

PROVISION FOR EXPENSES IN WORKMEN'S COMPENSATION PREMIUMS.

BY

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Such proportion of an insurance premium as is or may be assumed to be applicable to or necessary for the payment of all costs of conducting the business over and above the value of the benefits provided in the policy contract is commonly known as the *loading*. It includes such allowance for taxes as may be necessary and such specific provision for stockholders' profit or dividends to policyholders as may be decided upon.

In branches of insurance other than life insurance there has been but little discussion of the theory upon which premiums should be loaded to provide for expenses.* It has generally been assumed—at least in practice—that to the pure premium (being such portion of the office premium as is necessary to pay losses) there should be added a percentage of itself to provide for the expenses of acquisition, administration, adjustment, etc. The simple hypothesis underlying this assumption appears to be that expenses should, in general, be assessed in proportion to the value of the insurance benefits provided. More careful analysis, however, seems to show that such an hypothesis is too general to furnish a complete solution; that, while true in a general way, greater refinements of method must nevertheless be introduced if material inequities in premium rates are to be avoided.

The expenses of providing workmen's compensation insurance may conveniently be analyzed into four general groups, as follows:

1. Expenses proportional to the office premium (mainly acquisition expense and taxes).
2. Expenses proportional to the value of the benefits insured. (These may be assumed to be in proportion to the pure premium.)

* See, however, "Proceedings of the Joint Conference on Workmen's Compensation Insurance Rates, 1915;" published by the New York State Insurance Department, 1916; pp. 24-26.

Also, Frank E. Law, "A Method of Deducing Liability Rates," Spectator Co., 1908, pp. 19-21.

3. Expenses proportional to the amount of the insured payroll. (These constitute a constant addition to the pure premium.)

4. Expenses proportional to the number of policies issued. (These constitute a constant charge per policy.)

Under existing methods of underwriting we can go no further than to allocate expenses as accurately as may be to one of the first three groups: to utilize the fourth group, comprising those items of expense proportional to the number of policies issued, it would first be requisite that an actual policy fee or charge per policy be introduced in the computation of the premium. But without introducing any innovation in underwriting practice it is entirely feasible to assess expenses with greater regard for their sources by first distributing the actual expenses of the business, item by item in due proportion, among groups one to three inclusive. In actual practice the amount and distribution of expenses will, of course, vary considerably from state to state, making separate treatment for each state advisable.

The following allocation of expenses, adopted mainly for purposes of illustration, is based upon an analysis of the expense ratio of representative stock insurance companies for the year 1914 as reported in the *Proceedings of the Joint Conference, 1915*. The analysis represents average conditions for a number of important states and more recent studies indicate that the figures continue to reflect current conditions with considerable fidelity. Upon this basis it is assumed that the premium dollar is divisible into 60 cents for losses and 40 cents for expenses, as reported by the Conference. Personal judgment has been resorted to in subdividing the various items of expenses into three groups as shown below. It should be borne in mind that the figures given represent percentages of the gross premium in every case.

ALLOCATION OF EXPENSES (A).

(1) Division of Expense.	(2) Total.	(3) Proportional to Gross Premium.	(4) Proportional to Pure Premium.	(5) Proportional to Payroll.
1. Acquisition	17.5	17.5	0	0
2. Payroll audit	2.0	0	0	2.0
3. Administration	7.0	0	5.0	2.0
4. Inspection and prevention	4.0	0	2.0	2.0
5. Adjustment	7.0	0	7.0	0
6. Taxes	2.5	2.5	0	0
Total.....	40.0	20.0	14.0	6.0

A certain part of the audit, administration and inspection expenses are in point of fact proportional to the number of policies issued. Since, however, we have ignored for the moment this factor in the assessment of expense, we must distribute such charges as equitably as possible between the pure premiums and the payroll.

Acquisition expense, consisting wholly of the customary $17\frac{1}{2}\%$ commission or brokerage, is wholly allocatable to the gross premium since it is as a percentage of such gross premium that such commission or brokerage is payable.

Payroll audit expense has been treated as wholly chargeable against the amount of payroll to be audited.

General administration, which includes such items of overhead expenses as home office salaries, rent, postage, supplies, etc., has been allocated in the proportions two sevenths to payroll and five sevenths to pure premium. It would appear to be a sound fundamental principle that where there is a doubt as to the basis on which expenses should be assessed, the doubt should be resolved by allocating as much as is reasonably possible in proportion to the value of the benefits insured.

The cost of *inspection and the prevention of accidents* has been equally divided between the pure premium and the payroll on the theory that the size of a plant is largely measured by the number of employees, or, what is nearly the same thing, by the amount of the payroll, rather than by the amount which it is necessary to pay for insurance. On the other hand, inspection of a more hazardous plant is more costly than inspection of a less hazardous one, and hence a part of the cost of inspection should be assessed against the value of the hazard.

Adjustment expenses have been allocated against the pure premium since the value of the claims to be settled may be assumed to be in this proportion.

Taxes have been included as proportional to the gross premium since most of the taxes payable by insurance companies are levied upon the premium income.

Finally, then, we reach the conclusion that on the basis of the foregoing analysis, 50% of expenses should be assessed against the gross premium, 35% against the pure premium and 15% against the payroll.

Now let

- P = gross premium (manual) rate per \$100 payroll,
 p = pure premium rate,
 a = a percentage of the gross premium rate,
 e = a percentage of the pure premium rate,
 k = a constant per \$100 payroll.

Then

$$P = \frac{p(1 + e) + k}{1 - a}. \quad (A_1)$$

In order to determine the value of the constants in this formula upon the basis of the Allocation of Expenses (A) we proceed as follows:

From column (3) we can directly take the value $a = .20$.

From column (4) the expenses proportional to the pure premium amount to 14% of the gross premium. But the pure premiums average $(100 - 40)\%$ or 60% of the gross premiums. Hence 14% of the gross premium is equivalent to $(14 \div 60)\%$ or 23.3% of the pure premium. That is, $e = .23$.

From column (5) we ascertain that expenses proportional to payroll amount to 6% of the gross premium. To determine k , therefore, we should first ascertain for the particular state under consideration the average gross rate per \$100 payroll. This might be found from Schedule Z, where available, by dividing the total losses incurred for the state after loading by 66 $\frac{2}{3}\%$, or by whatever other percentage might be required to produce the aggregate expense fund decided to be necessary, by the total payroll exposure. If, for example, the average gross rate for the state should prove to be \$1.20, then k equals 6% of this amount or 7.2 cents. That is, $k = .072$.

Substituting in formula (A₁)

$$\begin{aligned} P &= \frac{p(1 + .23) + .072}{1 - .20} \\ &= 1.25(1.23p + .072) \\ &= 1.54p + .09 \text{ (very nearly)}. \end{aligned} \quad (A_2)$$

In other words, the loading for expenses under the foregoing assumptions is equivalent to 54% of the pure premium plus nine cents per \$100 payroll. The aggregate expense fund thus provided

is intended to be the same as though the pure premiums were loaded by a flat percentage of 66 $\frac{2}{3}$ %.

In order to show the differences in results produced by using formula (A_2) in place of the usual flat percentage the following short table is presented. Column (1) shows the pure premium rate; column (2) shows the gross premium rate as produced by the formula; column (3) shows the gross premium rate on the basis of 66 $\frac{2}{3}$ % loading with no payroll constant; and column (4) shows the difference between the two gross rates.

COMPARISON OF GROSS RATES
($P = 1.54p + .09$).

(1) <i>p.</i>	(2) <i>P.</i>	(3) 1 $\frac{2}{3}$ <i>p.</i>	(4) Difference (2)–(3).
.05	.167	.083	.084
.10	.244	.167	.077
.25	.475	.417	.058
.50	.860	.833	.027
.75	1.25	1.25	.000
1.00	1.63	1.67	–.04
2.00	3.17	3.33	–.16
5.00	7.79	8.33	–.54
10.00	15.49	16.67	–1.18

It will be observed from this comparison that the general effect of an allocation of expenses upon the basis of a more nearly exact analysis of actual conditions will produce loaded rates considerably higher, proportionately, for the classifications where the basic pure premium is low and considerably lower for the classifications where the basic pure premium is high. For the medium-rated classifications the results of the two methods are almost identical.

It should be noted that in the foregoing discussion the pure premium referred to is not intended to mean the pure premium derived from available experience without modification, but represents the pure premium after proper modification for such factors as increasing or decreasing industrial activity, the age of the compensation act, the effect of schedule and experience rating, the catastrophe hazard, and the like—that is, the entire probable value of the benefits insured.

The next step in the direction of a more accurate and equitable assessment of the expense burden involves the introduction of the fourth division of expenses hitherto referred to—namely, those

expenses which constitute a fixed charge per policy and are proportional to the number of policies issued. The imposition of a constant charge per policy—known generally as a policy or entrance fee—is a very ancient insurance device and one which may well be revived in connection with workmen's compensation insurance. It is recognized that such a suggestion, if put into effect, will call for some slight modifications in underwriting practice in the field and home office. Assuming that such modifications were made and that it is therefore possible to take this fourth division of the expenses into practical account, we may proceed to a reallocation of expenses upon this basis as follows:

ALLOCATION OF EXPENSES (B).

(1) Division of Expense.	(2) Total.	(3) Proportional to Gross Premium.	(4) Proportional to Pure Premium.	(5) Proportional to Payroll.	(6) Proportional to Number of Policies.
1. Acquisition	17.5	17.5	0	0	0
2. Payroll audit	2.0	0	0	1.0	1.0
3. Administration	7.0	0	3.0	2.0	2.0
4. Inspection and preven- tion	4.0	0	2.0	1.0	1.0
5. Adjustment	7.0	0	7.0	0	0
6. Taxes	2.5	2.5	0	0	0
Total	40.0	20.0	12	4.0	4.0

In (B) the general basis of apportionment is the same as in (A) save that a certain part of the expenses in items 2, 3 and 4 has been assigned as being in proportion to the number of policies. In order to effectuate this distribution of expenses in practice, it is clear that we shall no longer have the simple relation

$$\text{Gross premium} = \text{gross rate} \times \text{payroll},$$

but the more complicated relation

$$\text{Gross premium} = \text{gross rate} \times \text{payroll} + \text{a constant.}$$

Adopting the same notation as before with the additional symbols

$$W = \frac{\text{Insured payroll}}{100}$$

$$P' = \text{Gross premium}$$

$$f \text{ and } f' = \text{constants per policy}$$

we shall have

$$\begin{aligned}
 P' &= PW + f \\
 &= \frac{W[p(1 + e) + k] + f'}{1 - a} \qquad (B_1)
 \end{aligned}$$

In order that the aggregate expense fund may be the same as before it is necessary to redetermine the value of the constants on the basis of the percentages in scheme (B).

From column (3) we take, as before, the value $a = .20$.

From column (4) the expenses proportional to the pure premium amount to 12% of the gross premium. This is equivalent to $(12 \div .60)\%$ or 20% of the pure premium. That is, $e = .20$.

From column (5) it appears that expenses proportional to payroll equal 4% of the gross premium. Assuming the average gross rate to be \$1.20, the same as before, we have $k = .04 \times 1.20 = .048$.

From column (6) we find that expenses proportional to the number of policies amount to 4% of the gross premiums. That is, to determine f' it is necessary to take 4% of the total premium volume in the experience considered divided by the number of policies. This is equivalent to 4% of the average gross premium (*not* gross premium rate). Assuming the average premium per policy for the state under consideration to be \$125, $f' = .04 \times 125 = 5.00$.

Substituting in the formula

$$P' = \frac{W[p(1 + .20) + .048] + 5.00}{1 - .20} \quad (B_2)$$

$$= W(1.50p + .06) + 6.25.$$

Expressed in words, the loading for expenses provided in formula (B_2) is equivalent to 50% of the pure premium plus six cents per \$100 payroll plus \$6.25 per policy. The aggregate expense fund thus created is intended, as before, to be the same as though the pure premiums were loaded by a flat percentage of 66 $\frac{2}{3}$ %.

The following table shows, for certain selected values of the variables, the results produced by formula (B_2) as compared with the results of the usual flat percentage loading.

It will be observed from this comparison that the general effect of using formula (B_2) is to produce relatively high premiums for very small payrolls and low-rated classifications and proportionately lower premiums for large payrolls and high-rated classifications. Thus, to take two examples, where the payroll is \$500 and the pure premium 5 cents the gross premium required by the formula is \$6.93 as compared with 42 cents on the basis of a flat 66 $\frac{2}{3}$ % loading. Where the payroll is \$50,000 and the pure premium \$2.00 the gross premium is \$1536.25 as compared with \$1667 on the basis of a flat 66 $\frac{2}{3}$ % loading.

COMPARISON OF GROSS PREMIUMS

$$(P' = W[1.50p + .06] + 6.25).$$

(1) <i>p.</i>	<i>W</i> = 5.			<i>W</i> = 50.			<i>W</i> = 500.		
	(2) <i>P'</i> .	(3) 1½ <i>p W.</i>	(4) Differ- ence (2)–(3).	(5) <i>P'</i> .	(6) 1½ <i>p W.</i>	(7) Differ- ence (5)–(6).	(8) <i>P'</i> .	(9) 1½ <i>p W.</i>	(10) Differ- ence (8)–(9).
.05	6.93	.42	6.51	13.00	4.15	8.85	73.75	41.50	32.25
.10	7.30	.84	6.46	16.75	8.35	8.40	111.25	83.50	27.75
.25	8.43	2.09	6.34	28.00	20.85	7.15	223.75	208.50	15.25
.50	10.30	4.17	6.13	46.75	41.65	5.10	411.25	416.50	– 5.25
.75	12.18	6.25	5.93	65.50	62.50	3.00	598.75	625.00	– 26.25
1.00	14.05	8.35	5.70	84.25	83.50	0.75	786.25	835.00	– 48.75
2.00	21.55	16.67	4.88	159.25	166.70	– 7.45	1536.25	1667.00	–130.75
5.00	44.05	41.65	2.40	384.25	416.50	–32.25	3786.25	4165.00	–378.75
10.00	81.55	83.35	–1.80	759.25	833.50	–74.25	7536.25	8335.00	–798.85

Insurance under workmen's compensation laws involves policy contracts covering an enormous range of risk, from the small employer desiring to insure the hazard of a single employee—who may not even be working full time—up to a great corporation with thousands of employees where the premium on a single risk may be measured in tens of thousands of dollars. Under such conditions it is difficult to find a simple basis of loading which will be equitable for risks of all sizes. Rules of thumb break down when compelled to stretch over so wide a range of conditions. Expense loadings adequate for the small risks become so large proportionately when applied to large corporations that many are driven to self-insurance. *Vice versa*, premiums involving what would be a reasonable expense loading for a very large risk might be quite insufficient to take care of the risk of an employer with only two or three employees. Especially has the compulsory or virtually compulsory nature of compensation laws emphasized the difficulty of collecting from the immense number of small employers compelled to insure an adequate premium for the risk, considering the high cost of properly auditing, inspecting and administering business in such small units, without at the same time promulgating rates which impose an unfair burden upon employers whose payroll is sufficient to secure a fair spread for administrative expenses and to warrant the expense of an inspection and audit.

The device of charging a minimum premium is only a partial solution of the difficulty. According to the standard manual, "a minimum premium is an expression of the lowest premium amount

for which a single risk can be written and carried for a period of one year." It is obvious, however, that under such a system of loading as that just outlined the necessity for a minimum premium is to a large extent done away with. A constant charge per policy, no matter how large or how small the premium may be, yields better practical results and is more susceptible of theoretical justification than a minimum premium. Under a policy-charge system each increase or decrease in the payroll of the risk, no matter how large or how small, is reflected in the rate in an equitable and non-discriminatory manner. This is not true of a minimum premium system.

It seems probable that any proposed change whatever in the method of providing for expenses will be criticized as involving "discrimination." But the real test of discrimination is whether or not those fundamental principles of mutuality which enter into all insurance are violated. And the test of mutuality is that each insured shall be charged as exactly as possible with the value of the benefit in his policy plus his share of the expenses assessed in the proportion in which he has contributed to produce them.