 4 pole than to use two Class 7 poles.

1.07 Pole line construction usually entails the use of guys and anchors. Even a cursory examination of broad gauge costs of anchors indicates that it is usually more economical to provide a given holding power with one anchor than with two smaller anchors. In many cases, an anchor rated to support 18,000 pounds may cost 10 to 15 percent more than an anchor that is rated to support only 6000 pounds. However, a further increase in holding power to 26,000 pounds appears to entail a disproportionate cost increment of 60 to 80 percent. Even so, where circumstances will permit, there is usually some economy in using a single anchor as opposed to separate anchors. Also, from the property owner's point of view, a single anchor rod is generally less objectionable than two or three anchor rods.

1.08 From the preceding discussion, it may be logically assumed that the combined requirements of the telephone company and the power company can be provided more economically by a single pole line with jointly used anchors than by separate lines with separate anchors. The joint use line is admittedly penalized somewhat by the need to provide neutral space between power and telephone facilities. Even so, joint use normally ensures some overall savings compared to the costs of building separate pole lines. However, this does not automatically ensure that both parties will necessarily achieve a reduction in costs. Inequitable division of costs may divert the savings to one party or the other. In an extreme case, joint use may result in higher costs for one party. It cannot be emphasized too strongly that the desired objective is to obtain an ***equitable*** sharing of costs, with ***both*** parties benefiting from joint use.

1.09 It should be recognized that the term "equitable" may have a different meaning in the electric utility industry. The Bell System view is that an equitable division of costs will permit each party to achieve the same proportionate reduction in costs by employing joint construction as compared to nonjoint use. It is recognized that there are other concepts of equitable divisions of joint pole costs, and a number of these are discussed in this section. However, it appears that the concept of equal proportionate savings (percent savings) is the soundest and most logical.

1.10 Joint use, as opposed to the use of separate lines, normally involves both savings and added expenses which are not directly related to pole costs. The division of costs methods in this section do not attempt to deal with such items. However, the negotiating team should have at least some general knowledge in this area. For example, in a given set of circumstances, telephone facilities on a joint line are more subject to troublesome induction from power facilities than if the same telephone and power facilities were located on opposite sides of the street. Similarly, for a given set of circumstances, the number of accidental contacts between power and telephone facilities will usually be greater with joint construction than with separate lines on opposite sides of the street. Both of these troubles occur with nonjoint construction, but to a lesser degree. On the other hand, the presence of a well-grounded power facility on a joint line may reduce lightning damage to telephone facilities. Joint construction also normally facilitates coordination of electrical protection which tends to reduce the severity of plant damage when contacts with power conductors occur. The costs of constructing and maintaining facilities on joint and nonjoint lines are affected by many other factors as well. In general, however, it is recommended that such items be omitted from negotiations dealing with the division of pole costs. If circumstances warrant, it may be appropriate to make separate provisions to deal with items of this nature where they appear to be significant.

1.11 The skilled negotiator will recognize that the same approach or method is not necessarily the best one to use in all cases. Some methods require more detailed cost data than others, and availability of cost data may restrict the choice of methods. Power company negotiators differ as to background, training, technical ability, etc. They may be expected to vary somewhat in their reaction to any given method. In some cases, it may be preferable to use a relatively simple method (even at the cost of achieving less equitable results) rather than a more complicated method which may create resentment because it is not understood.

1.12 It is reasonable to expect that power companies over a given area will tend to follow much the same pattern within that area. On the other hand, there may be substantial differences because of different load densities, distribution voltages, local taxes, etc. Smaller power companies are likely to seek much the same treatment as larger companies in the same area. Differences in the type of area served, however, (ie, urban versus rural) may well justify different end results.

1.13 Associations of private power companies, and to some extent municipal utilities, frequently make it a point to keep their members informed as to significant agreements with telephone companies. It may be useful, therefore, to exchange similar information not only with neighboring System companies, but also with the larger independent telephone companies. In some cases, it may also be useful to find out how the end result was obtained.

1.14 The Operating Companies are requested to keep the American Company informed of their activities in revising and executing joint pole agreements. In this manner, a centralized file of information is developed for the use of all companies.

2. BASIC ASSUMPTIONS

2.01 To some extent, the problem of reaching agreement on any given specific division of costs will be influenced by the kind of costs to which the result is to be applied. For example, the division of costs might be applied to a specific size of joint pole with billing for the added cost of the larger poles. The division of costs also could be applied to the ***average*** joint pole with no billing for larger poles. It is also practical to specify that the party requiring a pole larger than the agreed specific size (sometimes called "normal") becomes the owner. This is done to minimize the administrative expense involved in billing for the extra cost of such poles. In this connection, serious consideration should be given to limiting the maximum size of joint pole which will be set or owned by the telephone company. Usually this will be a 40- or 45-foot pole, depending to some extent upon the capabilities of the pole derricks, etc. Generally, the power companies are better equipped to handle the larger poles.

2.02 In discussing the various methods of calculating the division of costs, the following standard notations and costs (no special significance to be given to the costs shown here) will be used:

T = Cost of average pole used for nonjoint telephone line. This is assumed to be a 50/50 mix of 25- and 30-foot poles with an average cost of $70. Average space equals (1 + 5-1/2)/2 = 3-1/4 feet (Fig. 1).

P = Cost of average pole used for nonjoint power line. This is assumed to be a 50/50 mix of 30- and 35-foot poles at an average cost of $95. Average space equals (5-1/2 + 10)/2 = 7-3/4 feet (Fig. 1).

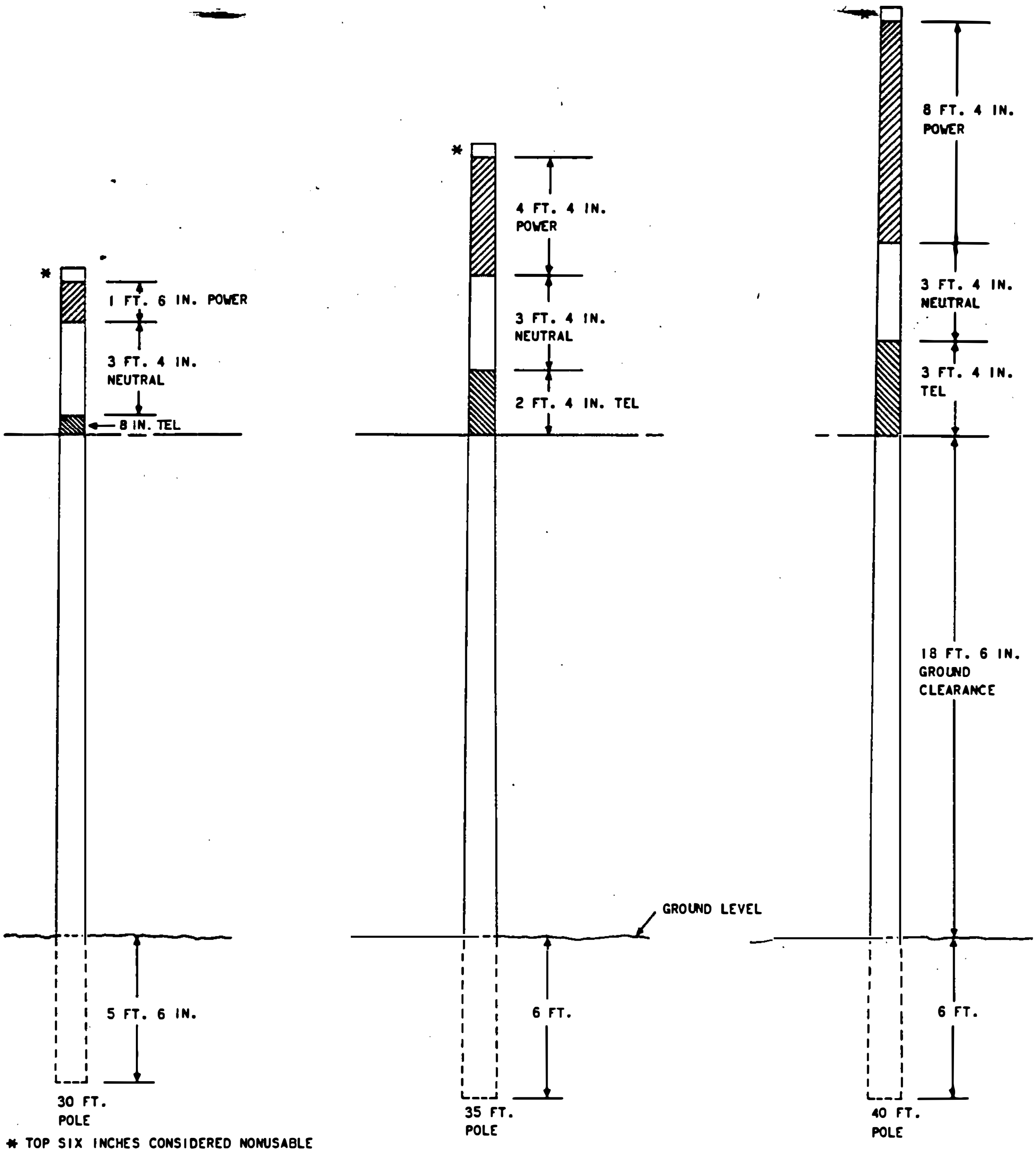
J = Cost of average pole used for joint line. This is assumed to be a 50/50 mix of 35- and 40-foot poles at an average cost of $120.

t = Telephone company share of costs expressed as a decimal or a percentage.

p = Power company share of costs expressed as a decimal or a percentage.

3. SPACE UTILIZATION METHODS

3.01 Space utilization methods (except the one in 3.05) have the merit of being applicable directly to joint pole construction and avoid the need for nonjoint pole data. Figure 2 illustrates assumed space allocations on joint poles. Obviously, where topography is favorable, it would be possible to attach at heights below 18 feet 6 inches and still obtain required ground clearances. Unfavorable topography would make it necessary to attach at greater heights. Rear lot construction, of course, might allow a minimum attachment level of approximately 12 to 15 feet, although it would require grading the line up and down to provide sufficient clearance at road crossings.



* TOP SIX INCHES CONSIDERED NONUSABLE

NOTE:
IF THE POWER COMPANY EMPLOYS RIDGE PIN CONSTRUCTION, THE TOP 6 INCHES OF THE POLE WOULD BE CONSIDERED USABLE.

Fig. 2—Space Allocations on Joint Poles

3.02 Assuming the ***average*** joint pole is as set forth in 2.02 (37-1/2 feet), the ***average*** telephone space provided would be 2 feet 4 inches plus 3 feet 4 inches, divided by 2, or 2 feet 10 inches. Similarly, the average power space provided would be 6 feet 4 inches. Accordingly, the ***total useful*** space provided on the average joint pole would be 9 feet 2 inches, costing $120 or $13.10 per foot. A possible approach is to divide costs on the basis of a uniform cost per foot of space provided. The power company's share would then be 6-1/3 × $13.10 or $82.92; the telephone company's share would be 2-5/6 × $13.10 = $37.08. This results in the telephone company bearing approximately 30.9 percent of the cost and the power company about 69.1 percent of the cost. As compared to the cost of nonjoint construction, the savings are as follows:

	TELEPHONE	POWER
Nonjoint Cost	$70.00	$95.00
Joint Cost	$37.08	$82.92
Savings	$32.92	$14.08

The telephone company's dollar savings is more [illegible] twice the power company's savings. Clearly, this does not represent equity. This result should not be surprising in view of 1.04.

3.03 One of the more obvious flaws in the preceding approach is that the calculation omits the nonusable part of the pole. It is, of course, highly questionable whether the power company's need for the neutral space, ground clearance space, etc, is considerably more than the telephone company's need. It seems more logical to assume these portions of the pole are equally needed by both parties. This assumption is used in the following calculation:

Total length of average pole	37' 6"
Total usable space	− 9' 2"
Total nonusable space	28' 4"
1/2 nonusable space	14' 2"

$$\text{Telephone share} = \frac{14'\,2'' + 2'\,10''}{37'\,6''}$$

$$= \frac{17'}{37'\,6''} = 45.3\%$$

$$\text{Power share} = \frac{14'\,2'' + 6'\,4''}{37'\,6''}$$

$$= \frac{20'\,6''}{37'\,6''} = 54.7\%.$$

Applied to the cost of the average joint pole, these factors produce the following results:

	TELEPHONE	POWER
Nonjoint Cost	$70.00	$95.00
Joint Cost	$54.36	$65.64
Dollar Savings	$15.64	$29.36
Percent Savings	22.3	30.9
Cost Per Foot of Usable Space	$19.21	$10.37

Note that the telephone company's cost per foot of usable space is nearly twice that of the power company. By comparison, on a nonjoint basis the telephone company's cost per usable foot would be $70/3-1/4 or $21.54, and the power company's cost per usable foot would be $95/7-3/4 or $12.26 (see 1.05 and 2.02). More significant than the cost per foot of usable space are the ***percent savings*** and the ***dollar savings*** for the two parties. Both of these indicators show this division of costs as favoring the power company.

3.04 It may be argued, perhaps with some justification, that the power attachments create a greater load on the pole than telephone attachments. Since overturning is resisted by the portion of the pole set in the ground, it would not be unreasonable to allocate this part of the pole unequally. A convenient method of achieving this result is to remove the 6-foot depth of setting from the previous calculation. This results in the following:

$$\text{Telephone share} = \frac{11'\,2'' + 2'\,10''}{31'\,6''}$$

$$= \frac{14'}{31'\,6''} = 44.4\%$$

$$\text{Power share} = \frac{11'\,2'' + 6'\,4''}{31'\,6''}$$

$$= \frac{17'\,6''}{31'\,6''} = 55.6\%.$$

Repeating the previous comparison with these factors shows the following:

	TELEPHONE	POWER
Nonjoint Cost	$70.00	$95.00
Joint Cost	$53.28	$66.72
Dollar Savings	$16.72	$28.28
Percent Savings	24.9	29.6
Cost Per Foot of Usable Space	$18.83	$10.54

Note: Including 44.4 percent of the depth of setting (2 feet 8 inches) in the numerator and the full depth of setting in the denominator of the previous calculation produces the same result (11′2″ + 2′10″ + 2′8″) ÷ 37′6″ = 44.4%.

It is interesting to note that this method shows the cost per foot of usable space provided on joint poles is about 7/8 of the cost per foot of space provided on nonjoint poles (87.42 percent for the telephone company versus 85.97 percent for the power company). Also, the ***dollar savings*** and the ***percent of savings*** still favor the power company. Both of the preceding methods have the advantage that they require relatively little cost data.

3.05 Obviously, some particular division of costs would achieve an identical proportionate reduction in the cost per foot of usable space for each party. The relationship necessary to accomplish this result is as follows:

$$\frac{\text{Unit Cost of Tel Space on Joint Pole}}{\text{Unit Cost of Tel Space on Nonjoint Pole}} = \frac{\text{Unit Cost of Power Space on Joint Pole}}{\text{Unit Cost of Power Space on Nonjoint Pole}}$$

Using the standard notations and costs discussed in 2.02, this may be stated algebraically as follows:

$$\frac{tJ}{2.83 \times \$21.54} = \frac{pJ}{6.33 \times \$12.26} \text{ or}$$

$$\frac{t}{60.96} = \frac{p}{77.64} \text{ so}$$

$$\frac{t}{p} = 0.7852 \text{ but}$$

$$(t + p) = 1 \quad \text{or} \quad p = (1 - t)$$

$$\text{thus, } t = 0.7852\,(1 - t)$$

$$1.7582\,t = 0.7852$$

$$\text{therefore, } t = \frac{0.7852}{1.7852} = 43.98\% \text{ and}$$

$$p = 56.02\%.$$

The unit costs are then as follows:

$$\text{Tel} = \frac{\$120 \times 43.98\%}{2.83} = \$18.65$$

$$\text{Pow.} = \frac{\$120 \times 56.02\%}{6.33} = \$10.62.$$

Ratio of cost per foot of usable space on joint versus nonjoint pole:

$$\text{Tel} = \frac{\$18.65}{\$21.54} = 86.6\%$$

$$\text{Pow.} = \frac{\$10.62}{\$12.26} = 86.6\%.$$

Rounding the division of costs to 44 and 56 percent for convenience and making the dollar and percentage savings comparison as in the preceding paragraph:

	TELEPHONE	POWER
Nonjoint Cost	$70.00	$95.00
Joint Cost	$52.80	$67.20
Dollar Savings	$17.20	$27.80
Percent Savings	24.57	29.26

3.06 It should be recognized that "space" may be hard to define in some cases. The telephone company's use of cross-connection terminals and other pole-mounted equipment use considerable space, but on relatively few poles. Street lights, of course, also occupy space but are not present on all poles. Power meters also occupy some space on scattered poles. With the possible exception of the "equal reduction in cost per foot" method (see 3.05), space utilization methods ignore pole strength as a cost consideration.

4. COMBINED SPACE UTILIZATION AND TRANSVERSE LOADING APPROACH

4.01 This method attempts to recognize the inherent flaw in the space utilization method (ie, ignoring the effects of pole class as a cost factor). To utilize this method will require some fairly detailed pole costs as well as some data regarding the average attachments of both companies. In some cases this information may be difficult and expensive to obtain with any degree of accuracy.

4.02 The effect of height as a factor in pole cost is usually readily available. This might represent an average of $2 to $4 per foot and could be developed as a percentage, if desired. This might be based on an average of pole costs for typical heights of 25 to 45 feet for Class 5 poles. The average cost of increasing pole class for 30- and 35-foot poles, Classes 1 through 7, should be developed next. The following is a sample pole cost study:

SAMPLE POLE COST STUDY

Cost of Five Feet of Extra Height for Class 5 Poles

POLE HEIGHTS	COST OF SHORTER POLE	COST OF TALLER POLE	DIFFERENCE	PERCENT DIFF OF SHORTER POLE
40-45	$122	$142	$20	16.4
35-40	106	122	16	15.1
30-35	93	106	13	14.0
25-30	81	93	12	14.8
				60.3

The average would be 60.3/4 = 15 percent.

Cost of One Class of Extra Strength for 35-Foot Poles

POLE CLASS	COST OF LARGER POLE	COST OF SMALLER POLE	DIFFERENCE	PERCENT DIFF OF SMALLER POLE
1-2	$154	$139	$15	10.8
2-3	139	127	12	9.4
3-4	127	116	11	9.5
4-5	116	106	10	9.4
5-6	106	96	10	10.4
6-7	96	87	9	10.3
				59.8

The average would be 59.8/6 = 10 percent.

4.03 Since pole class is usually most affected by transverse loading, the sail area per foot of average power and telephone attachments should be developed. These should be multiplied by the average minimum height of attachment aboveground on nonjoint poles to develop factors proportional to the respective bending moments. For example:

The combined diameter of telephone cables and strand might be approximately 2 inches plus 1 inch of ice if in a heavy loading area, and 1/2 inch of ice for medium loading, etc. The average power attachment might be approximately three separate wires of 0.4 inch diameter plus 1 inch of ice, for a total of 4.2 inches (assuming heavy loading area). Assuming a heavy loading area and an ***average*** height of 20 feet for telephone attachments and 22 feet for nonjoint power attachments provides the following:

Telephone	(2 + 1) x 20 =	60.0
Power	3(0.4 + 1) x 22 =	92.4
	Total	152.4

Loading factors would be as follows:

Telephone	60/152.4 = 39.5%
Power	92.4/152.4 = 60.5%

(Use 40 and 60% for simplicity.)

Assume the pole cost study developed the following:

Average increment for 5 feet extra height	=	15%
Average increment for larger class	=	10%.

The total average cost of increasing both height and class is 15% + 10% = 25%. Therefore, it would be logical to weight space utilization with a factor of 15/25 or 60 percent and loading (relating to pole class) with a factor of 10/25 or 40 percent.

Telco	(Space)	45%* x (weighting) 60% =	270
	(Loading)	40% x (weighting) 40% =	160
			430
Power Co.	(Space)	55%* x (weighting) 60% =	330
	(Loading)	60% x (weighting) 40% =	240
			570

$$\text{Telco Share of Cost} = \frac{430}{430 + 570} = 43\%$$

$$\text{Power Share of Cost} = \frac{570}{430 + 570} = 57\%$$

*These values assumed for simplicity in calculation.

Applying these percentages results in the following:

	TELEPHONE	POWER
Nonjoint Cost	$70.00	$95.00
Joint Cost	$51.60	$68.40
Dollar Savings	$18.40	$26.60
Percent Savings	26.4	28.0

This appears to be fairly reasonable, although the power company's percentage of savings is slightly greater.

5. SHARE-THE-COST METHOD

5.01 The "share-the-cost" method is based on the premise that any savings resulting from joint use should provide the same ***proportion*** of savings for both parties. The term "equal percentage savings" might be more descriptive. This method requires cost data for both joint and nonjoint construction. As indicated previously, the latter may be difficult to obtain. However, this method is recommended because it provides the most equitable results. The formula may be developed quite simply as follows. Using the notation of 2.02, the total savings would be T + P − J. In order for each party to obtain the same percentage of savings, it follows that:

$$\frac{t(s)}{T} = \frac{p(s)}{P} \text{ or } \frac{t}{T} = \frac{p}{P}.$$

The quantity (t + p) of course equals unity, and p = (1 − t). Substituting for p in the above equation:

$$\frac{t}{T} = \frac{(1-t)}{P}$$

$$Pt = T - tT$$

$$t(P + T) = T \text{ or } t = \frac{T}{T + P}.$$

Similar procedures will develop the relationship that p = P/(T + P).

5.02 Substituting the values of 2.02,

$$t = \frac{\$70}{\$70 + 95} = \frac{\$\ 70}{\$165} = 42.42\%$$

$$p = \frac{\$\ 95}{\$165} = 57.58\%.$$

Applied to the cost of a joint pole, the following comparison results:

	TELEPHONE	POWER
Nonjoint Cost	\$70.00	\$95.00
Joint Cost	\$50.90	\$69.10
Dollar Savings	\$19.10	\$25.90
Percent Savings	27.3	27.3

5.03 Another comparison may be made using 1000 poles as an illustration. Assume the telephone company sets 424 poles and the power company sets 576 poles. The respective investments would be as follows:

TELEPHONE

424 poles @\$120 =	\$50,880
576 poles @\$ 0 =	0
Total	\$50,880
*Average Cost	\$50.88

POWER

576 poles @\$120 =	\$69,120
424 poles @\$ 0 =	0
Total	\$69,120
*Average Cost	\$69.12

*Difference between these results and 5.02 due to rounding.

5.04 Each joint pole, of course, represents an average ***added*** investment of \$50 when owned by the telephone company and \$25 when owned by the power company. The two companies' total investment could be broken down as follows:

TELEPHONE COMPANY—

424 poles @ \$70 = \$29,680

The remaining investment of \$50 × 424 poles or \$21,200, however, gives the telephone company the right to attach to 576 poles placed by the power company. This equates to \$36.80 per pole.

POWER COMPANY—

576 poles @ \$95 = \$54,720

The power company's extra investment of \$25 per pole amounts to \$14,000. This gives the power company the right to attach to 424 poles placed by the telephone company, which equates to \$33.90 per pole. Dividing each party's investment in such a manner is, of course, arbitrary. The ***average*** cost of joint use for the two parties is far more significant.

5.05 The share-the-cost or "equal percentage savings" method is the preferred method. It avoids arguments as to the relevance of cost of space used or assigned, responsibility for nonusable portions of the pole, etc. Obviously, this method avoids any arbitrary assignment between investment and savings. On the other hand, it requires cost data for separate nonjoint lines and this may not be readily available.

6. EQUAL DOLLAR SAVINGS METHOD

6.01 This method, as the name implies, is based on the assumption that each party should save the same amount of money. Like the preceding method, it requires cost data on joint and nonjoint lines. Using the notation of 2.02, this may be stated algebraically as follows:

$$T - Jt = P - Jp.$$

This may be solved for t substituting (1 − t) for p, as previously:

$$T - Jt = P - J + Jt.$$

This may be rearranged as follows:

$$2\,Jt = J + T - P \text{ or}$$

$$t = \frac{J + T - P}{2J}.$$

Similarly, by substituting (1 − t) for p, it can be shown that:

$$p = \frac{J + P - T}{2J}.$$

6.02 Substituting the dollar values of 2.02 provides the following:

$$t = \frac{120 + 70 - 95}{240} = \frac{95}{240} \text{ or } 39.58\%$$

$$p = \frac{120 + 95 - 70}{240} = \frac{145}{240} \text{ or } 60.42\%.$$

The cost of joint use compared to nonjoint use is then as follows:

	TELEPHONE	POWER
Cost of Nonjoint Use	$70.00	$95.00
Joint Cost	$47.50	$72.50
Dollar Savings	$22.50	$22.50
Percent Savings	32.1	23.7

6.03 The dollar savings in 6.02 are equal, but the telephone company's percentage of savings is considerably higher than the power company's percentage. While equal dollar savings might appear to be equitable, if the savings were viewed as a return on investment, there would be little question that the percentage of savings for the two parties should be equal. It is apparent that dollar savings and percentage of savings cannot be equalized simultaneously unless the nonjoint costs of the two parties are equal. Since this practically never occurs in practice, a choice must be made, and equity considerations dictate equal percentage of savings as first choice.

7. EQUAL OR RECIPROCAL DIVISION OF COSTS METHOD

7.01 As the name implies, this method simply divides the costs of joint use ***equally.*** It was quite generally used in the early days of joint use when telephone plant commonly utilized open wire on crossarms. The extensive use of open wire often resulted in telephone requirements for pole space and strength to equal or exceed power company requirements. Telephone open wire today is an increasingly rare facility, and telephone requirements for pole space and strength are largely based upon cable considerations.

7.02 Power company requirements for pole space and strength have increased over the years as power loads have increased. Power companies have installed more numerous and larger transformers, voltage regulators, and capacitors to help handle the load. This has been accompanied by the use of higher voltages which require greater spacing between primary and secondary conductors. Also, conductor sizes have been increased. To some extent, these influences have been offset by the use of spacer cable and cabled secondaries in lieu of open wire on crossarms and racks. Even so, it is not uncommon to find that power attachments will occupy twice as much space as telephone attachments.

7.03 The following comparison of the costs of joint use versus nonjoint use assumes an equal division of joint use costs using the values shown in 2.02:

	TELEPHONE	POWER
Nonjoint Cost	$70.00	$95.00
Joint Cost	$60.00	$60.00
Dollar Savings	$10.00	$35.00
Percent Savings	14.3	37.8

:hough equal division of costs was used for many years and probably was justified, it now seems obvious that such arrangements are no longer equitable. The only apparent merit in this method is simplicity.

7.04 The preceding comparison used the values shown in 2.02, which assumed that the average joint pole was a mixture of 35- and 40-foot poles. It is apparent that if an equal division of costs were applied ***only*** to 30- or 35-foot poles, with the party requiring more space paying for the added cost, the division of costs would be somewhat more equitable, since the power company's needs for taller poles normally exceeds the telephone company's. However, it should be recognized that with rental-type agreements this would tend to generate a great deal of administrative cost in order to handle billing arrangements for the extra cost of the larger poles. If these larger poles are always placed and owned by the party whose needs made their use necessary, most of the extra administrative expense can be avoided.

7.05 Where joint use of poles is on a rental basis, it is not uncommon for the electric utility to own considerably more than half of the joint poles. When this situation is accompanied by a reciprocal rental rate which is significantly less than half of the annual charges on the average joint pole, the result may approximate an equitable division of costs. Obviously, regardless of the rental rate, if the pole ownership is equal, the net exchange of rentals would be zero, and the division of costs is 50/50. As noted earlier, this is not equitable as a general rule. Similarly, if the rental rate approximates 50 percent of the annual charges, the net cost of owning poles is the same as the rental payment. Thus, regardless of the division of ownership, the two parties' costs are the same. ***Both*** of the previously stated conditions must therefore exist if an equitable division of costs is to be approached where a reciprocal rental rate is employed. The following calculation illustrates such a situation.

Assume annual charges are $18, the reciprocal rental rate is $4.50, and a 60/40 division of ownership.

AVERAGE TELEPHONE COSTS

$4.50/pole paid to power
company x 6 poles = $27.00
$18/pole annual charges
on 4 poles = $72.00

Total $99.00

Less $4.50/pole x 4
(rental received from
power co.) — $18.00
Net Cost = $81.00
or $ 8.10/pole

AVERAGE POWER COSTS

$4.50/pole paid to telephone
company x 4 poles = $ 18.00
$18/pole annual charges
on 6 poles = $108.00

Total = $126.00

Less $4.50/pole x 6 poles
(rental received from
tel. co.) — $27.00
Net Cost = $99.00
or $ 9.90/pole

The actual division of cost is thus $8.10/$18.00 = 45 percent telephone and 55 percent power.

8. EQUAL ADDED INVESTMENT METHOD

8.01 It might appear that an equitable division of costs would result if the added investment uired by each company to build a joint line, as compared to a nonjoint line, were equalized. It follows, of course, that use of this method is contingent upon availability of cost data for both joint and nonjoint construction. Using the standard notation of 2.02, the telephone company's added investment is t (J − T). Similarly, the power company's added investment is p (J − P). It will be more convenient to develop and use the ratio t/p rather than to develop t and p directly. To satisfy the basic premise of this method, it is apparent that t (J − T) must equal p (J − P).

$$\text{Then } \frac{t}{p} = \frac{J-P}{J-T}$$

$$\text{Let } \frac{t}{p} = r \text{ and noting that}$$

$$t + p = 1, \text{ it follows that}$$

$$t = r(1-t) \text{ or } \frac{r}{1+r}$$

$$\text{Similarly, } p = \frac{1}{1+r}.$$

8.02 Substituting the dollar value of 2.02,

$$\frac{t}{p} = \frac{120-95}{120-70} = \frac{25}{50} = 0.5$$

$$t = \frac{0.5}{1+0.5} = 33.33\%$$

$$p = \frac{1}{1+0.5} = 66.67\%.$$

Comparing the costs of joint use to nonjoint use,

	TELEPHONE	POWER
Nonjoint Costs	$70.00	$95.00
Joint Cost	$40.00	$80.00
Dollar Savings	$30.00	$15.00
Percent Savings	42.8	15.8

It is clear that this is not equitable in that it allocates the major portion of savings to the telephone company. In general, this method tends to favor the telephone company. The inherent flaw in this method is that it deals only with part of the joint use costs (ie, the difference between the costs of joint and nonjoint construction). Note that in calculating the ratio t/p, the quantities T and P both appear as amounts to be subtracted from the joint cost.

9. EQUAL BENEFITS METHOD

9.01 As indicated previously, a joint pole generally costs more than a nonjoint telephone or power pole. Also, by placing joint poles in lieu of nonjoint poles, each party acquires the right to attach to poles owned by the other. The concept of "equal benefits" is that each party's added investment for joint use should provide the same cost per pole gained by joint use. It will be recognized that this method requires the same basic data as the preceding method. Using the same notation as previously, this may be stated algebraically as follows:

The added investments are:

Telephone = t (J − T)

Power = p (J − P).

In order for the cost per pole gained by joint use to be equal, then:

$$\frac{t(J-T)}{p} = \frac{p(J-P)}{t} \text{ or } \frac{t^2}{p^2} = \frac{J-P}{J-T}$$

$$\frac{t}{p} = \sqrt{\frac{J-P}{J-T}}.$$

It is more convenient to calculate the ratio t/p and then use the ratio to calculate t and p. If t/p has a value of r, then t = r (1 − t) or t = r/(1 + r) and p = 1/(1 + r).

> *Note:* This relationship may be more clearly understood if it is assumed that p and t are specific numbers of poles.

9.02 Substituting the dollar values of 2.02 produces the following:

$$\frac{t}{p} = \sqrt{\frac{120-95}{120-70}} = \sqrt{\frac{25}{50}} = 0.707 = r$$

$$t = \frac{0.707}{1+0.707} = 41.4\%$$

$$p = \frac{1}{1+0.707} = 58.6\%.$$

...plied to 1000 poles, this division of ownership (or costs) shows that the cost per pole gained by joint use are equal.

TELEPHONE

$120 x 414	=	$49,680	Total Investment
$50 x 414	=	$20,700	Extra Investment for Joint Use
$20,700 ÷ 586	=	$35.30	Per Pole Gained by Joint Use

POWER

$120 x 586	=	$70,320	Total Investment
$25 x 586	=	$14,650	Extra Investment for Joint Use
$14,650 ÷ 414	=	$35.30	Per Pole Gained by Joint Use

The ***average*** costs per pole for each party are, of course, $49.68 and $70.32 (telephone and power, respectively). The respective savings are $20.32 or 29 percent and $24.68 or 26 percent. This is not markedly different from the results obtained by the ***share-the-cost*** method. There is, however, a philosophical flaw in this method in that it concerns itself solely with ***added*** investment by each party. (Algebraically, J — T and J — P.) The results in this case are not unreasonable; the percentage of savings favors the telephone company to a small degree although the power company's dollar savings is somewhat greater.

10. PREMATURE REPLACEMENT OF POLES

10.01 Most joint use agreements make some sort of provision for the division of costs when service needs of one or both parties force premature replacement of poles. The general principle applied in these situations is that the nonbenefited party should not be obligated to spend more capital than has been (theoretically) accrued for the pole in question. In practice, depreciation is not accrued on an individual pole basis, but rather as a flat percentage applied to the total capital investment. It will be recognized that "payment for sacrificed life" is closely related to the depreciation which would accrue if the pole were not prematurely replaced. (Actually, depreciation charges are designed to recover not only the capital investment, but also the cost of removal.) Replacing a pole with a larger or stronger pole will almost always result in capital expenditure greater than the original investment. It is logical, therefore, for the benefited party to pay for the added cost of extra height or strength. One result of such transactions is that both parties will have a group of, for instance, 40-foot poles with an actual net investment which is that of 35-foot poles. When the telephone company pays for sacrificed life and extra height or strength of a power company pole, the payment is capitalized, but no pole is added to the property records. Payments of this kind are spread over the entire pole line account. These two aspects of capital payments tend to offset each other.

10.02 The reason for crediting used life against the cost of premature pole replacement has always been that it was assumed that there was a continuing need for the pole line, and the pole in question would eventually be replaced in any event. Today aerial plant and its associated poles are increasingly being replaced with "out-of-sight" plant. Even with the best advance planning, it may become necessary to dismantle a pole line that was rebuilt for joint use only a few years previous. While such happenings probably cannot be completely eliminated, at least some steps can be taken to reduce their economic impact. One step that can be taken is the elimination of credit for used life, and billing for all out-of-pocket costs of premature pole replacement. An alternative is to have the party whose needs force the premature replacement of poles do the work at his own expense. However, such measures should be limited to situations where there is good reason to believe that the removal of aerial plant is anticipated within 20 to 25 years. Inconspicuous distribution lines (eg, rear lot lines partially screened by trees) might be expected to remain in fully developed areas for many years in the absence of pressure from local government, etc.

10.03 The phrase "premature replacement of poles" infers that there is some remaining life in the poles to be removed. This raises the question as to whether an allowance should be made for salvage, and if so, how much. In general, it is assumed that a salvaged pole is not quite as good as a new pole. On the other hand, physical deterioration of poles is only one of a number of reasons which cause replacement. It seems reasonable, therefore, to allow a credit for salvaged poles. This might be some agreed-upon percentage of the material price of the same size new pole. Although a pole which has been in service for about two years might be expected to be in better condition than one which has been in service 15 years, for simplicity of administration it will usually be preferable to use the same values for the entire age group of poles which are to be salvaged. The basis for deciding whether poles are to be reused or junked is discussed in Section 621-220-011. In some cases, in order to reach agreement with the electric utility, it may be necessary to limit the age of poles for which salvage credit will be allowed.

10.04 Pole replacement, of necessity, entails some expense to physically transfer facilities from the old pole to the new pole. When rental-type arrangements are used, the lessee must transfer at his own expense. When the owner replaces a pole for the sole benefit of the lessee, the latter may also pay for the owner's transfer costs. Prior to the development of practical methods of constructing buried plant, it was reasoned that transfer costs would tend to balance out since both parties would be doing a certain amount of replacement work for the other. Today, one of the more common reasons for premature pole replacement is the power company's need for space to accommodate transmission facilities or increased distribution voltage. The telephone company normally has no reason to seek added pole space on a similar scale. Generally, the power company is responsible for a considerably larger number of premature pole replacements than the telephone company. The ***facts*** of the situation should be known, in any event. Unless the difference in billing for transfer costs is small enough to be offset by administrative savings, billing for transfer costs seems advisable (see 10.02).

10.05 Transfer and rearrangement charges are expense items; that is, they are charged to maintenance accounts and are not capitalized. As noted earlier, depreciation is concerned only with capital recovery and removal costs, but does not attempt to recover maintenance charges. Annual charges on pole lines do, however, include a maintenance component. It is usual practice to omit billing for transfer charges when the pole to be replaced is defective since the transfer costs would be incurred regardless of the needs of the other party. Since some expense is incurred in the preparation of bills, consideration might be given to omitting billing for transfer costs when a pole has less than five years of remaining life.

10.06 There has been favorable, although limited, experience with complete elimination of billing for transfer expense, sacrificed life and cost of additional height or strength. In the particular situation where this has been tried, the electric utility owned about 4/5 of the joint poles. It appears that the savings in administrative costs have been sufficient to compensate for the net difference in billing. The parties to this agreement included a clause which gave either one the right to revert back to billing for the previously-mentioned items. Such a safeguard is, of course, highly desirable (see 2.01). As an alternate safeguard, provision might be made to periodically specify areas where "full cost billing" would apply (see 10.02).

10.07 Billing for sacrificed life, cost or removal and cost of additional height or strength can, in many cases, be eliminated by having the party whose needs require it to replace the pole in question and become the owner. The change in ownership of the replaced pole is offset by changing ownership of another pole of the same size and age as the pole which was replaced. When the telephone company pays for sacrificed life and extra height or strength of a power company pole, the payment is capitalized, but no pole is added to the property records. Payments of this kind are spread over the entire pole line account. These two aspects of capital payments tend to offset each other.

11. USING THE DIVISION OF COSTS

11.01 As the preceding paragraphs imply, the division of costs ratio may be used in several ways. For example, it might be agreed that the ownership of solely owned joint poles ould be maintained approximately in the same ratio as the division of cost ratio. If the total number of poles is not too great (over 30,000 to 40,000 poles, for instance), it may be possible to reach agreement to let the ownership for each party vary a couple of percentage points either up or down (eg, telephone ownership might be 44 percent ±2 percent, or 42 to 46 percent. No rental would be paid. However, it should be recognized that it may be difficult to maintain pole ownership within these limits. This may require purchase of standing poles in some cases. Replacement of deteriorated poles may provide another means of keeping ownership within limits. Other opportunities may be afforded by selectively undergrounding aerial facilities.

11.02 A variation of the preceding method merely recognizes the difficulty of maintaining pole ownership at a particular ratio. This method requires development of a rental rate that usually tends to approach the annual charges on the average joint pole in plant. Rental is paid only on the deficiency in pole ownership. For example, if the telephone company owned 40 of 100 poles and the agreed-upon ratio were 44/56, the rental would be paid on four poles.

11.03 It sometimes happens that annual charges on the average joint pole owned by the telephone company are appreciably higher or lower than the power company's annual charges. If the difference is not too great, the two annual charges may be averaged. If the difference is significant, it may be appropriate to use separate annual charges, depending upon which party is deficient in ownership. Equity considerations suggest that if, for example, the power company were deficient, they should pay the annual charges on the extra poles owned by the telephone company and vice versa.

11.04 The division of costs may also be applied to the annual charges on the average joint pole in plant to develop separate rental rates for the two parties. For example, assume the annual charges are $18.00 and the agreed-upon division of costs is 42.5/57.5, the rental rates would be $7.65 (.425 × 18.00) and $10.35 (.575 × 18.00), respectively, for telephone and power. This normally implies cross billing for rentals and seems less attractive than the preceding method.

11.05 Joint ownership arrangements might use a uniform division of costs for all sizes of poles. However, it will be recognized that the costs of 50- and 60-foot poles such as commonly used with power transmission and subtransmission facilities are quite high. Purchasing 35 percent interest in a line of 60-foot poles, for example, could easily exceed the full cost of a line of 30-foot poles. On the other hand, this should be offset by the advantage of paying only 35 percent of the cost of 35- and 40-foot poles. Since both parties must record their investment and the percentage of ownership in each pole in any case, the advantage of having a uniform percentage of ownership in each pole is questionable. Usual practice is to specify different percentages of ownership for various sizes of poles. The basic principles employed are that, in general, the cost of a given amount of space remains the same regardless of pole height, and the party whose needs force the use of a pole which is larger than the standard used in the calculations should pay for the added cost. Another method of obtaining the same result is to consider the taller poles as standard size poles for billing purposes. In other words, the cost of the telephone company's interest in perhaps a 65-foot pole would be the same as if it were a 35-foot pole, or whatever the standard pole might be. Extra height may be required by both parties, for example, at railroad crossings or because of unusual topography, etc. The cost of extra height is normally shared equally in these situations and also where the presence of municipal attachments forces the use of higher poles.

11.06 In the particular case of joint ownership, it should be recognized that when the division of cost ratio is revised, the new division of costs applies ***only*** to poles that are replaced and poles in which an interest is being purchased. It does ***not*** affect standing jointly owned poles; the fraction of ownership in these poles remains unchanged. The new division of ownership does not obligate the power company, for example, to purchase another 5 percent in each standing pole in order to change their ownership from 50 to 55 percent.

12. SUMMARY

12.01 To summarize the arguments discussed in the preceding paragraphs, a comparison of the various methods of dividing costs is given in Table A.

TABLE A

COMPARISON OF DIVISION OF COST METHODS

DESCRIPTION OF METHOD	REF IN TEXT	SAVINGS (JOINT USE VERSUS NONJOINT USE) DOLLARS		PERCENT		DIVISION OF COSTS	REMARKS
		TEL	POWER	TEL	POWER		
Equal Cost Per Foot of Usable Space	3.01	32.92	14.08	45.6	14.8	30.9/69.1	Omits pole class and nonusable space
Equal Cost Per Foot Useful + 1/2 Nonusable Part of Pole	3.03	15.64	29.36	22.3	30.9	45.3/54.7	Omits pole class
Equal Cost Per Foot Useful + 1/2 Nonusable Above Ground	3.04	16.72	28.28	24.9	29.6	44.4/55.6	Omits pole class
Equal Percent Reduction in Cost Per Foot of Usable Space	3.05	17.20	27.80	24.57	29.26	43.98/56.02	Almost as good as "Share-the-Cost" method*
Combined Space Utilization and Transverse Loading	4.01	18.40	26.60	26.4	28.0	43/57	Required data hard to obtain
Share-the-Cost (Equal Percent Savings)	5.01	19.10	25.90	27.3	27.3	42.42/57.58	Most equitable*
Equal Dollar Savings	6.01	22.50	22.50	32.1	23.7	39.58/60.42	Favors telephone co.*
Reciprocal (50/50)	7.01	10.00	35.00	14.3	37.8	50/50	Generally favors power co.
Equal Added Investment	8.01	30.00	15.00	42.8	15.8	33.3/66.7	Favors telephone co.*
Equal Benefits	9.01	20.32	24.68	29.0	26.0	41.4/58.6	Deals with only part of costs*

* These methods require cost data for the construction of both joint and nonjoint lines. Cost data for nonjoint lines may be difficult to obtain.